

Wolbach Library: CfA in the News ~ Week ending 2 January 2011

1. **Research from S.W. Randall and co-researchers provides new data on astronomy**, Science Letter, p1407, Tuesday, January 4, 2011
2. **New astronomy study findings reported from R.I. Dawson and co-authors**, Science Letter, p542, Tuesday, January 4, 2011
3. **New astronomy study findings have been published by R.J. Foley and colleagues**, Science Letter, p541, Tuesday, January 4, 2011
4. **Yearender: Great science discoveries of 2010**, Xinhua News Agency, Friday, December 31, 2010
5. **Xinhua 'Yearender': Great Science Discoveries of 2010**, World News Connection, Friday, December 31, 2010

Record - 1

DIALOG(R)

Research from S.W. Randall and co-researchers provides new data on Astronomy,

Science Letter, p1407,
Tuesday, January 4, 2011

TEXT:

"We present results based on new Chandra and multi-frequency radio observations of the disturbed cool core cluster Abell 133. The diffuse gas has a complex bird-like morphology, with a plume of emission extending from two symmetric wing-like features," researchers in the United States report (see also).

"The plume is capped with a filamentary radio structure that has been previously classified as a radio relic. X-ray spectral fits in the region of the relic indicate the presence of either high-temperature gas or non-thermal emission, although the measured photon index is flatter than would be expected if the non-thermal emission is from inverse Compton scattering of the cosmic microwave background by the radio-emitting particles. We find evidence for a weak elliptical X-ray surface brightness edge surrounding the core, which we show is consistent with a sloshing cold front. The plume is consistent with having formed due to uplift by a

buoyantly rising radio bubble, now seen as the radio relic, and has properties consistent with buoyantly lifted plumes seen in other systems (e. g., M87). Alternatively, the plume may be a gas sloshing spiral viewed edge-on. from spectral analysis of the wing-like features are inconsistent with the previous suggestion that the wings formed due to the passage of a weak shock through the cool core. We instead conclude that the wings are due to X-ray cavities formed by displacement of X-ray gas by the radio relic. The central cD galaxy contains two small-scale cold gas clumps that are slightly offset from their optical and UV counterparts, suggestive of a galaxy-galaxy merger event. On larger scales, there is evidence for cluster substructure in both optical observations and the X-ray temperature map. We suggest that the Abell 133 cluster has recently undergone a merger event with an interloping subgroup, initialing gas sloshing in the core. The torus of sloshed gas is seen close to edge-on, leading to the somewhat ragged appearance of the elliptical surface brightness edge. We show that the additional buoyant force from a passing subcluster can have a significant effect on the rise trajectories of buoyant bubbles, although this effect alone cannot fully explain the morphology of Abell 133. The radio observations reveal a large-scale double-lobed structure not previously identified in the literature. this structure represents a previously unreported background giant radio galaxy at $z = 0.293$, the northern lobe of which overlies the radio relic in the core of Abell 133," wrote S.W. Randall and colleagues.

The researchers concluded: "A rough estimate indicates that the contribution of this background lobe to the total radio emission in the region of the relic is modest ($< 13\%$)."

Randall and colleagues published their study in *Astrophysical Journal* (Radio And Deep Chandra Observations Of The Disturbed Cool Core Cluster Abell 133. *Astrophysical Journal*, 2010;722(1):825-846).

For additional information, contact S.W. Randall, Harvard **Smithsonian** Center Astrophysics, 60 Garden St., Cambridge, MA 02138, USA.

Publisher contact information for the *Astrophysical Journal* is: IOP Publishing Ltd., Dirac House, Temple Back, Bristol BS1 6BE, England.

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Record - 2

DIALOG(R)

New astronomy study findings reported from R.I. Dawson and co-authors, Science Letter, p542,

Tuesday, January 4, 2011

TEXT:

According to recent research from the United States, "Radial velocity measurements of stellar reflex motion have revealed many extrasolar planets, but gaps in the observations produce aliases, spurious frequencies that are frequently confused with the planets' orbital frequencies. In the case of Gl 581 d, the distinction between an alias and the true frequency was the distinction between a frozen, dead planet and a planet possibly hospitable to life."

"To improve the characterization of planetary systems, we describe how aliases originate and present a new approach for distinguishing between orbital frequencies and their aliases. Our approach harnesses features in the spectral window function to compare the amplitude and phase of predicted aliases with peaks present in the data. We apply it to confirm prior alias distinctions for the planets GJ 876 d and HD 75898 b. We find that the true periods of Gl 581 d and HD 73526 b/c remain ambiguous. We revise the periods of HD 156668 b and 55 Cnc e, which were afflicted by daily aliases. For HD 156668 b, the correct period is 1.2699 days and the minimum mass is $(3.1 \pm 0.4) M_{\oplus}$. For 55 Cnc e, the correct period is 0.7365 days—the shortest of any known planet—and the minimum mass is $(8.3 \pm 0.3) M_{\oplus}$. This revision produces a significantly improved five-planet Keplerian fit for 55 Cnc, and a self-consistent dynamical fit describes the data just as well," wrote R.I. Dawson and colleagues (see also).

The researchers concluded: "As radial velocity techniques push to ever-smaller planets, often found in systems of multiple planets, distinguishing true periods from aliases will become increasingly important."

Dawson and colleagues published their study in *Astrophysical Journal* (RADIAL VELOCITY PLANETS DE-ALIASED: A NEW, SHORT PERIOD FOR SUPER-EARTH 55 Cnc e. *Astrophysical Journal*, 2010;722(1):937-953).

For additional information, contact R.I. Dawson, Harvard **Smithsonian** Center Astrophysics, 60 Garden St., MS 10, Cambridge, MA 02138, USA.

Publisher contact information for the *Astrophysical Journal* is: IOP Publishing Ltd., Dirac House, Temple Back, Bristol BS1 6BE, England.

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DIALOG(R)

New astronomy study findings have been published by R.J. Foley and Colleagues,

Science Letter, p541,
Tuesday, January 4, 2011

TEXT:

According to a study from the United States, "We present observations of supernova (SN) 2008ge, which is spectroscopically similar to the peculiar SN 2002cx, and its pre-explosion site indicating that its progenitor was probably a white dwarf. NGC 1527, the host galaxy of SN 2008ge, is an S0 galaxy with no evidence of star formation or massive stars."

"Astrometrically matching late-time imaging of SN 2008ge to pre-explosion Hubble Space Telescope imaging, we constrain the luminosity of the progenitor star. Since SN 2008ge has no indication of hydrogen or helium in its spectrum, its progenitor must have lost its outer layers before exploding, meaning that it is a white dwarf, a Wolf-Rayet star, or a lower-mass star in a binary system. Observations of the host galaxy show no signs of individual massive stars, star clusters, or H (II) regions at the SN position or anywhere else, making a Wolf-Rayet progenitor unlikely. Late-time spectroscopy of SN 2008ge shows strong [Fe (II)] lines with large velocity widths compared to other members of this class at similar epochs. These previously unseen features indicate that a significant amount of the SN ejecta is Fe (presumably the result of the radioactive decay of Ni-56 generated in the SN), further supporting a thermonuclear explosion," wrote R.J. Foley and colleagues (see also).

The researchers concluded: "Placing the observations of SN 2008ge in the context of observations of other objects in the same class of SNe, we suggest that the progenitor was most likely a white dwarf."

Foley and colleagues published the results of their research in *Astronomical Journal* (ON THE PROGENITOR AND SUPERNOVA OF THE SN 2002cx-LIKE SUPERNOVA 2008ge. *Astronomical Journal*, 2010;140(5):1321-1328).

For additional information, contact R.J. Foley, Harvard **Smithsonian** Center Astrophysics, 60 Garden St., Cambridge, MA 02138, USA.

The publisher of the *Astronomical Journal* can be contacted at: IOP Publishing Ltd., Dirac House, Temple Back, Bristol BS1 6BE, England.

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Record - 4

DIALOG(R)

Yearender: Great science discoveries of 2010,
Xinhua News Agency,
Friday, December 31, 2010

TEXT:

BEIJING, Dec 31, 2010 (Xinhua via COMTEX News Network) -- In the year 2010, we are living in a world where the seeds of technological wonders and scientific breakthroughs are quietly germinating.

From the creation of "artificial life" to the finding of the youngest black hole and the successful collisions performed by the Geneva atom smasher, the world is accelerating its steps into an unimaginable future, a future with more promises for changes.

AN ARTIFICIAL SLICE OF LIFE

On May 20, U.S. scientist Craig Venter and his team announced that they have created the first fully functioning, reproducing cell that is controlled by a completely synthetic chromosome.

The advance, detailed in the Science journal, could be the proof of principle that genomes, designed in a computer and chemically made in a lab, can function in a host cell, eventually producing a new self-replicating cell, that is, artificial life.

Researchers hope to design bacterial cells that could speed up vaccine production, manufacture renewable fuels, new food additives and chemical alternatives and even absorb greenhouse gases.

Though hailed as a scientific landmark, the technological breakthrough of "artificial life" also attracted criticisms and sparked fears that the research could be abused to create biological weapons or lead to environmental disasters.

Critics accused the scientists of playing God, saying the breakthrough, that took 15 years and 27.7 million U.S. dollars to achieve, opens an ethical Pandora's box.

Some also suggest that the importance and potential benefits of the technology have been over-stated, describing what Venter achieved as "a technical tour de force" as he did not actually create a new life form but in fact copied a pre-existing genome from an already existing cell.

Of course, the scientists may still have a long way from creating a whole

cell from scratch, and even further from an artificial plant or animal, but it is hard to deny that a boundary has been crossed.

ATOM SMASHER RECREATES BIG BANG

In late March, the Large Hadron Collider (LHC), also known as the Big Bang machine, made history by smashing proton beams into each other at the highest energy rate ever realized in a laboratory.

Scientists at the European Organization for Nuclear Research, or CERN, collided the beams at a record energy level of 7 trillion electron volts, starting a research program aimed at unlocking the secrets of the beginning of the universe.

The success came after a faltering start at the giant 3.9 billion euro (5.2 billion dollars) machine housed in a 27-km circular tunnel under the French-Swiss border near Geneva.

About seven months later, the program entered into a new phase as the LHC created its very own mini Big Bang after smashing together lead ions instead of protons.

The successful collision of lead ions in the accelerator at record energies allows matter to be probed as it would have been in the first moments of the universe's existence.

The experiment generated incredibly hot and dense sub-atomic fireballs with temperatures a million times hotter than the center of the Sun.

With these record-shattering collision energies, the LHC experiments are propelled into a vast new area of exploration and the hunt begins for dark matter, new forces, new dimensions and the Higgs boson particle, an elementary particle that exists only in theory of particle physics.

YOUNGEST BLACK HOLE

In mid-November, NASA announced that its Chandra X-ray Observatory has found evidence of the youngest black hole known to exist in our cosmic neighborhood.

The black hole is believed to be a remnant of a supernova in the galaxy M100 approximately 50 million light years from the Earth.

Code-named "SN 1979C," the supernova explosion is very likely a black hole, but cannot completely rule out other possibilities.

SN 1979C was first reported to be seen by an amateur astronomer in 1979. "If our interpretation is correct, this is the nearest example where the birth of a black hole has been observed," said lead researcher Daniel Patnaude, from the Harvard-Smithsonian Center for Astrophysics, in Massachusetts.

The black hole could offer scientists and researchers a rare opportunity to watch a black hole develop from infancy.

It could also shed light on how many black holes there may be in our galaxy and elsewhere.

The researchers believe that the black hole is now about five times the mass of the Sun, and was formed from the explosion of a star about 20 times as massive as the Sun.

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Record - 5

DIALOG(R)
Xinhua 'Yearender': Great Science Discoveries of 2010,
World News Connection,
Friday, December 31, 2010

TEXT:

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It could also shed light on how many black holes there may be in our galaxy and elsewhere.

The researchers believe that the black hole is now about five times the mass of the Sun, and was formed from the explosion of a star about 20 times as massive as the Sun.

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Wolbach Library: CfA in the News ~ Week ending 9 January 2011

1. **Research results from J.R. Pritchard and colleagues update understanding of astronomy**, Science Letter, p2493, Tuesday, January 11, 2011
2. **Reports on astronomy findings from J.D. Hartman and co-researchers provide new insights**, Science Letter, p1630, Tuesday, January 11, 2011
3. **Reports on astronomy research from Y. Birnboim and colleagues discussed**, Science Letter, p761, Tuesday, January 11, 2011
4. **Data on astronomy detailed by D.M. Kipping and co-authors**, Science Letter, p298, Tuesday, January 11, 2011
5. **Data on astronomy described by E.K. Simpson et al**, Science Letter, p297, Tuesday, January 11, 2011
6. **'Astronomy is technology driven'**, Staff Correspondent, Hindu (India), Friday, January 7, 2011
7. **Technology is killing schools, says Kamath**, Staff Correspondent, Hindu (India), Thursday, January 6, 2011
8. **NASA instrument shows never-before-seen Sun's innermost corona**, Hindustan Times, Wednesday, January 5, 2011
9. **Astronomy meet from Thursday**, Staff Correspondent, Hindu (India), Tuesday, January 4, 2011
10. **Quadrantid meteor shower tonight: the top nine meteor showers of 2011**, Pete Spotts, Staff writer, Christian Science Monitor (USA), ALL ed, Monday, January 3, 2011

Record - 1

DIALOG(R)

Research results from J.R. Pritchard and colleagues update understanding of astronomy, Science Letter, p2493, Tuesday, January 11, 2011

TEXT:

According to a study from the United States, "In this paper, we explore the constraints on the reionization history that are provided by current observations of the Ly alpha forest and the cosmic microwave background.

Rather than using a particular semi-analytic model, we take the novel approach of parametrizing the ionizing sources with arbitrary functions and perform likelihood analyses to constrain possible reionization histories."

"We find model-independent conclusions that reionization is likely to be mostly complete by $z = 8$ and that the intergalactic medium was 50 per cent ionized at $z = 9-10$. Upcoming low-frequency observations of the redshifted 21-cm line of neutral hydrogen are expected to place significantly better constraints on the hydrogen neutral fraction at z less than or similar to 6 less than or similar to 12. We use our constraints on the reionization history to predict the likely amplitude of the 21-cm power spectrum and show that observations with the highest signal-to-noise ratio will most likely be made at frequencies corresponding to $z = 9-10$. This result provides an important guide to the upcoming 21-cm observations. Finally, we assess the impact that measurement of the neutral fraction will have on our knowledge of reionization and the early source population," wrote J.R. Pritchard and colleagues (see also).

The researchers concluded: "Our results show that a single measurement of the neutral fraction mid-way through the reionization era will significantly enhance our knowledge of the entire reionization history."

Pritchard and colleagues published their study in Monthly Notices of the Royal Astronomical Society (Constraining reionization using 21-cm observations in combination with CMB and Ly alpha forest data. Monthly Notices of the Royal Astronomical Society, 2010;408(1):57-70).

For more information, contact J.R. Pritchard, Harvard Smithsonian Center Astrophysics, MS-51, 60 Garden St., Cambridge, MA 02138, USA.

Publisher contact information for the journal Monthly Notices of the Royal Astronomical Society is: Wiley-Blackwell Publishing, Inc., Commerce Place, 350 Main St., Malden 02148, MA, USA.

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Record - 2

DIALOG(R)

Reports on astronomy findings from J.D. Hartman and co-researchers provide new insights,

Science Letter, p1630,

Tuesday, January 11, 2011

TEXT:

"Using data from the Hungarian-made Automated Telescope Network (HATNet)

survey for transiting exoplanets, we measure photometric rotation periods for 368 Pleiades stars with 0.4 less than or similar to M less than or similar to 1.3 M_{\odot} . We detect periodic variability for 74 per cent of the cluster members in this mass range that are within our field-of-view, and 93 per cent of the members with 0.7 less than or similar to M less than or similar to 1.0 M_{\odot} ," scientists writing in the journal *Monthly Notices of the Royal Astronomical Society* report (see also).

"This increases, by a factor of 5, the number of Pleiades members with measured periods. We compare these data to the rich sample of spectroscopically determined projected equatorial rotation velocities ($v \sin i$) available in the literature for this cluster. Included in our sample are 14 newly identified probable cluster members which have proper motions, photometry and rotation periods consistent with membership. For stars with M greater than or similar to 0.85 M_{\odot} the rotation periods, $v \sin i$ and radius estimates are consistent with the stars having an isotropic distribution of rotation axes, if a moderate differential rotation law is assumed. For stars with M less than or similar to 0.85 M_{\odot} , the inferred $\sin i$ values are systematically larger than 1.0. These observations imply that the combination of measured parameters $P(v \sin i)/R$ is too large by similar to 24 per cent for low-mass stars in this cluster," wrote J.D. Hartman and colleagues.

The researchers concluded: "By comparing our new mass-period relation for the Pleiades to the slightly older cluster M35, we confirm previous indications that the spin-down stalls at similar to 100 Myr for the slowest rotating stars with 0.7 less than or similar to M less than or similar to 1.1 M_{\odot} - a fact which may indicate that the internal transport of angular momentum is inefficient in slowly rotating solar-mass stars."

Hartman and colleagues published their study in *Monthly Notices of the Royal Astronomical Society* (A large sample of photometric rotation periods for FGK Pleiades stars. *Monthly Notices of the Royal Astronomical Society*, 2010;408(1):475-489).

Additional information can be obtained by contacting J.D. Hartman, Harvard Smithsonian Center Astrophysics, 60 Garden St., Cambridge, MA 02138, USA.

The publisher of the journal *Monthly Notices of the Royal Astronomical Society* can be contacted at: Wiley-Blackwell Publishing, Inc., Commerce Place, 350 Main St., Malden 02148, MA, USA.

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DIALOG(R)

New astronomy research from Y. Birnboim and colleagues discussed,

Science Letter, p761,

Tuesday, January 11, 2011

TEXT:

"Cold fronts (CFs) are found in most galaxy clusters, as well as in some galaxies and groups of galaxies. We propose that some CFs are relics of merging between two shocks propagating in the same direction," scientists writing in the journal Monthly Notices of the Royal Astronomical Society report (see also).

"Such shock mergers typically result in a quasi-spherical, a factor of approximate to 1.4-2.7 discontinuity in density and in temperature. These CFs may be found as far out as the virial shock, unlike what is expected in other CF formation models. As a demonstration of this effect, we use 1D simulations of clusters and show that shock-induced CFs form when perturbations such as explosions or mergers occur near the cluster's centre. Perturbations at a cluster's core induce periodic merging between the virial shock and outgoing secondary shocks," wrote Y. Birnboim and colleagues.

The researchers concluded: "These collisions yield a distinctive, concentric, geometric sequence of CFs which trace the expansion of the virial shock."

Birnboim and colleagues published their study in Monthly Notices of the Royal Astronomical Society (Cold fronts by merging of shocks. Monthly Notices of the Royal Astronomical Society, 2010;408(1):199-212).

Additional information can be obtained by contacting Y. Birnboim, Harvard Smithsonian Center Astrophysics, 60 Garden St., Cambridge, MA 02138, USA.

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Record - 4

DIALOG(R)

Data on astronomy detailed by D.M. Kipping and co-authors,

Science Letter, p298,

Tuesday, January 11, 2011

TEXT:

"We explore how finite integration times or equivalently temporal binning induces morphological distortions to the transit light curve. These distortions, if uncorrected for, lead to the retrieval of erroneous system parameters and may even lead to some planetary candidates being rejected as ostensibly unphysical," researchers in the United States report (see also).

"We provide analytic expressions for estimating the disturbance to the various light-curve parameters as a function of the integration time. These effects are particularly crucial in light of the long-cadence photometry often used for discovering new exoplanets by, for example, Convection Rotation and Planetary Transits (CoRoT) and the Kepler Missions (8.5 and 30 min). One of the dominant effects of long integration times is a systematic underestimation of the light-curve-derived stellar density, which has significant ramifications for transit surveys. We present a discussion of numerical integration techniques to compensate for the effects and produce expressions to quickly estimate the errors of such methods, as a function of integration time and numerical resolution. This allows for an economic choice of resolution before attempting fits of long-cadence light-curves," wrote D.M. Kipping and colleagues.

The researchers concluded: "We provide a comparison of the short- and long-cadence light curves of TrES-2b and show that the retrieved transit parameters are consistent using the techniques discussed here."

Kipping and colleagues published their study in Monthly Notices of the Royal Astronomical Society (Binning is sinning: morphological light-curve distortions due to finite integration time. Monthly Notices of the Royal Astronomical Society, 2010;408(3):1758-1769).

For additional information, contact D.M. Kipping, Harvard Smithsonian Center Astrophysics, 60 Garden St., Cambridge, MA 02144, USA.

Publisher contact information for the journal Monthly Notices of the Royal Astronomical Society is: Wiley-Blackwell Publishing, Inc., Commerce Place, 350 Main St., Malden 02148, MA, USA.

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Record - 5

DIALOG(R)

Data on astronomy described by E.K. Simpson et al,

Science Letter, p297,
Tuesday, January 11, 2011

TEXT:

According to recent research from the United States, "The stellar rotation periods of 10 exoplanet host stars have been determined using newly analysed Ca ii H&K flux records from the Mount Wilson Observatory and Stromgren b, y photometric measurements from Tennessee State University's automatic photometric telescopes at the Fairborn Observatory. Five of the rotation periods have not previously been reported, with that of HD 130322 very strongly detected at $P\text{-rot} = 26.1 \pm 3.5$ d. The rotation periods of five other stars have been updated using new data."

"We use the rotation periods to derive the line-of-sight inclinations of the stellar rotation axes, which may be used to probe theories of planet formation and evolution when combined with the planetary orbital inclination found from other methods. Finally, we estimate the masses of 14 exoplanets under the assumption that the stellar rotation axis is aligned with the orbital axis," wrote E.K. Simpson and colleagues (see also).

The researchers concluded: "We calculate the mass of HD 92788 b (28 M-J) to be within the low-mass brown dwarf regime and suggest that this object warrants further investigation to confirm its true nature."

Simpson and colleagues published their study in Monthly Notices of the Royal Astronomical Society (Rotation periods of exoplanet host stars. Monthly Notices of the Royal Astronomical Society, 2010;408(3):1666-1679).

For additional information, contact E.K. Simpson, Harvard Smithsonian Center Astrophysics, 60 Garden St., Cambridge, MA 02138, USA.

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Record - 6

DIALOG(R)

'Astronomy is technology driven',

Staff Correspondent,

Hindu (India)

Friday, January 7, 2011

TEXT:

Udupi: 'Our understanding of the universe is poised for a revolution,' said scientist at the Harvard-Smithsonian Centre for Astrophysics, Cambridge, Massachusetts, U.S., Vinay Kashyap here on Thursday.

He was delivering the keynote address at the inaugural function of the three-day national conference on 'astronomy and astrophysics' organised by the Poornaprajna College and Association of Physics Teachers of Mangalore.

Dr. Kashyap said astronomy was a technology driven and data driven science. 'If we can take advantage of the data streams that are heading our way, astronomy enthusiasts will have a large role to play,' he said.

'Astronomy and astrophysics are a highly active field, and an extraordinary amount of progress is being made, rivalling any other era of scientific discovery,' Dr. Kashyap said.

Inaugurating the conference, Deputy Commissioner P. Hemalatha said that ancient Indians were far ahead of the west in the field of astronomy.

K.J. Rao, head of the Solid State and Structural Chemistry (SSCU), Indian Institute of Science, Bangalore, K.J. Rao, presided over the inaugural function.

Principal of the college K. Sadashiva Rao welcomed the gathering. Coordinator A.P. Bhat spoke.

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Record - 7

DIALOG(R)

Technology is killing schools, says Kamath,

Staff Correspondent,

Hindu (India),

Thursday, January 6, 2011

TEXT:

Manipal: 'Technology is killing our schools,' said honorary director of Manipal Institute of Communication M.V. Kamath, here on Wednesday.

He was inaugurating the three-day 71st conclave of heads of Indian Public Schools' Conference (IPSC) organised by the Sharada Residential School, a unit of the Dr. T.M.A. Pai Foundation.

Mr. Kamath said technology was changing the way education was being imparted in schools. Students had access to Internet and gather information from it. Some students, who collected information from the Internet, even bragged that they knew more than their teachers. 'It is necessary to understand that Internet provided information and not knowledge,' he said. Concepts such as e-learning and paper-free classes were the present-day buzz words. While such concepts were attractive, the consequences of adopting them should be thought of thoroughly. Many teachers were resorting to power-point presentation. But such power-point presentations were no substitute to eye-to-eye contact. 'Eye contact teaching is essential. If a teacher cannot keep eye contact with students, he is not a teacher at all,' he said.

He said writing was slowly dying. Students depended on calculators and mobile telephones to do simple multiplication tables. There was talk of students learning with the help of CDs and e-learning techniques in their own houses instead of going to schools.

'If this becomes a reality, teachers would lose their relevance. The purpose of schools is to produce well-educated students and not robots,' he said.

But the parents should realise that besides knowledge, values were imparted in schools. There was talk of textbooks becoming irrelevant. 'This bookless vision in the next 20 to 25 years is a cause for concern,' he said.

There was the other side.

If there was a bright student, who could muster the knowledge of his class in three months, should he be made to study in the same class for the remaining nine months? 'But it is essential that parents or teachers did not force more knowledge than the students can digest,' he said.

Students in public schools were thought to come from elite background. Students of these elite schools should be made sensitive to the problem of poverty in the country. They should be asked to visit gram panchayats and understand the problems there. Students should be taught moral values, Mr. Kamath said.

Foundation president Mohandas Pai, IPSC chairperson Jyotsana Brar, Secretary I.L. Syal, Director (sports) V.K. Verma, scientist at Harvard-Smithsonian Centre for Astrophysics, U.S., and school principal Vidyavantha Acharya were present.

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Record - 8

DIALOG(R)

NASA instrument shows never-before-seen Sun's innermost corona,

Hindustan Times,

Wednesday, January 5, 2011

TEXT:

Washington, Jan. 5 -- An instrument aboard NASA's Solar Dynamics Observatory (SDO), developed by Smithsonian scientists, has provided never before seen views of the innermost corona 24 hours a day, 7 days a week.

The corona, which is the outer layer of the Sun's atmosphere is hotter than the Sun's surface and becomes visible only when the Sun is blocked, which happens for just a few minutes during an eclipse.

'We can follow the corona all the way down to the Sun's surface,' said Leon Golub of the Harvard-Smithsonian Center for Astrophysics (CfA).

The only way astronomers could view the corona earlier was by physically blocking the solar disk with a coronagraph, but the Atmospheric Imaging Assembly (AIA) instrument on SDO can 'fill' this gap.

'The AIA solar images, with better-than-HD quality views, show magnetic structures and dynamics that we've never seen before on the Sun,' said CfA astronomer Steven Cranmer.

The images obtained will be used to study the initial eruption phase of coronal mass ejections (CMEs) as they leave the Sun and to test theories of solar wind acceleration based on magnetic reconnection. Published by HT Syndication with permission from Asian News International. For any query with respect to this article or any other content requirement, please contact Editor at htsyndication@hindustantimes.com

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Record - 9

DIALOG(R)

Astronomy meet from Thursday,

Staff Correspondent,

Hindu (India)

Tuesday, January 4, 2011

TEXT:

Udupi: Poornaprajna College and the Association of Physics Teachers of Mangalore University will organise a three-day national conference on 'Astronomy and Astrophysics' here from Thursday.

200 delegates

Addressing presspersons here on Monday, Head of the Department of Physics at the college A.P. Bhat said that over 200 delegates were expected to participate in the conference. Four sessions will be held during the conference and experts will deliver lectures.

Topics

The topics which will be discussed include 'Evolution of stars', 'Super massive black holes and their observational signature', 'Indian Space Programme', 'Magnetic universe', 'Chandrayan-challenges' 'Experiments related to Astronomy' and 'Radio Astronomy'.

The conference is sponsored by the University Grants Commission.

President of Admar Math Education Council Vishwapriya Tirtha swami will inaugurate the conference. Vinay Kashyap of Harvard Smithsonian Centre for Astrophysics, U.S., will deliver the keynote address.

Head of the Department of Solid State and Spectral Chemistry, Indian Institute of Science, K.J. Rao will preside over the inaugural session. Professors Srikant Sidhapura, Muralidhar Upadhya Hiriyadka and Jagadish Shetty were present.

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Record - 10

DIALOG(R)

Quadrantid meteor shower tonight: the top nine meteor showers of 2011,
Pete Spotts, Staff writer,
Christian Science Monitor (USA), ALL ed,
Monday, January 3, 2011

TEXT:

This week will see a lesser known meteor shower, the Quadrantid, dazzle the night sky on Jan. 3 and 4. It's the first of nine significant meteor showers in 2011. Here's a list of all the events and what to watch for each time.

#9 Quadrantid

Jan. 3-4

The Quadrantid meteor shower is set to give well-bundled skywatchers a great show overnight Jan. 3, weather permitting.

The meteor shower could generate from 60 to 100 "shooting stars" an hour at its peak, astronomers say. The meteors will appear to stream from a spot in the sky below the end of the constellation Big Dipper's handle. But because this spot, or "radiant," is low on the horizon at the predicted peak time of around 8 p.m. Jan. 3, many of those meteors will show up only for viewers well over the horizon, say, in Europe.

Thus, the best viewing for people in North America will still fall somewhere after 1 a.m. Jan. 4, when the radiant rises high enough in the sky to display meteors heading out in all directions, according to Alan McRobert, a senior editor and experience skywatcher at Sky and Telescope magazine.

Astronomers are still puzzling over the source for Quadrantid meteor shower. Many argue that a once-active comet-cum-asteroid 2003EH1 is the source. Others argue for a short-period comet labeled C/1490 Y1, which was last seen in 1491 and so either has broken up or somehow was flung into an orbit that no longer allows astronomers to observe it. Still others suggest the dust and rocks forming the Quadrantid meteor shower represent the remains of an asteroid that disintegrated.

#8 Lyrid

April 21-22

Astronomers have been watching this shower for some 2,600 years. The debris entering Earth's atmosphere comes from comet C/1861 G1, which swings around the sun once every 415 years. The meteors appear to emanate from the constellation Lyra.

Typically, this shower yields up to 20 meteors an hour at its peak, modest to be sure. But when Earth passes through denser portions of the debris trail the comet has left behind, the result is a meteor storm, with up to 90 meteors an hour flitting across the night sky.

#7 Eta Aquarid

May 5-6

Blame comet 1P/Halley, a.k.a Halley's Comet, for this one. Halley orbits the sun once every 75 to 76 years, refreshing the stream of debris. Even

so, this is another modest shower, typically yielding about 12 meteors an hour at its peak. The meteors appear to stream away from the constellation Aquarius.

#6 Delta Aquarid

July 28-29

The material comes from the two groups of sungrazing comets: one named for Brian Marsden, the late director of the International Astronomical Union's Minor Planet Center at the Harvard-Smithsonian Center for Astrophysics, the other for German astronomer Rainer Kracht. The Delta Aquarids peak at roughly 15 to 20 meteors an hour.

#5 Perseid

Aug. 12-13

This shower is another civilization-spanning spectacle, one astronomers have been observing for around 2,000 years.

It owes its origins to Comet 109P/Swift-Tuttle, which orbits the sun once every 133 years. The shower draws its name from the constellation Perseus, where the meteors appear to originate as they streak across the sky. At its peak, viewers under clear, dark skies can see up to 60 shooting stars an hour.

#4 Draconid

Oct. 8-9

This is generally one of the mellow meteor showers, typically producing around 35 meteors an hour at its peak. But it has been known to surprise astronomers with more-intense meteor storms in 1933 and 1946.

There also is much more to the shower than meets the eye. The shower, from Comet 21P/Giacobini-Zinner, on a 6.6-year orbital swing around the sun, only yielded about 35 meteors an hour visually. But radar picked up a peak encounter rate of about 150 meteors an hour a substantial number of no-see-ums, objects too small to generate much heat and light as it encounters Earth's atmosphere.

#3 Orionid

Oct. 21-22

This is comet 1P/Halley's annual curtain call following the Eta Aquarid

shower in May. It appears to originate from near the constellation Orion. It's another of the more-humble showers, peaking at about 20 meteors a minute.

#2 Leonid

Nov. 17-18

When the Leonids are on, they are really on a(euro)" producing storms of more than 1,000 meteors an hour, versus a more-sedate 12 an hour usually seen at its peak. The parent object for this storm is comet 55P/Tempel-Tuttle, which orbits the sun once every 33 years. One reason for the occasional intensity: the comet's orbit crosses Earth's orbit, so if Earth is plowing through a recent stream, the debris will be more dense than it is in old debris streams.

During those intense bursts, they even have an effect on the moon that is noticeable from Earth. The meteors strike the moon, kicking up dust that contains sodium, and astronomers can measure a tail of sodium that trails behind the moon. The more intense the activity, the longer the tail.

Following the pattern of other meteor showers, the Leonid shower draws its name from the constellation Leo, near where the radiant appears.

#1 Geminid

Dec. 13-14

Credit (or blame) an asteroid for this one - 3200 Phaethon. It orbits the sun once every 523 days.

One of the oddities here: Unlike comets, asteroids don't tend to give off any dust or gas because they are essentially orbiting rubble piles left over from the formation of the solar system. So what generates the Geminids? Some astronomers suggest they may be watching the asteroid spontaneously disintegrate as repeated passes close to the sun heat and crack otherwise cold rocks and rubble. A similar process - strong heating during the day followed by cold nights - cracks boulders in deserts on Earth.

Under ideal viewing conditions, this shower generates as many as 160 meteors an hour.

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Wolbach Library: CfA in the News ~ Week ending 16 January 2011

1. **Pluto may make comeback ... as king dwarf planet; Pluto and denizens of deep space may teach us about birth of solar system**, Dan Vergano, Vancouver Sun (Canada), Final ed, pB7, Friday, January 14, 2011
2. **A better way to accurately measure dark energy identified**, ANI, Asian News International, Friday, January 14, 2011
3. **Russian probe to take detailed pictures of the Sun**, Russia & CIS Military Daily, Thursday, January 13, 2011
4. **Dwarf planets in a big world**, Dan Vergano, USA Today (USA), p1D, Wednesday, January 12, 2011
5. **'Enormous catastrophic threat' feared from electromagnetic pulses; Experts differ on level of danger presented to the world's electrical systems**, Dan Vergano, Vancouver Sun (Canada), Final ed, pB10, Tuesday, January 11, 2011
6. **Exploreum plans 'Summer of Space'**, THOMAS B. HARRISON, Press-Register (Mobile, AL), 01 ed, p01, Sunday, January 9, 2011
7. **Billions, billions and more billions: new estimate triples number of stars populating cosmos.**, Cowen, Ron, Science News, v179, n1, p10(1), Saturday, January 1, 2011

Record - 1

DIALOG(R)

Pluto may make comeback ... as king dwarf planet; Pluto and denizens of deep space may teach us about birth of solar system,

Dan Vergano,
Vancouver Sun (Canada), Final ed, pB7,
Friday, January 14, 2011

TEXT:

Pluto fans, take heart.

Dethroned from the planetary pantheon, the dwarf world may still reign -- well, co-reign-- as King of the Comet Belt.

It was the 2005 discovery of Eris, the "dwarf planet," that led to Pluto's losing its full-fledged 'planet' status, after it looked as if the newcomer were bigger. But new observations of Eris reported as 2010 came to a close

suggest the two frozen worlds are the same size, about 2,300 kilometres wide.

"Things are a little crazy out there," says astronomer Mike Brown of the California Institute of Technology. 'It really is interesting what is going on out in the outer solar system.'

Brown, the author of the newly released *How I Killed Pluto and Why It Had It Coming*, knows from crazy. In 2003, he led the team that discovered Eris, named after the goddess of discord. Discovery of a '10th planet' in our solar system seemingly larger than Pluto, and the likelihood that many more in this size range existed, led participants at the 2006 International Astronomical Union meeting to defrock poor Pluto and reclassify it as a 'dwarf planet,' much to the dismay of schoolchildren and astronomers, including Alan Stern of the Southwest Research Institute in Boulder, Colo. 'A Chihuahua is still a dog,' Stern told EarthSky.org.

Since then, things have only become a little weirder for astronomers, gathered this week for their annual meeting, as they try to understand the dwarf planets ringing the cometary Kuiper Belt nearly 1.5 billion km from the sun, beyond Neptune's orbit. Since the discovery of the Kuiper Belt in 1992, astronomers have identified nearly 1,400 objects there, a rogues' gallery of space oddities ranging in size from Eris down to oversized snowballs only 50 km wide.

An Australian telescope team Tuesday announced the discovery of 10 more such objects, ranging from 300 to 500 km wide, saying they expected to find many more.

The objects come in a variety of colours -- red, white or brown -- densities that range from puffballs to basalt-hard, shapes that range from round to lumpy, and they follow a multiplicity of trajectories. Four are big enough to qualify as dwarfs in the comet belt so far (Ceres, the fifth dwarf planet, orbits in the asteroid belt between Mars and Jupiter), and Brown estimates eventually about 100 will be found there.

If you're keeping score, our nine-planet solar system has been reduced to eight, with Pluto and Eris, and three smaller worlds, now tacked on as dwarf planets. And more and more space objects are showing up all the time.

To Pluto -- and beyond

Telescopes and Hubble spacecraft observations have provided the observations so far, but the National Aeronautics and Space Administration's New Horizons mission, slated to arrive at Pluto in 2015, should offer some answers, at least about that world's history, says Hubble space telescope astronomer Keith Noll of the Space Telescope Science

Institute in Baltimore. Once it zooms past Pluto, scientists hope the spacecraft will steer by a smaller Kuiper Belt object for a look at a more typical denizen of deep space.

"One thing we do know now is there is a lot of variety out there," Noll says. "These are just the survivors, most likely, the one-tenth of one per cent, the lucky ones who weren't ejected from the solar system."

Bragging rights over their sizes aside, the dwarf planets and their comet-belt companions hold the answer to questions about the origin of our solar system about 4.6 billion years ago.

The sun and the planets most likely formed from a whirling disk of dust and gas inside a nebula filled with these building blocks of solar systems, just like the thousands of proto-solar systems that astronomers observe today in the nearby Orion Nebula, a stellar nursery 1,340 light-years away. (A light-year is about 9.5 trillion km.)

Since then, our solar system has circled the centre of the Milky Way Galaxy at least 20 times. The planets formed about 3.9 billion years ago, after enduring a shooting gallery of comet impacts that has left only a scant population of oversized snowballs, little changed from their formation about 4.6 billion years ago. There, they mixed with dwarf worlds such as Eris and Pluto, which are thought to resemble the embryonic cores of today's planets.

"This is fundamental science. Understanding these objects will tell us a great deal about the birth of our solar system," says the Southwest Research Institute's Elliot Young, an expert on determining the size of dwarf planets.

What is a dwarf planet? Dwarf planets are big enough to be made round by their gravity's weight, according to the controversial 2006 IAU decision, but not big enough to sweep their orbits clear of other objects.

Eris may not dwarf Pluto

Since its 2005 discovery, Eris had seemed bigger than Pluto, making it the largest dwarf planet, based simply on its albedo, or brightness, Brown and colleagues wrote in the *Astrophysical Journal* paper describing its discovery. A 2006 *Nature* paper put its diameter at about 3,000 km, much bigger than Pluto. (Earth's moon has a diameter of 3,500 km, for perspective.)

But in early November, the dwarf planet Eris passed in front of a distant star, giving astronomers a better handle on its size. Essentially, this so-called occultation passed the shadow of Eris over the Earth. Measurement

of that shadow's duration from locations across the Earth allowed astronomers to peg the diameter of Eris at about 2,300 km across, close to Pluto's size, says astronomer Young.

"I have no idea now which one is wider," Brown says. "All I can say is they are both massive. And really very different."

All dwarf planets in the Kuiper Belt are "confusing," Brown adds, for different reasons:

- Eris. Despite rivalling Pluto's size, Eris must be almost 30 per cent heavier, based on the motions of its moon, Dysnomia. That means its icy crust must be thinner, hiding a dense core. 'Eris was at one point much larger,' Brown says, until something smacked into it hard enough to boil off its ice. 'Maybe Pluto is to blame.'

- Makemake (MAH-kay MAH-kay): Named after an Easter Island goddess, the third-largest dwarf planet follows an orbit 7.7 billion km from the sun, out to the far reaches of the Kuiper Belt.

- Haumea (how-MAY-a): The rapid spin of this world, which gives it a solar system record 3.9-hour day, elongates its shape into an oval. Named after a Hawaiian mother goddess, Haumea also must have suffered a collision in its past, one that sent large shards of ice, including two moons, into its orbital track around the sun.

- One of Brown's favourite discoveries is Sedna, thought to be two-thirds as heavy as Pluto, and so far from the sun, about 1.3 billion km, that it lies beyond the Kuiper Belt. Too faint for telescopes to determine whether it's round enough to be a dwarf planet, Sedna follows a stretched-out 12,000-year orbit of the sun.

Was Sedna kidnapped?

Astronomer Allesandro Morbidelli of France's Observatoire de la Cote d'Azur and colleagues have proposed that Sedna was tugged out of the early solar system by the gravity of a nearby star within the first 100 million years of the solar system.

And Scott Kenyon at the Harvard-Smithsonian Center for Astrophysics has suggested that Sedna was snatched away from another smaller star by our sun. 'We will unscramble what happened to our solar system,' says Noll, the Hubble astronomer. 'But it will take a lot more observations.'

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Record - 2

DIALOG(R)

A better way to accurately measure dark energy identified,

ANI,

Asian News International,

Friday, January 14, 2011

TEXT:

Washington, Jan 14 (ANI): Type Ia supernovae are currently the best way to measure dark energy because they are visible across intergalactic space. Also, they can function as 'standard candles' in distant galaxies since the intrinsic brightness is known.

But as they are not equally bright, astronomers had to correct for certain variations. Even if they corrected it, their measurements still showed some scatter, which leads to inaccuracies when calculating distances and therefore the effects of dark energy.

Now the best way of measuring dark energy just got better, thanks to a new study of Type Ia supernovae led by Ryan Foley of the Harvard-Smithsonian Center for Astrophysics.

He has found a way to correct for small variations in the appearance of these supernovae so that they become even better standard candles. The key is to sort the supernovae based on their colour.

"Dark energy is the biggest mystery in physics and astronomy today. Now, we have a better way to tackle it," said Foley.

The new tool also will help astronomers to firm up the cosmic distance scale by providing more accurate distances to faraway galaxies.

Foley discovered that after correcting for how quickly Type Ia supernovae faded, they show a distinct relationship between the speed of their ejected material and their colour: the faster ones are slightly redder and the slower ones are bluer.

Previously, astronomers assumed that redder explosions only appeared that way because of intervening dust, which would also dim the explosion and make it appear farther than it was.

Trying to correct for this, they would incorrectly calculate that the explosion was closer than it appeared.

Foley's work showed that some of the colour difference is intrinsic to the

supernova itself.

The new study succeeded for two reasons. First, it used a large sample of more than 100 supernovae. More importantly, it went back to 'first principles' and re-examined the assumption that Type Ia supernovae are one average colour.

The discovery provides a better physical understanding of Type Ia supernovae and their intrinsic differences.

It also will allow cosmologists to improve their data analysis and make better measurements of dark energy.

The findings were presented at the 217th meeting of the American Astronomical Society. (ANI)

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Record - 3

DIALOG(R)

Russian probe to take detailed pictures of the Sun,

Russia & CIS Military Daily,
Thursday, January 13, 2011

TEXT:

MOSCOW. Jan 13 (Interfax-AVN) - Russia is designing a space probe, which will take unprecedentedly high resolution pictures of the Sun, Sergei Bogachev from the Lebedev Physical Institute of the Russian Academy of Sciences told Interfax-AVN on Wednesday.

He said the project was approved by the Academy's Space Council in late December 2010.

"A sketch design of the probe will be done in 2011, and a mockup will be built starting from 2012. The launch is scheduled for 2015 or 2016. We think that is a realistic deadline," Bogachev said.

The project is a part of the program "Small Spacecraft for Fundamental Space Research". It will be based on the Karat platform developed by Lavochkin. The probe, initially named ARCA, will have two mirror telescopes with a record angular resolution to observe a fourth of the solar disc, the researcher said.

The Physical Institute will create one of the telescopes, while the other will be created together with the Smithsonian Astrophysical Laboratory and the Marshall Space Flight Center. "Cooperation with our U.S. colleagues will help us exchange advanced technologies. American colleagues have modern stabilization systems for astrophysical observatories, and Russia has never built systems of the sort. Meanwhile, our X-ray optics and detectors are called some of the world's best," Bogachev said.

The combination of two telescopes will result in a large focal distance and high angular resolution. "Our probe will have an angular resolution eleven times better than Coronas Photon and four times better than the NASA solar observatory SDO," he said.

ARCA will study the heating of the solar corona and the replacement of solar corona mass ejected in solar wind.

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Record - 4

DIALOG(R)

Dwarf planets in a big world,

Dan Vergano,

USA Today (USA), p1D,

Wednesday, January 12, 2011

TEXT:

Pluto fans, take heart.

Dethroned from the planetary pantheon, the dwarf world may still reign -- well, co-reign -- as King of the Comet Belt.

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New Horizons opening up

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Out of the shadow

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What happened when the solar system formed? Mayhem.

From Mercury to Mars, planets endured a period of "bombardment" by comets that ended about 3.9 billion years ago. A planet the size of Mars likely struck the Earth in a cataclysm that formed the moon from the debris. Mars similarly suffered a scalping of its northern hemisphere. Comets are the faint reminders of those days, visitors from beyond Neptune that plunge close to the sun before heading out to deep space again.

Not an easy beginning

In the Kuiper Belt, the evidence suggests that Neptune moved farther from the sun to an orbit overlapping Pluto's, sending the icy denizens of the comet belt flying. Only a small population of objects in the Kuiper Belt remain undisturbed from the era, Noll suggests, following circular orbits untilted from the planet's paths.

The highly tilted orbit of Haumea and elongated one of Sedna suggest something even more dramatic perhaps shook up the early comet belt, such as a supernova blast from a nearby star's implosion.

"I'm not so shocked," Morbidelli says, by news that Eris or other dwarf planets took some hard knocks at the dawn of the solar system.

Brown is less sanguine about the latest turn in the saga of the 10th planet.

"I wouldn't have guessed that Eris and Pluto are the same size," he says. "Really, all the dwarf planets are different. And they are supposed to be the same."

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Record - 5

DIALOG(R)

'Enormous catastrophic threat' feared from electromagnetic pulses; Experts differ on level of danger presented to the world's electrical systems,

Dan Vergano,

Vancouver Sun (Canada), Final ed, pB10,

Tuesday, January 11, 2011

TEXT:

The sky erupts. Cities darken, food spoils and homes fall silent. Civilization collapses.

End-of-the-world novel? A video game? Or could such a scenario loom in America's future?

There is talk of catastrophe ahead, depending on whom you believe, because of the threat of an electromagnetic pulse triggered by either a supersized solar storm or terrorist A-bomb, both capable of disabling the electric grid that powers modern life.

Electromagnetic pulses, or EMPs, are oversized outbursts of atmospheric electricity. Whether powered by geomagnetic storms or by nuclear blasts, their resultant intense magnetic fields can induce ground currents strong enough to burn out power lines and electrical equipment across state lines.

The threat has even become political fodder, drawing warnings from former House Speaker Newt Gingrich, a likely presidential contender.

"We are not today hardened against this," he told a Heritage Foundation audience last year. 'It is an enormous catastrophic threat.'

Meanwhile, in Congress, a "Grid Act" bill aimed at the threat awaits Senate

action, having passed in the House of Representatives.

Fear is evident. With the sun's 11-year solar cycle ramping up for its stormy maximum in 2012, and nuclear concerns swirling about Iran and North Korea, a drumbeat of reports and blue-ribbon panels centre on electromagnetic pulse scenarios.

"We're taking this seriously," says Ed Legge of the Edison Electric Institute in Washington, which represents utilities. He points to a North American Electric Reliability Corp. report in June, conducted with the Energy Department, that found pulse threats to the grid 'may be much greater than anticipated.'

There are "some important reasons for concern," says physicist Yousaf Butt of the Harvard-Smithsonian Center for Astrophysics in Cambridge, Mass. 'But there is also a lot of fluff.'

At risk are the more than 200,000 miles of high-voltage transmission lines that cross North America, supplying 1,800 utilities the power for TVs, lights, refrigerators and air conditioners in homes, and for the businesses, hospitals and police stations that take care of us all.

"The electric grid's vulnerability to cyber and to other attacks is one of the single greatest threats to our national security,' Rep. Ed Markey, D-Mass., said in June as he introduced the bill to the House of Representatives.

Markey and others point to the August 2003 blackout that struck states from Michigan to Massachusetts, and southeastern Canada, as a sign of the grid's vulnerability. Triggered by high-voltage lines stretched by heat until they sagged onto overgrown tree branches, the two-day blackout shut down 100 power plants, cut juice to about 55 million people and cost \$6 billion, says the 2004 U.S.-Canada Power System Outage Task Force.

Despite the costs, most of them from lost work, a National Center for Environmental Health report in 2005 found 'minimal' death or injuries tied directly to the 2003 blackout -- a few people died in carbon monoxide poisonings as a result of generators running in their homes or from fires started from candles. But the effects were pervasive: Television and radio stations went off the air in Detroit, traffic lights and train lines stopped running in New York, turning Manhattan into the world's largest pedestrian mall, and water had to be boiled after water mains lost pressure in Cleveland.

The electromagnetic pulse threat is a function of simple physics: Electromagnetic pulses and geomagnetic storms can alter Earth's magnetic field. Changing magnetic fields in the atmosphere, in turn, can trigger

surging currents in power lines.

"We have understood the electromagnetic effect since the 1800s," says Butt, who this year reviewed geomagnetic and nuke blast worries in *The Space Review*.

Two historic incidents often figure in the discussion:

--On July 9, 1962, the Atomic Energy Commission and the Defense Atomic Support Agency detonated the Starfish Prime, a 1.4-megaton H-bomb test at an altitude of 250 miles, some 900 miles southwest of Hawaii over the Pacific Ocean. The pulse shorted out street lights in Oahu.

--On March 9, 1989, the sun spat a million-mile-wide blast of high-temperature charged solar gas straight at the Earth. The 'coronal mass ejection' struck the planet three days later, triggering a geomagnetic storm that made the northern lights visible in Texas. The storm also knocked out power for 6 million people in Canada and the U.S. for at least nine hours.

"A lot of the questions are what steps does it make sense to take," Legge says. 'We could effectively gold-plate every component in the system, but the cost would mean that people can't afford the rates that would result to pay for it.'

"The high-altitude nuclear-weapon-generated electromagnetic pulse is one of a small number of threats that has the potential to hold our society seriously at risk,' concluded a 2008 EMP Commission report headed by William Graham, a former science adviser to President Reagan.

In the nuclear scenario, the detonation of an A-bomb anywhere from 25 to 500 miles high electrifies, or ionizes, the atmosphere about 25 miles up, triggering a series of electromagnetic pulses. The pulse's reach varies with the size of the bomb, the height of its blast and design.

One complication for rogue nations or terrorists contemplating a high-altitude nuclear blast is that such an attack requires a missile to take the weapon at least 25 miles high to trigger the electromagnetic pulse. For nations, such a launch would invite massive nuclear retaliation from the USA's current stockpile of 5,000 warheads, many of them riding in submarines far from any pulse effects.

Any nation giving a terror group an atomic weapon and missile would face retaliation, Butt and others note, as nuclear forensics capabilities at the U.S. national labs would quickly trace the origins of the bomb.

On the solar front, the big fear is a solar super storm, a large, fast, coronal mass ejection with a magnetic field that lines up with an orientation perfectly opposite the Earth's own magnetic field, says solar physicist Bruce Tsurutani of NASA's Jet Propulsion Laboratory in Pasadena, Calif.

Tsurutani and other solar physicists view such an event as inevitable in the next 10 to 100 years.

"It has to be the perfect storm," Tsurutani says.

In June, national security analyst Steven Aftergood of the Federation of American Scientists described congressional debate over power-grid security as 'a somewhat jarring mix of prudent anticipation and extravagant doomsday warnings.'

The June NERC report essentially calls for more study of the problem, warning of excessive costs to harden too much equipment against the nuclear risk. 'If there are nuclear bombs exploding, we have lots of really, really big problems besides the power grid,' Legge says.

Colour Photo: Reuters / The CN Tower is silhouetted against the setting sun in Toronto during a massive power failure on Aug. 14, 2003. Some worry that natural or deliberately created electromagnetic pulses could produce similar incidents in the future.;

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Record - 6

DIALOG(R)

Exploream plans 'Summer of Space',
THOMAS B. HARRISON,
Press-Register (Mobile, AL), 01 ed, p01,
Sunday, January 9, 2011

TEXT:
ArtBeat

Exploream plans 'Summer of Space'

By THOMAS B. HARRISON

Arts & Entertainment Editor

Dark matter, event horizon, nebula, quasar, perihelion, radial veLOCITY,

black hole, white dwarf. You've heard a few of those terms before, perhaps in a PBS documentary, an episode of "Star Trek" or in a sci-fi movie about deep space.

Space, "the final frontier," will get a lot closer next summer when the Gulf Coast Exploreum Science Center opens "Black Holes: Space Warps & Time Twists," which will reveal "what we know, don't know and think we know about one of the world's greatest space mysteries," according to a news release. Produced by the Harvard-Smithsonian Center for Astrophysics, the "Black Holes" exhibit features interactive portions co-designed by teens. Teams from the Youth Astronomy Apprenticeship Program at MIT and the Galaxy Explorers Black Hole Youth Media Team at Chabot Space & Science Center in Oakland, Calif.

The exhibit will open June 4 and be remain on view through Aug. 28, the Exploreum's "Summer of Space," with events and activities focused on the cosmos.

The corresponding IMAX film for the exhibit will be "Hubble," narrated by actor Leonardo DiCaprio.

"Hubble" will take audiences through distant galaxies to explore the grandeur and mysteries of our celestial surroundings, and accompany space-walking astronauts as they attempt the most difficult and important tasks in NASA's history. The film offers an inspiring and unique look into the Hubble Space Telescope's legacy and its profound impact on the way we view the universe. In addition, the Hearin-Chandler Virtual Journeys Digital Theater will produce a new show titled "Summer Stars Over Alabama," which will discuss the constellations that can be viewed from our area during the summer months. Additional programs planned for the "Summer of Space" include lectures from astrophysicists and NASA experts, star-gazing parties and more.

For the uninitiated, a black hole is one astronomical anomaly often discussed but rarely understood. Black holes are regions in space, sometimes only a few kilometers in size, with gravity so powerful that light cannot escape, and where time and space are warped in unimaginable ways. The exhibit will guide visitors on a journey to the edge of these strange phenomena to discover how research is turning science fiction into fact, challenging our notions of space and time.

Interactive components will give visitors an in-depth experience of how black holes behave, shape our universe and influence our lives.

Visitors will use a "Black Holes" explorer's ID card to collect discoveries and generate a personalized Web site that will be part personal diary and part observer's log and will include data recorded by the visitor including

their observations, conclusions, questions, notes and photos of their group and activities. Guiding visitors through their explorations will be photos and videos of the Youth Team exhibit collaborators and a diverse team of scientists and engineers.

ArtBeat will have more on the "Black Holes" exhibit and the "Hubble" film in future editions. Information, call 251-208-6879 or visit the Exploreum Web site: www.exploreum.com.

E-mail: tharrison@press-register.com and visit the Press-Register blog site: <http://www.al.com/events/mobile/>

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Record - 7

DIALOG(R)

Billions, billions and more billions: new estimate triples number of stars populating cosmos.

Cowen, Ron

Science News, v179, n1, p10(1),

Saturday, January 1, 2011

TEXT:

Astronomers studying eight galaxies have found evidence of a surprising abundance of faint, low-mass stars--each galaxy has about 10 times as many as the Milky Way. The scientists extrapolate that the heavens contain up to three times the total number of stars previously estimated.

That profusion suggests that early cosmic history may need a rewrite.

Previous estimates of the total stellar mass in many of the universe's first, massive galaxies may need to be doubled. Pieter van Dokkum of Yale University and Charlie Conroy of the Harvard-Smithsonian

Center for

Astrophysics in Cambridge, Mass., describe their study online December 1 in Nature.

The researchers examined light from the central regions of each of eight massive elliptical galaxies--four in the Coma cluster and four in the Virgo cluster. Such galaxies are thought to account for one-third of the stellar mass in the universe. Spectra of the galactic light indicate that faint red dwarfs account for 80 percent of stars in elliptical galaxies.

"Extrapolating from the central regions of these eight galaxies to the entire universe is somewhat hazardous, but if the galaxies are typical examples of their class it may well lead to a tripling" of the number of

stars in the cosmos, van Dokkum says. Previous estimates put that number at roughly 100 billion trillion.

Still, the results might be otherwise explained by fewer low-mass stars if they differ in chemical makeup from those in the Milky Way, says astronomer Richard Ellis of Caltech.

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Wolbach Library: CfA in the News ~ Week ending 23 January 2011

1. **Climate Change in the Classroom: Patterns, Motivations, and Barriers to Instruction Among Colorado Science Teachers**, Wise, Sarah B., Journal of Geoscience Education, v58, n5, p297, Monday, November 1, 2010

Record - 1

DIALOG(R)

Climate Change in the Classroom: Patterns, Motivations, and Barriers to Instruction Among Colorado Science Teachers,

Wise, Sarah B,

Journal of Geoscience Education, v58, n5, p297,

Monday, November 1, 2010

TEXT:

HEADNOTE

ABSTRACT

A large online survey of Colorado public school science teachers (n=628) on the topic of climate change instruction was conducted in 2007. A majority of Earth science teachers were found to include climate and climate change in their courses. However, the majority of teachers of other science subjects only informally discuss climate change, if at all. Teachers are motivated to include this topic in the curriculum when they perceive it is represented in their standards and when they receive direct encouragement from members of their school and wider communities. At the time of this study, only a small minority of teachers had experienced pressure to avoid teaching climate change. Certain misconceptions about climate change are widespread among teachers, as is the belief that "both sides" of the public controversy over human causes of climate change should be presented to students. The patterns of instruction, knowledge gaps, and a lack of learning experiences for teachers documented here suggest that all science teachers would benefit from professional development focused on climate science, best practices in climate instruction, and climate communication.

INTRODUCTION

Climate Literacy and Formal Education

Thirteen U.S. government agencies recently voiced their support for the development of a 'climate literate' public by endorsing the publication *Climate Literacy: The Essential Principles of Climate Science* (U.S. Climate Change Science Program, 2009). Climate literacy involves understanding how people influence the climate, and in turn how the climate influences people. Gaining an understanding of this simple statement is difficult, however, because climate systems and human impacts upon them are inherently complex (Intergovernmental Panel on Climate Change, 2007; U.S. Climate Change Science Program, 2009). The complexity of climate systems cannot adequately be conveyed using mass media (Dunwoody, 2007). Furthermore, given the interactions of climate with human systems, climate science would ideally be conveyed via an interdisciplinary instructional approach (Fortner, 2001; Hansen, 2009; Rebich and Gautier, 2005). In effect, to generate a climate literate public, students are likely to require comprehensive formal instruction about climate change.

A number of countries have developed strategies to promote climate change instruction. For example, in England, instruction about climate change is a mandatory part of the geography curriculum for students aged 11-14 (Qualifications and Curriculum Authority, 2007) and has been supported by free curricular resources (DirectGov, 2007). Specifically, this curriculum requires students study weather and climate, the impact of human activity on climate, and sustainable development. Climate change related concepts also appear frequently in the U.S. National Geography Standards (Boehm and Bednarz, 1994), though implementation of those standards is voluntary. Mandatory curricula related to global warming or climate change are outlined for teachers in Singapore (Singapore Ministry of Education, 2007), Scotland (Scottish Government, 2008), and Norway (though limited to non-vocational students) (Hansen, 2009), among others.

In United States, national and state science education standards are important drivers of educational change (Finn et al., 2006; Roseman and Koppal, 2008; Scherer, 2001). However, climate change is inconsistently addressed in these curricular guidelines. Coverage of the historical mechanisms, recent human causes, and impacts of climate change science appear in the standards of only 11 U.S. states; only 3 of these also mention mitigation strategies (Kastens and Turrin, 2008). The term 'global warming' appears in the National Science Education Standards as an exemplar for an area 'where data or understanding [is] incomplete' (National Research Council, 1996). However, climate change related benchmarks do appear in Project 2061's recent *Atlas of Science Literacy, Volume 2* (American Association for the Advancement of Science, 2007a, 2007b). Given such variable treatment of the topic, U.S. state and national science education standards currently provide weak guidance for climate change instruction.

Climate science instruction also faces challenges related to disciplinary 'siloeing' (Gayford, 2002). Climate-related topics naturally fall within Earth science classes, but the effects of climate change on humans and other species fall more naturally within biology and social science classes. Furthermore, Earth science education in the United States has traditionally been marginalized (Hoffman and Barstow, 2007; McCaffrey and Buhr, 2008; Metz, 2008). While state recommendations for the inclusion of Earth science courses are increasing, less than a quarter of high school students take Earth science (American Geological Institute, 2009).

Current science standards and patterns in course enrollment generate a dilemma for many U.S. science teachers. They face a choice over whether to leave the topic of climate change out of their courses, or to incorporate instruction not explicitly supported by standards into curricula that are frequently criticized as overstuffed (American Association for the Advancement of Science, 2001; Bentley et al., 2007). In this light, it is not surprising that students report learning more about climate change from the media than from school (Gowda et al., 1997).

Climate Change Education Research: Status and Gaps

The nascent literature on climate change education has focused around three areas of study: the relationship between instruction and environmental action or activism, misconceptions about climate, and classroom activities to teach climate concepts.

The first group of studies has demonstrated that instruction about climate change can result in student conceptual and attitudinal change (Cordero et al., 2008; Devine-Wright et al., 2004; Lester et al., 2006; Pruneau et al., 2003). The second and larger group of studies has catalogued dozens of misconceptions (Gautier et al., 2006; McCaffrey and Buhr, 2008) and their persistence following instruction (Chi, 2005). These include the ideas that burning destroys matter, the hole in the ozone causes warming, and individual weather events provide evidence for climate change. Similar misconceptions have been documented among school students (Andersson and Wallin, 2000; Gowda et al., 1997; Hansen, 2009; Henriques, 2002; Meadows and Wiesenmayer, 1999; Rule, 2005; Rye et al., 1997), college students (Cordero, 2001; Gautier et al., 2006; Jeffries et al., 2001; Madsen et al., 2007; Schneps and Sadler, 1985), teachers (Groves and Pugh, 1999; Khalid, 2003; Rule, 2005; Summers et al., 2003), and the general public (Pruneau et al., 2001).

Misconceptions studies reveal an important reason why instruction about climate change is inherently challenging. However, further research is needed into other barriers to climate instruction. It can be hypothesized that science education standards and disciplinary 'siloeing' may affect the

incidence of instruction. Furthermore, some teachers may not feel they have enough preparation to teach the topic well (Fortner, 2001).

Still other teachers may fear that public controversy around climate change could cause disruption to their classroom. While public controversy around climate change was not focused on schooling at the time of this survey, anecdotal evidence exists that incidents of controversy at that time did affect school communities (Robbins, 2008).

Evidence suggests that teachers' instructional choices may be influenced by the general presence of controversy, even when public attention to climate change education is not salient. One qualitative study documented that teachers can be concerned about how to teach about climate change 'in a rational manner so that the balance of arguments can be appreciated' (Gayford, 2002).

Public controversy around climate change likely generates confusion about the state of the science for teachers and students. Over a third of the U.S. public thinks that scientists disagree about the topic (Curry et al., 2007) and that climate change is primarily related to nonhuman causes (Leiserowitz et al., 2008). As a result of controversy, some teachers may fear objections about the content of their instruction, or be unsure about what content to present.

Patterns of Climate Change Instruction are Unknown

Perhaps surprisingly, no studies have yet surveyed the incidence of instruction about climate change in U.S. schools. Such studies could provide insight into the extent of student exposure to this topic as well as the factors teachers assess when considering whether to voluntarily incorporate this topic into their curriculum. A number of open questions exist, including: What fraction of science and social studies teachers include lessons about climate change in their curricula? In which subjects are students learning about the topic? How well do teachers understand climate change, and what kinds of learning experiences have they engaged in around this topic?

Public controversy and misconceptions around climate change bring additional questions to the fore. How do the views of teachers about climate change compare with those of scientists? Do teachers hold misconceptions about climate change that may be passed on to students? What proportion of teachers accept the scientific consensus that recent climate change is caused by human activities? Do teachers experience community pressure either for or against the teaching of climate change?

To explore these questions, I undertook a large survey of K-12 public school science teachers working in the state of Colorado. The aim was to

collect and compare descriptive data on the views and instructional practices of teachers on two publicly controversial topics, climate change and evolution. In this paper, I examine the data from secondary science teachers on their teaching of climate change. The results reveal a number of characteristics of climate change instruction that provide insights for both secondary science teachers and those providing professional development to these teachers.

METHODS

Survey design and recruitment

Nearly 950 K-12 public school teachers from all regions of Colorado responded to the 'Teaching About Publicly Controversial Science' survey during the 2007-2008 school year. Data presented here are drawn from the subset of secondary (middle level and high school) science teacher respondents (n=628) with responses to survey items related to climate change. The survey was administered using a third-party secure online platform, www.surveymonkey.com. In order to moderate the length of the survey, participants received questions relevant to their subject area. As climate is included in Colorado secondary Earth science standards, Earth science teachers received a full set of questions related to climate change instruction, including items related to their general opinions about climate change, their knowledge of climate change, and their approach to climate change in the classroom. Other science teachers were asked a smaller subset of climate related questions. For this reason, analysis in this report focuses on Earth science teacher data, augmented when relevant by data from other science teacher subsets.

The survey was grounded in qualitative data from a set of semi-structured interviews with 22 elementary and secondary science teachers. Themes from these interviews (Denzin and Lincoln, 2000) included how teachers choose whether to incorporate formal lessons for climate change, or use informal discussion to address the topic; the amount of class time devoted to the topic of climate change, and topics covered; the impact of learning experiences and community pressure on curricular choices around climate change; and the choice over whether to discuss the public controversy around the existence or causes of climate change with the class. These themes were used to develop specific question items on the survey and informed the use of the term 'global warming' in the survey. One bank of questions included items similar to those found in public opinion polls about climate change (Nisbet and Myers, 2007), in order to assess participant agreement with common statements about global warming. The draft survey was reviewed for face validity by five practicing teachers and other educators and revised based on their feedback. The final survey included demographic questions, a set of Likertscale items, multiple-choice

items, and free response items and can be retrieved from <http://cires.colorado.edu/education/kl2/people/wise/index.html>. The internal consistency of the Likert scale items was assessed by calculating Cronbach's alpha, which with a value of .75 indicated satisfactory reliability.

The convenience sample of participants was initially recruited by direct contact at the fall NSTA conference in Denver, Colorado, and via email solicitations distributed to two science educator electronic mailing lists. Phone contacts to school districts around the state led 41 districts to send an email requesting participation to their teachers; 6 sent this email twice. Teachers in additional districts were identified from school websites and emailed directly by the author, or received an email solicitation from a colleague. Responses were received from 73 (41%) of the 178 districts in Colorado.

Self-selection bias, whereby participants highly interested in the survey topic respond at a greater rate, is of particular concern for publicly controversial topics. The impact of incentives on bias is not well understood (Jackie and Lynn, 2008). Nevertheless, a \$5 gift card incentive was offered to each participant completing the survey in an effort to increase the response rate (Warriner, 1996) and to potentially obtain a wider variety of viewpoints on the survey topics.

Where participants provided names and addresses, duplicate entries were able to be identified and removed. Entries that were more than 50% incomplete were also removed. The resulting sample was reflective of the proportion of teachers residing in different regions of Colorado, and of urban and rural teachers (Table 1). Within the secondary science teacher subset, the sample was roughly split between middle level (46%) and high school (54%) teachers. These teachers identified a main science subject; 35% (n=220) of this subset identified life science; 29% (n=183) identified Earth science; and 36% (n=225) identified an environmental science, general/ integrated science, or physical science subject, referred to below as the 'all other' science group.

When possible, responses were converted into numerical values to facilitate analysis. Free response data was categorized and coded by the author (Denzin and Lincoln, 2000); categories are described with the results of these responses in the next section. For questions related to instructional practices, data were analyzed separately for the life science, Earth science, and 'all other' science groups, to investigate potential disciplinary drivers of instruction. Descriptive statistics and statistical tests were conducted using STATA. The raw data are archived at <http://cires.colorado.edu/education/outreach/people/wise/>.

Limitations of study

The response rate to the survey was not possible to estimate precisely due to the fact that recruitment was extended by email-based networking. However, the response rate for teachers in 29 districts which the author contacted directly was only 26%, lower than the generally accepted rate of 60% for generalizability (Moore, 2008; Warriner et al., 1996), but similar to other Web-based surveys (Kaplowitz et al., 2004). Therefore, this nonrandom convenience sample does not represent all secondary science teachers across Colorado. On the other hand, the sample can be appropriately used to identify key trends for use by professional development providers and researchers.

The sample surveyed here may differ from the population of all teachers in Colorado in several important ways. First, teachers who are actively teaching the topic of climate change may have been more likely to respond, causing an inflation of estimates of the incidence of climate change instruction. Secondly, teachers who feel uncomfortable due to the controversy around climate change, or unsure of their opinion about the topic, may be underrepresented in the sample. Therefore, the proportions of teachers in this sample having views favorable to teaching climate change may be higher than the state or national average. Next, the presence of questions about evolution in the larger survey could have encouraged a greater participation by life science teachers. However, actual patterns of participation did not indicate this occurred. Finally, social studies teachers were not included in the survey even though they may teach about climate change, limiting the ability of this study to estimate overall exposure of students to instruction about this topic.

Despite these possible biases, results suggest that the sample captures the perspectives of teachers with wideranging opinions and instructional practices around climate change. It was observed that for every survey item, participants selected the full range of choices available. Free responses to selected items indicate the sample includes a number of teachers skeptical about the presence or human cause of climate change, a number of teachers committed to teaching the latest consensus of climate scientists, and many teachers with intermediate views. Therefore, the diversity of Colorado teachers' perspectives on climate change is likely included in the sample.

RESULTS

General Views about Climate Change Education

Teachers responded to several items related to their general support for the inclusion of climate change in school curricula (Table 2, section A).

The secondary science teachers in this sample overwhelmingly supported teaching the topic of global warming and teaching about solutions to global warming. A majority of participants thought that global warming should be discussed in Earth science, life science, environmental science, and social studies classes. On average, teachers chose five school subjects in which they thought the topic of global warming should be discussed.

Public controversy about global warming has become increasingly focused on whether the phenomenon is caused by human activity. Therefore, participants were asked specifically about whether teachers should discuss "both sides" of this public controversy (Table 2, section A). Support for this idea was high (85% overall). Because such a discussion could be steered in many ways, a follow-up question was posed: "If you replied yes, please explain your reasoning for why. Please also explain how you think teachers should discuss 'both sides'. If you replied no, please explain your reasoning for why not." Free responses (n=627) to this question varied greatly, but generally fell into three groups that can be roughly organized along a continuum (Figure 1). At one end of the continuum, about 25% of the sample of teachers reasoned that 'both sides' should be taught because both constitute valid scientific viewpoints. In the middle of the continuum, about 50% of the responding teachers reasoned that 'both sides' should be taught because it would be more fair or promote independent decisionmaking or critical thinking. This group of teachers' reasonings seemed to leave unclear the scientific validity of each of the sides of the public controversy around human causes of climate change. At the other end of the continuum, approximately 25% of teachers generally reasoned that allowing student discussion of 'both sides' is appropriate, but that teachers and curricula should emphasize the scientific consensus that humans are primarily responsible for recent climate change.

Patterns of Instruction About Climate Change

Secondary science teachers show great variability in their approaches to teaching about climate change (Table 2, section B). Overall, 87% of respondents address the topic in some way, but many do so only through informal discussion in class. Earth science teachers most frequently approached the topic using formal (planned) lessons. Significantly more high school science teachers than middle level science teachers in the sample reported teaching formal lessons about global warming ($t=-3.6$, $p<.01$).

The subset of teachers using formal lessons to instruct about global warming were asked to identify teaching strategies they employ (Table 2, section B), from a list composed of strategies anecdotally used by teachers in handling the publicly controversial topic of evolution (Scott and Branch, 2008). Two-thirds of the sample reported using one or more of the

strategies on the list when teaching about global warming. The most common strategies reported were emphasizing the 'nature of science' (e.g., how scientists gather evidence, arrive at explanations, and engage in peer review) in their teaching of global warming, and acknowledging or discussing the presence of public controversy and skepticism around the topic of global warming with their students.

Factors Influencing Curricular Inclusion of Climate Change

Motivating Experiences - Secondary science teachers who include formal lessons about global warming in their curriculum were asked what motivates their teaching (Table 3). Top reasons such as 'it is in my curriculum/standards' were similar to what would be expected for any topic. Many teachers also cited student interest as a motivating factor, but only a minority cited encouragement from someone else. Two survey items explored possible community motivators to instruction in more depth (Table 3). First, most secondary science teachers reported that their students expressed interest in learning about global warming. Secondly, about a third of Earth and "other" science teachers identified adults in their community who had directly encouraged them to teach about global warming. Most of these encouraging experiences originated from within the teachers' professional communities, such as other teachers and administrators.

The effect of encouragement on instruction was explored further by asking teachers to describe one experience in which they had been encouraged to teach about global warming. These free responses (n=106) were coded as shown in Table 4; the sum of the codes showed that most teachers encouraged in this way enhanced their teaching of global warming as a result (Figure 2).

Barrier Experiences - Patterns of climate change instruction documented above (Table 2, section B), indicate that 63% of the overall sample either marginalize the topic (by limiting it to informal discussion) or avoid it altogether. This suggests that most science teachers face barriers to including formal lessons about climate change in their curriculum. Several survey items explored such barriers. When science teachers not teaching about global warming were asked to choose reasons why, they most frequently chose a structural factor: it doesn't fit into their curriculum or standards (Table 3). Many teachers who wrote an "other" choice for this item cited the related structural factor of time limitations on their curriculum. On the other hand, community-related barriers affecting the inclusion of climate change in the curriculum appear minimal. Very few teachers reported their students uniformly object about learning about global warming. Similarly, only a small minority of Earth and "other" science teachers reported being directly discouraged from teaching about global warming by someone in their community (Table 3).

Free responses describing a discouraging experience (n=48, Table 4) were coded with respect to effects on instruction. Calculating the fraction of responses for each type of code revealed that discouraging experiences hindered teaching very infrequently. Moreover, discouraging experiences appeared to have a smaller overall effect on teaching than did encouraging experiences (Figure 2).

Knowledge and Perceptions of Climate Change

Teachers' responses to questions about why they do or do not include formal lessons about climate change (Table 3) revealed that for many teachers, their level of knowledge about climate change acts as a motivating factor for instruction, while for some teachers it acts as a barrier. I explored Earth and "other" science teachers' knowledge by asking them to identify learning experiences they had about the topic from a list (Table 3). Most teachers reported they had learned about climate change in two to three different ways. Overall, more teachers reported learning about climate change independently (from web sites, books, and magazines), compared to learning through professional development (conference sessions, workshops, and school inservices) or a college-level course. A sizeable minority of teachers reported no learning experiences about climate change at all.

To further explore teachers' perceptions of climate change, I asked the subset of Earth science teachers to indicate their agreement with eight factual or opinion statements on a Likert scale. Several of these statements were worded to reflect the scientific consensus on climate change (Figure 3, upper three statements) as reported by the Intergovernmental Panel on Climate Change (2007). A strong majority of Earth science teachers agreed or somewhat agreed with each of these statements. However, these teachers were the least certain about the statement 'recent global warming is caused mostly by things people do', with the majority choosing "somewhat agree" or "somewhat disagree" as their response.

Additional statements in this item set were worded in reverse, to reflect common misconceptions or skepticism about climate change (Figure 3, lower five statements). A majority of Earth science teachers disagreed or somewhat disagreed with three of these statements. However, over half of these teachers agreed or somewhat agreed with the misconception that the ozone hole contributes to global warming, and nearly a majority agreed with the statement that 'there is substantial disagreement between scientists about the cause of recent global warming'.

DISCUSSION

Patterns of instruction are highly variable

Science teachers participating in this study show strong support for teaching about climate change, teaching about solutions to the problem, and for including instruction about climate change in a variety of science and social studies classes. However, formal curricular inclusion of the topic by study participants lags significantly behind these general levels of support.

Disciplinary divisions and enrollment trends appear to generate barriers to providing students with comprehensive instruction about climate change. High school Earth science teachers in this sample were most likely to teach formal lessons about climate change and perceive the topic falls within their curricular standards. However, a minority of U.S. high school students take Earth science at the high school level (American Geological Institute, 2009). In comparison, 91% of high school students take biology (National Center for Education Statistics, 2002) but nearly half of the life science teachers in this sample perceive climate change to fall outside of their curricular standards. It would be interesting to track changes in instructional practices in states such as Colorado, which recently adopted revised science standards that more explicitly included climate change for both middle and high school classrooms (Colorado Department of Education, 2009).

In addition to these barriers to the inclusion of instruction about climate change, the data provide insight into the possible content of climate change instruction. When teachers provided their perspectives on statements about climate change (Figure 1, Figure 3), they agreed with most scientifically-supported statements, such as the fact that the Earth is warming, but supported other statements which contradict the views of the scientific community (Intergovernmental Panel on Climate Change, 2007; Doran and Kendall Zimmerman, 2009). Strikingly, only about 25% of the sample appears to hold the opinion that teachers should emphasize the scientific consensus that human activities cause climate change, and a substantial minority of teachers perceive disagreement about the cause of recent climate change among scientists.

Misconceptions about climate change abound in the general public (Leiserowitz, 2007). While their presence in this sample of teachers is not surprising, they are cause for concern as they may lead some to misrepresent the content and nature of climate science. However, much further research is needed to characterize the extent to which teachers hold known climate-related misconceptions, to document ways in which misconceptions are included in instruction, and to assess the impact of instruction on student knowledge and perceptions of climate and climate change science. A concept inventory for the greenhouse effect (Keller,

2006) combined with qualitative classroom observations could further our understanding of how climate misconceptions may be reinforced through instruction.

Does public controversy influence instruction?

While many science-related topics inspire public controversy, most of these (e.g., human reproduction, cloning, nuclear energy, and policy around carbon dioxide emissions) are related to questions about how to apply scientific knowledge. Many science teachers appropriately treat these 'science and society' topics as rich forums for student debate and discussion. In contrast, the cause of recent climate change is a topic for which public controversy involves questions about the validity of the science itself. It stands to reason that teachers could feel 'caught in the middle' when objections arise about the validity of climate change, as has been documented for the topic of evolution (Griffith and Brem, 2004).

Results of this study indicate that, at the very least, most science teachers are sensitive to the public controversy around climate change. Many teachers in this sample acknowledge the existence of public controversy as one strategy they use in teaching about climate change (Table 2, section B). Furthermore, participants' free responses to the 'both sides' question reveal that about 7 out of 10 would approach a discussion of human causes of climate change in ways that could be argued to undermine student perception of the validity of the science (Figure 1). Ironically, within the same sample of teachers, 8 out of 10 personally agree at some level with the statement that 'recent global warming is caused mostly by things people do' (Figure 3). Therefore, public controversy appears likely to affect the content of instruction about climate change, particularly with respect to the question of human attribution.

On the other hand, it appears that at the time this survey was administered, public controversy was not an important factor affecting the inclusion of instruction about climate change. The proportion of teachers receiving community pressure against teaching about climate change was quite small. Similarly, only a small minority of teachers cited concerns about objections or controversy in their classroom. The most prevalent reason for teachers excluding climate change was that 'it does not fit in my curriculum or standards', indicating that concerns over authorization or time currently drive patterns of instruction about climate change across different science subjects.

However, it will be important to monitor whether the effect of public controversy on the inclusion of climate change education remains small over time, as schoolrelated climate controversy appears to be on the rise. Between 2008 and 2010, "Academic Freedom" bills aimed at influencing

instruction of global warming and other controversial topics were introduced in a number of states (Kaufman, 2010), a publication promoting skepticism about climate change science was mailed to nearly 14,000 public school board presidents in Colorado and other states (Nova, 2009), and the nonprofit group "Balanced Education for Everyone" attracted national press by petitioning a school board in western Colorado to prevent teaching about global warming (Lofholm, 2010).

Lastly, while prior studies have focused on the potential negative impacts of public controversy on instruction, this study reveals a potentially positive effect of the attention and discussion generated by controversy. A number of teachers have been directly encouraged to teach about climate change, and a larger proportion of such "encouraged" teachers enhance their teaching of climate change, compared to the proportion of teachers for whom direct discouragement hinders teaching (Figure 2). However, additional research is needed to further test the idea that controversial topics lead teachers to receive more encouragement or discouragement, compared to other topics, and to examine whether encouragement to teach about controversial issues can outweigh the influence of discouraging experiences or other barriers to instruction on a teacher's decision to instruct about climate change.

Implications for policy and professional development

Because teachers in this sample generally support climate change education, it is possible that thoughtful policy and professional development efforts to encourage the incidence of instruction will be well received. Given the patterns, motivations, and barriers to instruction documented here, efforts should be focused in three areas: supporting interdisciplinary professional development, targeting professional development to help teachers overcome misconceptions and appropriately frame the public controversy, and explicitly including climate change in national, state, and district science standards for all science subjects.

Science teachers of all stripes in this study reported teaching about climate change. Therefore, opportunities for comprehensive professional development around climate change should ideally be directed to all science teachers. For example, biology teachers may currently feel comfortable instructing only about ecosystem-level impacts of climate change. Given many students could encounter climate change only in a biology classroom, these teachers would ideally understand and be able to instruct about the physical basis of climate change as well. A second strategy for professional development could provide needed support for teachers across science and social studies departments to divide and sequence climate subtopics appropriately. It may be possible to meet such an ambitious professional development objective, as teachers increasingly engage in local district or school professional learning communities (Nelson 2009).

Professional development providers may find that working with existing interdisciplinary teams could result in a greater and lasting impact on students.

A reliance on independent forms of learning has likely led many teachers to hold misconceptions about climate science. Professional development providers must take care to specifically target misconceptions that are the most prevalent among teachers. Results from this study would suggest a focus on the role of uncertainty in climate change science and science in general, the processes by which scientists come to consensus about the collective knowledge of climate science, and the attribution of climate change to human activities. In this latter area, where teachers diverge most strongly from scientists, teachers not only need information about how human activities can cause climate change (U.S. Climate Change Science Program, 2009), but also how alternative explanations (e.g., natural cycles, solar activity, volcanic activity) do not sufficiently explain the onset and rate of the warming trend of the last century (Crowley, 2000; Intergovernmental Panel on Climate Change, 2007; Landstrom, 2008).

Teachers also need support targeted toward understanding how to appropriately acknowledge and frame the public controversy. Teachers may not realize that they can be fair to both science and the public by instructing about the 'single side' of the scientific consensus while later giving students ample opportunity to debate the applications of science to public policy and individual decision-making. Campaigns by scientific and educational groups to 'first, teach the science' around climate change could further teacher awareness of this important distinction. Such campaigns would maintain the topic as an active point of discussion among teachers, possibly heightening the 'encouragement effect' identified here.

If education leaders and the public wish to catalyze instruction around climate change, encouraging and preparing teachers to include climate change in their curriculum will be necessary, but likely not sufficient, components of the process, because science teachers who marginalize or avoid the topic of climate change clearly indicate that they perceive that this topic does not fall within their curriculum or educational standards (Table 3). This likely explains why climate change is most likely to be taught by Earth science teachers. While it is difficult to argue for an expansion of science standards given the critical need to reduce the overstuffed curriculum (Scherer, 2001), compelling arguments have also been made for the interdisciplinary educational value and societal need for instruction on this topic (Fortner, 2001; Gautier et al., 2006; McCaffrey and Buhr, 2008; Hansen, 2009; U.S. Climate Change Science Program, 2009). Therefore, explicit and thorough inclusion of the causes, impacts, and solutions of climate change in national, state, and district science standards is likely to be an important lever for change (Kastens and

Turrin, 2008). In the short term, professional development providers can focus teacher attention on the fact that newer standards do include climate change (see the Atlas of Science Literacy, American Association for the Advancement of Science, 2007b). In the long term, climate scientists and educators will need to make their perspectives on climate education known to the state committees that review and update science education standards, and to the growing movement for a new set of national science standards.

CONCLUSIONS

This study documents patterns in climate change instruction that suggest a substantial fraction of science teachers may not provide entirely accurate formal instruction about this important topic. Policymakers and professional development providers can use insights about the barriers and motivators of instruction from this study to guide their efforts towards supporting interdisciplinary training and collaboration, the reduction of misconceptions about climate science, and the explicit inclusion of climate change in educational standards.

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Wolbach Library: CfA in the News ~ Week ending 30 January 2011

1. **Reports from S.M. Ord and Co-Researchers Add New Data to Research in Astronomy**, Science Letter, p1444, Tuesday, February 1, 2011
2. **Space museum marks Australian role**, Canberra Times, Tuesday, January 25, 2011
3. **SPACE FOR LEARNING: New Ph.D. in engineering physics attracts 'dedicated'**, DEBORAH CIRCELLI - EDUCATION WRITER, Daytona News-Journal, N-J Final ed, p01C, Monday, September 6, 2010

Record - 1

DIALOG(R)

Reports from S.M. Ord and Co-Researchers Add New Data to Research in Astronomy,
Science Letter, p1444,
Tuesday, February 1, 2011

TEXT:

"The Murchison Wide-Field Array (MWA) is a low-frequency radio telescope, currently under construction, intended to search for the spectral signature of the epoch of reionization (EOR) and to probe the structure of the solar corona," scientists in the United States report (see also).

"Sited in western Australia, the full MWA will comprise 8192 dipoles grouped into 512 tiles and will be capable of imaging the sky south of 40 degrees declination, from 80 MHz to 300 MHz with an instantaneous field of view that is tens of degrees wide and a resolution of a few arcminutes. A 32 station prototype of the MWA has been recently commissioned and a set of observations has been taken that exercise the whole acquisition and processing pipeline," wrote S.M. Ord and colleagues.

The researchers concluded: "We present Stokes I, Q, and U images from two similar to 4 hr integrations of a field 20 degrees wide centered on Pictoris A. These images demonstrate the capacity and stability of a real-time calibration and imaging technique employing the weighted addition of warped snapshots to counter extreme wide-field imaging distortions."

Ord and colleagues published their study in Publications of the Astronomical Society of the Pacific (Interferometric Imaging with the 32 Element Murchison Wide-Field Array. Publications of the Astronomical Society of the Pacific, 2010;122(897):1353-1366).

For additional information, contact S.M. Ord, Harvard Smithsonian Center Astrophysics, 60 Garden St., Cambridge, MA 02138, USA.

The publisher's contact information for the journal Publications of the Astronomical Society of the Pacific is: University Chicago Press, 1427 E 60th St., Chicago, IL 60637-2954, USA.

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JOURNAL SUBJECT: Science & Engineering

Record - 2

DIALOG(R)

Space museum marks Australian role,

Canberra Times,
Tuesday, January 25, 2011

TEXT:

EFFORTS to build a national astronomy and space science museum at Mount Stromlo have taken a giant leap forward following the signing of an agreement last week between the Smithsonian's National Air and Space Museum and The Australian National University.

ANU vice-chancellor Professor Ian Chubb AC and National Air and Space Museum director General John 'Jack' Dailey signed the agreement in Washington DC.

It sets out the first steps for cooperation that will support the development of a museum to tell the story of Australia's contribution to space science and space technologies, and celebrate the role Australian astronomers have played in the exploration of the cosmos.

The signing comes as the university prepares to celebrate the 100th anniversary of the Mount Stromlo Observatory and will see a number of curatorial staff from Washington come to Canberra in coming months to take part in a planning conference for the proposed museum.

"The National Air and Space Museum in Washington DC is one of the great science museums of the world," Professor Chubb said.

"We want to build a museum that will inspire our young people, melding science, art, culture and history and growing our already close relationship with the Smithsonian Institution will ensure that we create

something wonderful for Australia." Professor Chubb said the museum would draw on the long history of cooperation between the United States and Australia in astronomy and space science, and the Smithsonian Institution has always been part of that cooperation.

"The Smithsonian Institution has been linked to Canberra since 1907, when Smithsonian Secretary Walcott provided expert advice on the establishment of the Commonwealth Solar Observatory at Mount Stromlo. The observatory was designed so that it would complement the research of Smithsonian astronomers in the northern hemisphere," Professor Chubb said.

"In the 1990s a joint ANU - Harvard-Smithsonian Centre for Astrophysics (CfA) research team discovered the acceleration of the universal expansion of the Universe, one of the major mysteries of modern science.

"And both the ANU and the Smithsonian are foundation partners in the billion-dollar Giant Magellan Telescope, which will push the boundaries of science." The plans for the proposed museum has drawn praise from Chief Minister Jon Stanhope, who said it would boost tourism and build on the government's plans to further develop Stromlo Forest Park.

"We are exploring ways to attract more investment into Stromlo Forest Park, to increase the amount of low- cost tourism accommodation, to provide retail and events spaces, improve the equine and mountain biking tracks and to build a gondola that would scale Mount Stromlo, taking visitors and bike riders to the top," he said.

"The gondola and retail facilities would help bring visitors to the new space museum, which would in turn provide even more reasons for people to visit Stromlo Forest Park and stay in Canberra.

"The space museum coupled with new facilities at Stromlo Forest Park would be a particular drawcard for visitors from the highly lucrative US market."

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Record - 3

DIALOG(R)

SPACE FOR LEARNING: New Ph.D. in engineering physics attracts 'dedicated',
DEBORAH CIRCELLI - EDUCATION WRITER,
Daytona News-Journal, N-J Final ed, p01C,
Monday, September 6, 2010

TEXT:

DAYTONA BEACH - DAYTONA BEACH - Chris Heale remembers going to air shows when he was younger with his parents and grandparents, who all worked in aviation and engineering.

He was drawn to space and spacecraft and "all the things that went with it." As a 6-year-old, he read books on astronomy and learned about the planets. He was hooked.

The 24-year-old from Bristol, England, is part of an elite group of five students in Embry-Riddle Aeronautical University's new doctorate program in engineering physics.

It's Embry-Riddle's second doctoral program after starting a program in aviation in January. That program is primarily online although students come to the university several times during the program, which can last from three to seven years. Officials at Embry-Riddle said the aviation doctorate is the first in the nation.

Embry-Riddle is the only college or university based in Volusia County to offer a doctoral program. The University of Central Florida in Orlando offers nearly 30 doctoral degrees, but none in engineering physics.

Heale and four other students - Alex Sjogren of Sweden; Damon Burke of Winter Park; Chau Ton of California and Bill Price of New Jersey - started classes last week at the Daytona Beach campus. They will remain there throughout the program that can take three to five years to complete, officials said.

Heale, who received his master's degree in astrophysics at the University of Southampton in England and also did graduate work at the Harvard-Smithsonian Center, has been working in England for two years designing infrared sensors for the defense industry.

His dream, like some of the four other students, is to one day be an astronaut. But the odds are low, so they instead focused on research in hopes of working at NASA or with private companies in the space industry or becoming professors. All said they would not turn down a chance of going into space if given the opportunity.

The five students, who are receiving scholarships and a living stipend, were selected out of about 20 who applied, according to John J. Olivero, professor and chairman of the physical sciences department, including engineering physics and space physics.

The new doctoral program includes working 20 hours a week in various departments helping professors and students. Olivero said getting a doctorate, which he also has, and doing the research and dissertation paper becomes a "labor of love."

"It can take over virtually all of their time for several years," he said.

He estimates there are no more than a dozen universities offering doctorates in engineering physics nationwide.

Just being smart, he said, "won't hack it. You have to be dedicated."

The students will take courses in space physics, planetary orbits and spacecraft dynamics and conduct research ranging from the earth's upper atmosphere to the engineering of spacecraft control systems. About four or five more students will be added every fall for the next few years. Olivero said the doctoral program will position Embry-Riddle to compete for more grants and become even better known for doing "world-class research." Space research can relate to what happens on Earth, he said. Solar storms happening in space have been known, for example, to impact satellite systems and disrupt power grids and pipelines.

Heale said the "reputation of the faculty" and its programs nationally attracted him to Embry-Riddle.

Sjogren, 26, came to Embry-Riddle from Sweden. He arrived in October before the program started as part of a research grant analyzing data from NASA satellites regarding particles emitted from the sun.

Sjogren, who has a master's from Uppsala University in Sweden and also spent a year in Hawaii, heard about Embry-Riddle from other people in Sweden.

"I've always been interested in physics and problem-solving," he said.

Burke, 33, received his bachelor's and master's degrees from Embry-Riddle and is now seeking his doctorate. He's worked in the university's atmospheric physics research lab doing work involving rockets.

When asked why he chose this field, he said, "it's outer space - who wouldn't be interested?" He's always been impressed with computer technology and simulators.

Ton, who was born in Vietnam but moved to California when he was 10, and Price, 33, who was a lieutenant in the U.S. Navy, both are interested in control systems and unmanned space vehicles. Ton, who has his bachelor's

and master's from Embry-Riddle, at one time wanted to be an astronomer after taking a program in high school.

"I didn't know what was out there so I was curious," he said.

Price, who has two master's degrees, attended band camps as a child and likes the challenges of engineering and "pushing the technology field to the limits."

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Record - 1

DIALOG(R)

Study Findings from A.J. Richings et al Provide New Insights into Astronomy,
Science Letter, p3691,
Tuesday, February 8, 2011

TEXT:

According to a study from the United States, "We present an analysis of the hot interstellar medium (ISM) in the spiral galaxy NGC 4490, which is interacting with the irregular galaxy NGC 4485, using similar to 100 ks of Chandra ACIS-S observations. The high angular resolution of Chandra enables us to remove discrete sources and perform spatially resolved spectroscopy for the star-forming regions and associated outflows, allowing us to look at how the physical properties of the hot ISM such as temperature, hydrogen column density, and metal abundances vary throughout these galaxies."

"We find temperatures of >0.41 keV and $0.85(-0.12)(+0.59)$ keV, electron densities of $> 1.87 \eta(-1/2) \times 10(-3)$ cm⁻³ and $0.21(-0.04)(+0.03)\eta \times 10(-3)$ cm⁻³, and hot gas masses of $> 1.1 \eta(1/2) \times 10(7)$ M-circle dot and similar to $3.7 \eta(1/2) \times 10(7)$ M-circle dot in the plane and halo of NGC 4490, respectively, where η is the filling factor of the hot gas. The abundance ratios of Ne, Mg, and Si with respect to Fe are found to be consistent with those predicted by theoretical models of type II supernovae (SNe). The thermal energy in the hot ISM is similar to 5% of the total mechanical energy input from SNe, so it is likely that the hot ISM has been enriched and heated by type II SNe," wrote A.J. Richings and colleagues (see also).

The researchers concluded: "The X-ray emission is anticorrelated with the H alpha and mid-infrared emission, suggesting that the hot gas is bounded by filaments of cooler ionized hydrogen mixed with warm dust."

Richings and colleagues published the results of their research in Astrophysical Journal (The Hot Interstellar Medium Of The Interacting Galaxy Ngc 4490. Astrophysical Journal, 2010;723(2):1375-1392).

For additional information, contact A.J. Richings, Harvard Smithsonian Center Astrophysics, 60 Garden St., Cambridge, MA 02138, USA.

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Record - 2

DIALOG(R)

Studies from S. Wuyts et al in the Area of Astronomy Described,
Science Letter, p3410,
Tuesday, February 8, 2011

TEXT:

"We present a detailed analysis of the structure and resolved stellar populations of simulated merger remnants, and compare them to observations of compact quiescent galaxies at z similar to 2. We find that major merging is a viable mechanism to produce systems of similar to 10^{11} M_{\odot} and similar to 1 kpc size, provided the gas fraction at the time of final coalescence is high (similar to 40%) and provided that the progenitors are compact star-forming galaxies, as expected at high redshift. Their integrated spectral energy distributions and velocity dispersions are in good agreement with the observations, and their position in the $(\nu_{\text{maj}}/\sigma, \epsilon)$ diagram traces the upper envelope of the distribution of lower redshift early-type galaxies," scientists in the United States report (see also).

"The simulated merger remnants show time- and sightline-dependent M/L ratio gradients that result from a superposition of radially dependent stellar age, stellar metallicity, and extinction. The median ratio of the effective radius in rest-frame V-band light to that in mass surface density is similar to 2 during the quiescent remnant phase. This is typically expressed by a negative color gradient (i.e., red core), which we expect to correlate with the integrated color of the system. Finally, the simulations differ from the observations in their surface brightness profile shape. The simulated remnants are typically best fit by high ($n \gg 4$) Sersic indices, whereas observed quiescent galaxies at z similar to 2 tend to be less cuspy ($\langle n \rangle$ similar to 2.3)," wrote S. Wuyts and colleagues.

The researchers concluded: "Limiting early star formation in the progenitors may be required to prevent the simulated merger remnants from having extended wings."

Wuyts and colleagues published their study in *Astrophysical Journal* (ON SIZES, KINEMATICS, M/L GRADIENTS, AND LIGHT PROFILES OF MASSIVE COMPACT GALAXIES AT z similar to 2. *Astrophysical Journal*, 2010;722(2):1666-1684).

For additional information, contact S. Wuyts, Harvard Smithsonian Center Astrophysics, 60 Garden St., Cambridge, MA 02138, USA.

The publisher's contact information for the *Astrophysical Journal* is: IOP Publishing Ltd., Dirac House, Temple Back, Bristol BS1 6BE, England.

Record - 3

DIALOG(R)

Studies from J.H. Zhao and Colleagues Provide New Data on Astronomy,
Science Letter, p3307,
Tuesday, February 8, 2011

TEXT:

"We report a study of the H30 alpha line emission at 1.3 mm from the region around Sgr A* made with the Submillimeter Array at a resolution of 2 " over a field of 60 " (2 pc) and a velocity range of -360 to +345 km s(-1). This field encompasses most of the Galactic center's "minispiral." With an isothermal homogeneous H II model, we determined the physical conditions of the ionized gas at specific locations in the Northern and Eastern Arms from the H30 alpha line data along with Very Large Array data from the H92 alpha line at 3.6 cm and from the radio continuum emission at 1.3 cm," researchers in the United States report (see also).

"The typical electron density and kinetic temperature in the minispiral arms are $3\text{-}21 \times 10^4 \text{ cm}^{-3}$ and 5000-13,000 K, respectively. The H30 alpha and H92 alpha line profiles are broadened due to the large velocity shear within and along the beam produced by dynamical motions in the strong gravitational field near Sgr A*. We constructed a three-dimensional model of the minispiral using the orbital parameters derived under the assumptions that the gas flows are in Keplerian motion. The gas in the Eastern Arm appears to collide with the Northern Arm flow in the "Bar" region, which is located 0.1-0.2 pc south of and behind Sgr A*," wrote J.H. Zhao and colleagues.

The researchers concluded: "Finally, a total Lyman continuum flux of 3×10^{50} photons s(-1) is inferred from the assumption that the gas is photoionized and the ionizing photons for the high-density gas in the minispiral arms are from external sources, which is equivalent to similar to 250 O9-type zero-age-main-sequence stars."

Zhao and colleagues published their study in *Astrophysical Journal* (The High-density Ionized Gas In The Central Parsec Of The Galaxy. *Astrophysical Journal*, 2010;723(2):1097-1109).

For additional information, contact J.H. Zhao, Harvard Smithsonian Center Astrophysics, 60 Garden St., Cambridge, MA 02138, USA.

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Record - 4

DIALOG(R)

Studies from H. Kirk and Co-Researchers in the Area of Astronomy Published,
Science Letter, p3283,
Tuesday, February 8, 2011

TEXT:

According to recent research published in the Astrophysical Journal, "We utilize the extensive data sets available for the Perseus molecular cloud to analyze the relationship between the kinematics of small-scale dense cores and the larger structures in which they are embedded. The kinematic measures presented here can be used in conjunction with those discussed in our previous work as strong observational constraints that numerical simulations (or analytic models) of star formation should match."

"We find that dense cores have small motions with respect to the (CO)-C-13 gas, about one third of the (CO)-C-13 velocity dispersion along the same line of sight. Within each extinction region, the core-to-core velocity dispersion is about half of the total ((CO)-C-13) velocity dispersion seen in the region," wrote H. Kirk and colleagues (see also).

The researchers concluded: "Large-scale velocity gradients account for roughly half of the total velocity dispersion in each region, similar to what is predicted from large-scale turbulent modes following a power spectrum of $P(k)$ proportional to k^{-4} ."

Kirk and colleagues published their study in Astrophysical Journal (The Dynamics Of Dense Cores In The Perseus Molecular Cloud. Ii. The Relationship Between Dense Cores And The Cloud. Astrophysical Journal, 2010;723(1):457-475).

For additional information, contact H. Kirk, Harvard Smithsonian Center Astrophysics, 60 Garden St., Cambridge, MA 02138, USA.

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DIALOG(R)

Studies from E. Berger and Co-Researchers Update Current Data on Astronomy,

Science Letter, p3268,

Tuesday, February 8, 2011

TEXT:

According to a study from the United States, "We investigate the afterglow properties and large-scale environments of several short-duration gamma-ray bursts (GRBs) with subarcsecond optical afterglow positions but no bright coincident host galaxies. The purpose of this joint study is to robustly assess the possibility of significant offsets, a hallmark of the compact object binary merger model."

"Five such events exist in the current sample of 20 short bursts with optical afterglows, and we find that their optical, X-ray, and gamma-ray emission are systematically fainter. These differences may be due to lower circumburst densities (by about an order of magnitude), to higher redshifts (by Δz approximate to 0.5-1), or to lower energies (by about a factor of 3), although in the standard GRB model the smaller gamma-ray fluences cannot be explained by lower densities. To study the large-scale environments, we use deep optical observations to place limits on underlying hosts and to determine probabilities of chance coincidence for galaxies near each burst. In four of the five cases, the lowest probabilities of chance coincidence ($P < \Delta R$) similar to 0.1) are associated with bright galaxies at separations of ΔR similar to 10", while somewhat higher probabilities of chance coincidence are associated with faint galaxies at separations of similar to 2". By measuring redshifts for the brighter galaxies in three cases ($z = 0.111, 0.473, 0.403$), we find physical offsets of approximate to 30-75 kpc, while for the faint hosts the assumption of z greater than or similar to 1 leads to offsets of similar to 15 kpc. Alternatively, the limits at the burst positions (greater than or similar to 26 mag) can be explained by typical short GRB host galaxies (L approximate to $0.1-1 L^*$) at z greater than or similar to 2-3. Thus, two possibilities exist: (1) similar to 1/4 of short GRBs explode similar to 50 kpc or similar to 15 kpc from the centers of $z \geq 0.3$ or z greater than or similar to 1 galaxies, respectively, and have fainter afterglows due to the resulting lower densities; or (2) similar to 1/4 of short GRBs occur at z greater than or similar to 2 and have fainter afterglows due to their higher redshifts. The high-redshift scenario leads to a bimodal redshift distribution, with peaks at z similar to 0.5 and z similar to 3. The large offset scenario leads to an offset distribution that is well matched by theoretical predictions of NS-NS/NS-BH binary kicks, or by a hybrid population with globular cluster NS-NS binaries at large offsets and primordial binaries at offsets of less than or similar to 10 kpc (indicative of negligible kicks)," wrote E. Berger and colleagues (see also).

The researchers concluded: "Deeper constraints on any coincident galaxies to greater than or similar to 28 mag (using the Hubble Space Telescope) will allow us to better exclude the high-redshift scenario."

Berger and colleagues published their study in *Astrophysical Journal* (A SHORT GAMMA-RAY BURST "NO-HOST" PROBLEM? INVESTIGATING LARGE PROGENITOR OFFSETS FOR SHORT GRBs WITH OPTICAL AFTERGLOWS *Astrophysical Journal*, 2010;722(2):1946-1961).

For more information, contact E. Berger, Harvard Smithsonian Center Astrophysics, 60 Garden St., Cambridge, MA 02138, USA.

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DIALOG(R)

Reports from S. Mohanty and Colleagues Advance Knowledge in Astronomy,
Science Letter, p1790,
Tuesday, February 8, 2011

TEXT:

According to a study from the United States, "We present high-resolution Keck optical spectra of the very young substellar eclipsing binary 2MASS J05352184-0546085, obtained during eclipse of the lower-mass (secondary) brown dwarf. The observations yield the spectrum of the higher-mass (primary) brown dwarf alone, with negligible (similar to 1.6%) contamination by the secondary."

"We perform a simultaneous fine analysis of the TiO-epsilon band and the red lobe of the K I doublet, using state-of-the-art PHOENIX dusty and COND synthetic spectra. Comparing the effective temperature and surface gravity derived from these fits to the empirically determined surface gravity of the primary ($\log g = 3.5$) then allows us to test the model spectra as well as probe the prevailing photospheric conditions. We find that: (1) fits to TiO-epsilon alone imply $T_{\text{eff}} = 2500 \pm 50$ K; (2) at this T_{eff} , fits to K I imply $\log g = 3.0$, 0.5 dex lower than the true value; and (3) at the true $\log g$, K I fits yield $T_{\text{eff}} = 2650 \pm 50$ K, similar to 150K higher than from TiO-epsilon alone. On the one hand, these are the trends expected in the presence of cool spots covering a large fraction of the primary's surface (as theorized previously to explain the observed T_{eff} reversal

between the primary and secondary). Specifically, our results can be reproduced by an unspotted stellar photosphere with $T_{\text{eff}} = 2700$ K and (empirical) $\log g = 3.5$, coupled with axisymmetric cool spots that are 15% cooler (2300 K), have an effective $\log g = 3.0$ (0.5 dex lower than photospheric), and cover 70% of the surface. On the other hand, the trends in our analysis can also be reproduced by model opacity errors: there are lacks in the synthetic TiO-epsilon opacities, at least for higher-gravity field dwarfs," wrote S. Mohanty and colleagues (see also).

The researchers concluded: "Stringently discriminating between the two possibilities requires combining the present results with an equivalent analysis of the secondary (predicted to be relatively unspotted compared to the primary)."

Mohanty and colleagues published their study in *Astrophysical Journal* (High-resolution Spectroscopy During Eclipse Of The Young Substellar Eclipsing Binary 2mass 0535-0546. I. Primary Spectrum: Cool Spots Versus Opacity Uncertainties. *Astrophysical Journal*, 2010;722(2):1138-1147). For more information, contact S. Mohanty, Harvard Smithsonian Center Astrophysics, 60 Garden St., Cambridge, MA 02138, USA.

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DIALOG(R)

Reports from E.A. Kruse and Co-Researchers Add New Data to Research in Astronomy,

Science Letter, p1746,

Tuesday, February 8, 2011

TEXT:

According to a study from the United States, "We present the first comprehensive study of short-timescale chromospheric H alpha variability in M dwarfs using the individual 15 minute spectroscopic exposures for 52,392 objects from the Sloan Digital Sky Survey. Our sample contains about 10(3)-10(4) objects per spectral type bin in the range M0-M9, with a typical number of three exposures per object (ranging up to a maximum of 30 exposures)."

"Using this extensive data set, we find that about 16% of the sources exhibit H alpha emission in at least one exposure, and of those about 45%

exhibit H alpha emission in all of the available exposures. As in previous studies of H alpha activity (L-H alpha/L-bol), we find a rapid increase in the fraction of active objects from M0-M6. However, we find a subsequent decline in later spectral types that we attribute to our use of the individual spectra. Similarly, we find saturated activity at a level of L-H alpha/L-bol approximate to $10^{-3.6}$ for spectral types M0-M5 followed by a decline to about $10^{-4.3}$ in the range M7-M9. Within the sample of objects with H alpha emission, only 26% are consistent with non-variable emission, independent of spectral type. The H alpha variability, quantified in terms of the ratio of maximum to minimum H alpha equivalent width (R-EW), exhibits a rapid rise from M0 to M5, followed by a plateau and a possible decline in M9 objects. In particular, variability with R-EW greater than or similar to 10 is only observed in objects later than M5, and survival analysis indicates a probability of less than or similar to 0.1% that the R-EW values for M0-M4 and M5-M9 are drawn from the same distribution. We further find that for an exponential distribution, the R-EW values follow $N(R-EW) \cdot \exp[-(R-EW - 1)/2.3]$ for M0-M4 and $\alpha \exp[-(R-EW - 1)/2.9]$ for M5-M9. Finally, comparing objects with persistent and intermittent H alpha emission, we find that the latter exhibit greater variability," wrote E.A. Kruse and colleagues (see also).

The researchers concluded: "Based on these results, we conclude that H alpha variability in M dwarfs on timescales of 15 minutes to 1 hr increases with later spectral type, and that the variability is larger for intermittent sources."

Kruse and colleagues published their study in *Astrophysical Journal* (CHROMOSPHERIC VARIABILITY IN SLOAN DIGITAL SKY SURVEY M DWARFS. II. SHORT-TIMESCALE H alpha VARIABILITY. *Astrophysical Journal*, 2010;722(2):1352-1359).

For more information, contact E.A. Kruse, Harvard Smithsonian Center Astrophysics, 60 Garden St., Cambridge, MA 02138, USA.

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DIALOG(R)

Reports from D.V. Lal and Colleagues Advance Knowledge in Astronomy,
Science Letter, p1746,
Tuesday, February 8, 2011

TEXT:

According to recent research published in the Astrophysical Journal, "We present results from a 42 ks Chandra/ACIS-S observation of the transitional FR I/FR II radio galaxy 3C 288 at $z = 0.246$. We detect similar to 3 keV gas extending to a radius of similar to 0.5 Mpc with a 0.5-2.0 keV luminosity of 6.6×10^{43} erg s⁻¹), implying that 3C 288 lies at the center of a poor cluster."

"We find multiple surface brightness discontinuities in the gas indicative of either a shock driven by the inflation of the radio lobes or a recent merger event. The temperature across the discontinuities is roughly constant with no signature of a cool core, thus disfavoring either the merger cold front or sloshing scenarios. We argue therefore that the discontinuities are shocks due to the supersonic inflation of the radio lobes. If they are shocks, the energy of the outburst is similar to 10^{60} erg, or roughly 30% of the thermal energy of the gas within the radius of the shock, assuming that the shocks are part of a front produced by a single outburst," wrote D.V. Lal and colleagues (see also).

The researchers concluded: "The cooling time of the gas is similar to 10^8 yr, so that the energy deposited by the nuclear outburst could have reheated and efficiently disrupted a cool core."

Lal and colleagues published their study in Astrophysical Journal (A CHANDRA OBSERVATION OF 3C 288-REHEATING THE COOL CORE OF A 3 keV CLUSTER FROM A NUCLEAR OUTBURST at $z=0.246$. Astrophysical Journal, 2010;722(2):1735-1743).

For additional information, contact D.V. Lal, Harvard Smithsonian Center Astrophysics, 60 Garden St., Cambridge, MA 02138, USA.

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DIALOG(R)

New Findings Reported from S.M. Andrews and Co-Authors Describe Advances in Astronomy,

Science Letter, p1012,

Tuesday, February 8, 2011

TEXT:

"We present new results from a significant extension of our previous high angular resolution (0".3 approximate to 40 AU) submillimeter array survey of the 340 GHz (880 μ m) thermal continuum emission from dusty circumstellar disks in the similar to 1 Myr old Ophiuchus star-forming region. An expanded sample is constructed to probe disk structures that emit significantly lower millimeter luminosities (hence dust masses), down to the median value for T Tauri stars," scientists in the United States report (see also).

"Using a Monte Carlo radiative transfer code, the millimeter visibilities and broadband spectral energy distribution for each disk are simultaneously reproduced with a two-dimensional parametric model for a viscous accretion disk that has a surface density profile $\Sigma \propto (R/R_c)^{-\gamma} \exp[-(R/R_c)^{2-\gamma}]$. We find wide ranges of characteristic radii ($R_c = 14$ -198 AU) and disk masses ($M_d = 0.004$ -0.143 M_\odot), but a narrow distribution of surface density gradients ($\gamma = 0.4$ -1.1) that is consistent with a uniform value $\langle \gamma \rangle = 0.9 \pm 0.2$ and independent of mass (or millimeter luminosity). In this sample, we find a correlation between the disk luminosity/mass and characteristic radius, such that fainter disks are both smaller and less massive. We suggest that this relationship is an imprint of the initial conditions inherited by the disks at their formation epoch, compare their angular momenta with those of molecular cloud cores, and speculate on how future observations can help constrain the distribution of viscous evolution timescales. No other correlations between disk and star properties are found. The inferred disk structures are briefly compared with theoretical models for giant planet formation, although resolution limitations do not permit us to directly comment on material inside $R \approx 20$ AU," wrote S.M. Andrews and colleagues.

The researchers concluded: "However, there is some compelling evidence for the evolution of dust in the planet formation region: 4/17 disks in the sample show resolved regions of significantly reduced millimeter optical depths within similar to 20-40 AU of their central stars."

Andrews and colleagues published their study in *Astrophysical Journal* (Protoplanetary Disk Structures In Ophiuchus. II. Extension To Fainter Sources. *Astrophysical Journal*, 2010;723(2):1241-1254).

For more information, contact S.M. Andrews, Harvard Smithsonian Center Astrophysics, 60 Garden St., Cambridge, MA 02138, USA.

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DIALOG(R)

New Astronomy Research Reported from C.J. Lada and Co-Authors,
Science Letter, p799,
Tuesday, February 8, 2011

TEXT:

According to recent research from the United States, "In this paper, we investigate the level of star formation activity within nearby molecular clouds. We employ a uniform set of infrared extinction maps to provide accurate assessments of cloud mass and structure and compare these with inventories of young stellar objects within the clouds."

"We present evidence indicating that both the yield and rate of star formation can vary considerably in local clouds, independent of their mass and size. We find that the surface density structure of such clouds appears to be important in controlling both these factors. In particular, we find that the star formation rate (SFR) in molecular clouds is linearly proportional to the cloud mass ($M^{-0.8}$) above an extinction threshold of $A(K)$ approximate to 0.8 mag, corresponding to a gas surface density threshold of $\Sigma(\text{gas})$ approximate to $116 M(\text{circle dot}) \text{ pc}^2$. We argue that this surface density threshold corresponds to a gas volume density threshold which we estimate to be $n(\text{H-2})$ approximate to 10^4 cm^{-3} . Specifically, we find $\text{SFR} (M\text{-circle dot yr}^{-1}) = 4.6 \pm 2.6 \times 10^{-8} M^{-0.8}$ ($M\text{-circle dot}$) for the clouds in our sample. This relation between the rate of star formation and the amount of dense gas in molecular clouds appears to be in excellent agreement with previous observations of both galactic and extragalactic star-forming activity. It is likely the underlying physical relationship or empirical law that most directly connects star formation activity with interstellar gas over many spatial scales within and between individual galaxies," wrote C.J. Lada and colleagues (see also).

The researchers concluded: "These results suggest that the key to obtaining a predictive understanding of the SFRs in molecular clouds and galaxies is to understand those physical factors which give rise to the dense components of these clouds."

Lada and colleagues published their study in *Astrophysical Journal* (On The Star Formation Rates In Molecular Clouds. *Astrophysical Journal*, 2010;724(1):687-693).

For additional information, contact C.J. Lada, Harvard Smithsonian Center

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DIALOG(R)

Findings in Astronomy Reported from M. Su and Co-Researchers,
Science Letter, p596,
Tuesday, February 8, 2011

TEXT:

"Data from the Fermi-LAT reveal two large gamma-ray bubbles, extending 50 degrees above and below the Galactic center (GC), with a width of about 40 degrees in longitude. The gamma-ray emission associated with these bubbles has a significantly harder spectrum (dN/dE similar to E^{-2}) than the inverse Compton emission from electrons in the Galactic disk, or the gamma rays produced by the decay of pions from proton-interstellar medium collisions," scientists writing in the Astrophysical Journal report (see also).

"There is no significant spatial variation in the spectrum or gamma-ray intensity within the bubbles, or between the north and south bubbles. The bubbles are spatially correlated with the hard-spectrum microwave excess known as the WMAP haze; the edges of the bubbles also line up with features in the ROSAT X-ray maps at 1.5-2 keV. We argue that these Galactic gamma-ray bubbles were most likely created by some large episode of energy injection in the GC, such as past accretion events onto the central massive black hole, or a nuclear starburst in the last similar to 10 Myr. Dark matter annihilation/decay seems unlikely to generate all the features of the bubbles and the associated signals in WMAP and ROSAT; the bubbles must be understood in order to use measurements of the diffuse gamma-ray emission in the inner Galaxy as a probe of dark matter physics," wrote M. Su and colleagues.

The researchers concluded: "Of the origin and evolution of the bubbles also has the potential to improve our understanding of recent energetic events in the inner Galaxy and the high-latitude cosmic ray population."

Su and colleagues published their study in Astrophysical Journal (Giant Gamma-ray Bubbles From Fermi-lat: Active Galactic Nucleus Activity Or Bipolar Galactic Wind? Astrophysical Journal, 2010;724(2):1044-1082).

Additional information can be obtained by contacting M. Su, Harvard

Smithsonian Center Astrophysics, Institute Theory & Computational, 60 Garden St., MS 51, Cambridge, MA 02138, USA.

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DIALOG(R)

Data on Astronomy Discussed by J.Y. Lee and Colleagues,
Science Letter, p350
Tuesday, February 8, 2011

TEXT:

According to a study from the United States, "We investigate the evolution of coronal loop emission in the context of the coronal magnetic field topology. New modeling techniques allow us to investigate the magnetic field structure and energy release in active regions (ARs)."

"Using these models and high-resolution multi-wavelength coronal observations from the Transition Region and Coronal Explorer and the X-ray Telescope on Hinode, we are able to establish a relationship between the light curves of coronal loops and their associated magnetic topologies for NOAA AR 10963. We examine loops that show both transient and steady emission, and we find that loops that show many transient brightenings are located in domains associated with a high number of separators. This topology provides an environment for continual impulsive heating events through magnetic reconnection at the separators. A loop with relatively constant X-ray and EUV emission, on the other hand, is located in domains that are not associated with separators. This result implies that larger-scale magnetic field reconnections are not involved in heating plasma in these regions, and the heating in these loops must come from another mechanism, such as small-scale reconnections (i.e., nanoflares) or wave heating. Additionally, we find that loops that undergo repeated transient brightenings are associated with separators that have enhanced free energy," wrote J.Y. Lee and colleagues (see also).

The researchers concluded: "In contrast, we find one case of an isolated transient brightening that seems to be associated with separators with a smaller free energy."

Lee and colleagues published the results of their research in Astrophysical Journal (The Role Of Magnetic Topology In The Heating Of Active Region Coronal Loops. Astrophysical Journal, 2010;723(2):1493-1506).

For additional information, contact J.Y. Lee, Harvard Smithsonian Center Astrophysics, 60 Garden St., Cambridge, MA 02138, USA.

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DIALOG(R)

NASA's NEOWISE Completes Scan for Asteroids and Comets,

Ascribe,

Tuesday, February 1, 2011

TEXT:

PASADENA, Calif., Feb. 1 (AScribe Newswire) - PASADENA, Calif., Feb. 1 (AScribe Newswire) -- NASA's NEOWISE mission has completed its survey of small bodies, asteroids and comets, in our solar system. The mission's discoveries of previously unknown objects include 20 comets, more than 33,000 asteroids in the main belt between Mars and Jupiter, and 134 near-Earth objects (NEOs). The NEOs are asteroids and comets with orbits that come within 45 million kilometers (28 million miles) of Earth's path around the sun.

NEOWISE is an enhancement of the Wide-field Infrared Survey Explorer, or WISE, mission that launched in December 2009. WISE scanned the entire celestial sky in infrared light about 1.5 times. It captured more than 2.7 million images of objects in space, ranging from faraway galaxies to asteroids and comets close to Earth.

In early October 2010, after completing its prime science mission, the spacecraft ran out of the frozen coolant that keeps its instrumentation cold. However, two of its four infrared cameras remained operational. These two channels were still useful for asteroid hunting, so NASA extended the NEOWISE portion of the WISE mission by four months, with the primary purpose of hunting for more asteroids and comets, and to finish one complete scan of the main asteroid belt.

"Even just one year of observations from the NEOWISE project has significantly increased our catalog of data on NEOs and the other small bodies of the solar systems," said Lindley Johnson, NASA's program executive for the NEO Observation Program.

Now that NEOWISE has successfully completed a full sweep of the main asteroid belt, the WISE spacecraft will go into hibernation mode and remain

in polar orbit around Earth, where it could be called back into service in the future.

In addition to discovering new asteroids and comets, NEOWISE also confirmed the presence of objects in the main belt that had already been detected. In just one year, it observed about 153,000 rocky bodies out of approximately 500,000 known objects. Those include the 33,000 that NEOWISE discovered.

NEOWISE also observed known objects closer and farther to us than the main belt, including roughly 2,000 asteroids that orbit along with Jupiter, hundreds of NEOs and more than 100 comets.

These observations will be key to determining the objects' sizes and compositions. Visible-light data alone reveal how much sunlight reflects off an asteroid, whereas infrared data is much more directly related to the object's size. By combining visible and infrared measurements, astronomers also can learn about the compositions of the rocky bodies -- for example, whether they are solid or crumbly. The findings will lead to a much-improved picture of the various asteroid populations.

NEOWISE took longer to survey the whole asteroid belt than WISE took to scan the entire sky because most of the asteroids are moving in the same direction around the sun as the spacecraft moves while it orbits Earth. The spacecraft field of view had to catch up to, and lap, the movement of the asteroids in order to see them all.

"You can think of Earth and the asteroids as racehorses moving along in a track," said Amy Mainzer, the principal investigator of NEOWISE at NASA's Jet Propulsion Laboratory in Pasadena, Calif. "We're moving along together around the sun, but the main belt asteroids are like horses on the outer part of the track. They take longer to orbit than us, so we eventually lap them."

NEOWISE data on the asteroid and comet orbits are catalogued at the NASA-funded International Astronomical Union's Minor Planet Center, a clearinghouse for information about all solar system bodies at the Smithsonian Astrophysical Observatory in Cambridge, Mass. The science team is analyzing the infrared observations now and will publish new findings in the coming months.

When combined with WISE observations, NEOWISE data will aid in the discovery of the closest dim stars, called brown dwarfs. These observations have the potential to reveal a brown dwarf even closer to us than our closest known star, Proxima Centauri, if such an object does exist. Likewise, if there is a hidden gas-giant planet in the outer reaches of our solar system, data from WISE and NEOWISE could detect it.

The first batch of observations from the WISE mission will be available to the public and astronomical community in April.

"WISE has unearthed a mother lode of amazing sources, and we're having a great time figuring out their nature," said Edward (Ned) Wright, the principal investigator of WISE at UCLA.

JPL manages WISE for NASA's Science Mission Directorate at the agency's headquarters in Washington. The mission was competitively selected under NASA's Explorers Program, which NASA's Goddard Space Flight Center in Greenbelt, Md., manages. The Space Dynamics Laboratory in Logan, Utah, built the science instrument, and Ball Aerospace & Technologies Corp. of Boulder, Colo., built the spacecraft. Science operations and data processing take place at the Infrared Processing and Analysis Center at the California Institute of Technology in Pasadena. JPL manages NEOWISE for NASA's Planetary Sciences Division. The mission's data processing also takes place at the Infrared Processing and Analysis Center.

More information is online at <http://www.nasa.gov/wise> and <http://wise.astro.ucla.edu> and <http://jpl.nasa.gov/wise> .

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Trent Perrotto, 202-358-0321, Headquarters, Washington, trent.j.perrotto@nasa.gov

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Record - 14

DIALOG(R)

Spacecraft finds new comets, asteroids,

UPI Science News,

Tuesday, February 1, 2011

TEXT:

A NASA spacecraft surveying our solar system has discovered previously unknown objects, including 20 new comets and more than 33,00 asteroids, scientists say.

The main mission of the NEOWISE program was to hunt for more asteroids and comets and to finish one complete scan of the main asteroid belt, a NASA release said Tuesday.

The mission also identified 134 near-Earth objects, or NEOs, asteroids and comets whose orbits bring them within 28 million miles of Earth's path around the sun, researchers said.

"Even just one year of observations from the NEOWISE project has significantly increased our catalog of data on NEOs and the other small bodies of the solar systems," Lindley Johnson, NASA program executive for the NEO Observation Program, said.

NEOWISE data on asteroid and comet orbits are cataloged at the NASA-funded International Astronomical Union's Minor Planet Center, a clearinghouse for information about all solar system bodies at the Smithsonian Astrophysical Observatory in Cambridge, Mass.

The mission was managed by NASA's Jet Propulsion Laboratory in Pasadena, Calif.

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Wolbach Library: CfA in the News ~ Week ending 20 February 2011

1. **Research on Astronomy Discussed by E. Donghia and Co-Researchers**, Science Letter, p1717, Tuesday, February 22, 2011
2. **Research on on Astronomy Described by Y. Shen and Colleagues**, Science Letter, p1716, Tuesday, February 22, 2011
3. **Research Reports on Astronomy from A.C. Seth and Colleagues Provide New Insights**, Science Letter, p1406, Tuesday, February 22, 2011
4. **Reports Outline Astronomy Research from R. Galvanmadrid and Colleagues**, Science Letter, p1104, Tuesday, February 22, 2011
5. **New Astronomy Study Results from A.M. Soderberg et al Described**, Science Letter, p574, Tuesday, February 22, 2011
6. **Data from C.N. Leibler et al Provide New Insights into Astronomy**, Science Letter, p192, Tuesday, February 22, 2011
7. **New device to help confirm Kepler's planetary candidates**, ANI, Asian News International, Tuesday, February 15, 2011
8. **Strange bubbles in space**. Hamalainen, Karina, Science World, v67, n9, p2(2) Monday, February 14, 2011
9. **Hungarian astronomer receives high US award**, Hungarian News Agency (MTI), Monday, January 17, 2011

Record - 1

DIALOG(R)

Research on Astronomy Discussed by E. Donghia and Co-Researchers,
Science Letter, p1717,
Tuesday, February 22, 2011

TEXT:

"When a spinning system experiences a transient gravitational encounter with an external perturber, a quasi-resonance occurs if the spin frequency of the victim roughly matches the peak angular speed of the perturber. Such encounters are responsible for the formation of long tails and bridges during galaxy collisions," investigators in the United States report (see also).

"For high-speed encounters, the resulting velocity perturbations can be described by the impulse approximation. The traditional impulse approximation, however, does not distinguish between prograde and retrograde encounters, and therefore completely misses the resonant response. Here, we modify the impulse approximation to include the effects of quasi-resonant phenomena on stars orbiting within a disk. Explicit expressions are derived for the velocity and energy changes to the stars induced by tidal forces from an external gravitational perturber passing either on a straight line or a parabolic orbit," wrote E. Donghia and colleagues.

The researchers concluded: "Comparisons with numerical-restricted three-body calculations illustrate the applicability of our analysis."

Donghia and colleagues published their study in *Astrophysical Journal* (Quasi-resonant Theory Of Tidal Interactions. *Astrophysical Journal*, 2010;725(1):353-368).

For additional information, contact E. Donghia, Harvard Smithsonian Center Astrophysics, 60 Garden St., Cambridge, MA 02138, USA.

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Record - 2

DIALOG(R)

Research on Astronomy Described by Y. Shen and Colleagues,
Science Letter, p1716,
Tuesday, February 22, 2011

TEXT:

According to recent research published in the *Astrophysical Journal*, "Double-peaked broad emission lines in active galactic nuclei may indicate the existence of a bound supermassive black hole (SMBH) binary where two distinct broad-line regions (BLRs) contribute together to the line profile. An alternative interpretation is a disk emitter origin for the double-peaked line profile."

"Using simple BLR models, we calculate the expected broad line profile for an SMBH binary at different separations. Under reasonable assumptions that both BLRs are illuminated by the two active SMBHs and that the ionizing

flux at the BLR location is roughly constant, we confirm the emergence of double-peaked features and radial velocity drifts of the two peaks due to the binary orbital motion. However, such a clear double-peaked feature only arises in a particular stage of the binary evolution when the two black holes (BHs) are close enough such that the line-of-sight orbital velocity difference is larger than the FWHM of the individual broad components, while the two BLRs are still mostly distinct. Prior to this stage, the velocity splitting due to the orbit motion of the binary is too small to separate the emission from the two BLRs, leading to asymmetric broad line profiles in general. When the two BHs are even closer such that the two BLRs can no longer be distinct, the line profile becomes more complex and the splitting of the peaks does not correspond to the orbital motion of the binary. In this regime, there are no coherent radial velocity drifts in the peaks with time. Asymmetric line profiles are probably a far more common signature of binary SMBHs than double-peaked profiles," wrote Y. Shen and colleagues (see also).

The researchers concluded: "We discuss the temporal variations of the broad line profile for binary SMBHs and highlight the different behaviors of reverberation mapping in the binary and disk emitter cases, which may serve as a feasible tool to disentangle these two scenarios."

Shen and colleagues published their study in *Astrophysical Journal* (Identifying Supermassive Black Hole Binaries With Broad Emission Line Diagnosis. *Astrophysical Journal*, 2010;725(1):249-260).

For additional information, contact Y. Shen, Harvard Smithsonian Center Astrophysics, 60 Garden St., MS 51, Cambridge, MA 02138, USA.

The publisher's contact information for the *Astrophysical Journal* is: IOP Publishing Ltd., Dirac House, Temple Back, Bristol BS1 6BE, England.

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Record - 3

DIALOG(R)

Research Reports on Astronomy from A.C. Seth and Colleagues Provide New Insights,

Science Letter, p1406,

Tuesday, February 22, 2011

TEXT:

"Using adaptive optics assisted Gemini/NIFS data, I study the present and past gas accretion in the central 3 " of the M32 nucleus. From changes in

the spectral slope and CO line depths near the center, I find evidence for unresolved dust emission resulting from black hole (BH) accretion," researchers in the United States report (see also).

"With a luminosity of similar to 2×10^{38} erg s⁻¹, this dust emission appears to be the most luminous tracer of current BH accretion, 2 orders of magnitude more luminous than previously detected X-ray emission. These observations suggest that using high-resolution infrared data to search for dust emission may be an effective way to detect other nearby, low-luminosity BHs, such as those in globular clusters. I also examine the fossil evidence of gas accretion contained in the kinematics of the stars in the nucleus. The higher order moments (h3 and h4) of the line-of-sight velocity distribution show patterns that are remarkably similar to those seen on larger scales in elliptical galaxies and in gas-rich merger simulations. The kinematics suggests the presence of two components in the M32 nucleus, a dominant disk overlying a pressure supported component. I discuss possible formation scenarios for the M32 nucleus in the context of the kinematic data as well as previous stellar population studies," wrote A.C. Seth and colleagues.

The researchers concluded: "The kinematic measurements presented here are the highest quality available for the nucleus of M32, and may be useful for any future dynamical models of this benchmark system."

Seth and colleagues published their study in *Astrophysical Journal* (Gas Accretion In The M32 Nucleus: Past And Present. *Astrophysical Journal*, 2010;725(1):670-676).

For additional information, contact A.C. Seth, Harvard Smithsonian Center Astrophysics, 60 Garden St., Cambridge, MA 02138, USA.

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Record - 4

DIALOG(R)

Reports Outline Astronomy Research from R. Galvanmadrid and Colleagues,
Science Letter, p1104,
Tuesday, February 22, 2011

TEXT:

"Interferometric observations of the W33A massive star formation region, performed with the Submillimeter Array and the Very Large Array at

resolutions from 5 " (0.1 pc) to 0 ".5 (0.01 pc), are presented. Our three main findings are: (1) parsec-scale, filamentary structures of cold molecular gas are detected," researchers in the United States report (see also).

"Two filaments at different velocities intersect in the zone where the star formation is occurring. This is consistent with triggering of the star formation activity by the convergence of such filaments, as predicted by numerical simulations of star formation initiated by converging flows. (2) The two dusty cores (MM1 and MM2) at the intersection of the filaments are found to be at different evolutionary stages, and each of them is resolved into multiple condensations. MM1 and MM2 have markedly different temperatures, continuum spectral indices, molecular-line spectra, and masses of both stars and gas. (3) The dynamics of the "hot-core" MM1 indicates the presence of a rotating disk in its center (MM1-Main) around a faint free-free source. The stellar mass is estimated to be similar to 10 M_{\odot} ," wrote R. Galvanmadrid and colleagues.

The researchers concluded: "A massive molecular outflow is observed along the rotation axis of the disk."

Galvanmadrid and colleagues published their study in *Astrophysical Journal* (From The Convergence Of Filaments To Disk-outflow Accretion: Massive Star Formation In W33a. *Astrophysical Journal*, 2010;725(1):17-28).

For additional information, contact R. Galvanmadrid, Harvard Smithsonian Center Astrophysics, 60 Garden St., Cambridge, MA 02138, USA.

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Record - 5

DIALOG(R)

New Astronomy Study Results from A.M. Soderberg et al Described,
Science Letter, p574,
Tuesday, February 22, 2011

TEXT:

"We present extensive radio and X-ray observations of the nearby Type Ic SN 2007gr in NGC 1058 obtained with the Very Large Array (VLA) and the Chandra X-ray Observatory and spanning 5 to 150 days after explosion. Through our detailed modeling of these data, we estimate the properties of the blast

wave and the circumstellar environment," scientists writing in the *Astrophysical Journal* report (see also).

"We find evidence for a freely expanding and non-relativistic explosion with an average blast wave velocity, $\langle v \rangle$ approximate to $0.2c$, and a total internal energy for the radio emitting material of E approximate to 2×10^{46} erg assuming equipartition of energy between electrons and magnetic fields (is an element of $e =$ is an element of $B = 0.1$). The temporal and spectral evolution of the radio emission points to a stellar wind-blown environment shaped by a steady progenitor mass loss rate of \dot{M} over dot approximate to $6 \times 10^{-7} M(\text{circle dot}) \text{ yr}^{-1}$ (wind velocity, $v(w) = 10(3) \text{ km s}^{-1}$). These parameters are fully consistent with those inferred for other SNe Ibc and are in line with the expectations for an ordinary, homologous SN explosion. Our results are at odds with those of Paragi et al. who recently reported evidence for a relativistic blast wave in SN 2007gr based on their claim that the radio emission was resolved away in a low signal-to-noise Very Long Baseline Interferometry (VLBI) observation. Here we show that the exotic physical scenarios required to explain the claimed relativistic velocity-extreme departures from equipartition and/or a highly collimated outflow-are excluded by our detailed VLA radio observations. Moreover, we present an independent analysis of the VLBI data and propose that a modest loss of phase coherence provides a more natural explanation for the apparent flux density loss which is evident on both short and long baselines," wrote A.M. Soderberg and colleagues.

The researchers concluded: "SN 2007gr is an ordinary Type Ibc supernova."

Soderberg and colleagues published their study in *Astrophysical Journal* (RADIO AND X-RAY OBSERVATIONS OF THE TYPE Ic SN 2007gr REVEAL AN ORDINARY, NON-RELATIVISTIC EXPLOSION. *Astrophysical Journal*, 2010;725(1):922-930).

Additional information can be obtained by contacting A.M. Soderberg, Harvard Smithsonian Center Astrophysics, 60 Garden St., Cambridge, MA 02138, USA.

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Record - 6

DIALOG(R)

Data from C.N. Leibler et al Provide New Insights into Astronomy,

Science Letter, p192,
Tuesday, February 22, 2011

TEXT:

"We present multi-band optical and near-infrared observations of 19 short gamma-ray burst (GRB) host galaxies, aimed at measuring their stellar masses and population ages. The goals of this study are to evaluate whether short GRBs track the stellar mass distribution of galaxies, to investigate the progenitor delay time distribution, and to explore any connection between long and short GRB progenitors," investigators in the United States report (see also).

"Using single stellar population models we infer masses of $\log(M^*/M_{\text{circle dot}})$ approximate to 8.8-11.6, with a median of $\langle \log(M^*/M_{\text{circle dot}}) \rangle$ approximate to 10.1, and population ages of $\tau(^*)$ approximate to 0.03-4.4 Gyr with a median of $\langle \tau(^*) \rangle$ approximate to 0.3 Gyr. We further infer maximal masses of $\log(M^*/M_{\text{circle dot}})$ approximate to 9.7-11.9 by assuming stellar population ages equal to the age of the universe at each host's redshift. Comparing the distribution of stellar masses to the general galaxy mass function, we find that short GRBs track the cosmic stellar mass distribution only if the late-type hosts generally have maximal masses. However, there is an apparent dearth of early-type hosts compared to the equal contribution of early-and late-type galaxies to the cosmic stellar mass budget. Similarly, the short GRB rate per unit old stellar mass appears to be elevated in the late-type hosts. These results suggest that stellar mass may not be the sole parameter controlling the short GRB rate, and raise the possibility of a two-component model with both mass and star formation playing a role (reminiscent of the case for Type Ia supernovae). If short GRBs in late-type galaxies indeed track the star formation activity, the resulting typical delay time is similar to 0.2 Gyr, while those in early-type hosts have a typical delay of similar to 3 Gyr. Using the same stellar population models, we fit the broadband photometry for 22 long GRB host galaxies in a similar redshift range and find that they have significantly lower masses and younger population ages, with $\langle \log(M^*/M_{\text{circle dot}}) \rangle$ approximate to 9.1 and $\langle \tau(^*) \rangle$ approximate to 0.06 Gyr, respectively; their maximal masses are similarly lower, $\langle \log(M^*/M_{\text{circle dot}}) \rangle$ approximate to 9.6, and as expected do not track the galaxy mass function. Most importantly, the two GRB host populations remain distinct even if we consider only the star-forming hosts of short GRBs, supporting our previous findings (based on star formation rates and metallicities) that the progenitors of long and short GRBs in late-type galaxies are distinct," wrote C.N. Leibler and colleagues.

The researchers concluded: "Given the much younger stellar populations of long GRB hosts (and hence of long GRB progenitors), and the substantial differences in host properties, we caution against the use of Type I and II

designations for GRBs since this may erroneously imply that all GRBs which track star formation activity share the same massive star progenitors."

Leibler and colleagues published their study in *Astrophysical Journal* (The Stellar Ages And Masses Of Short Gamma-ray Burst Host Galaxies: Investigating The Progenitor Delay Time Distribution And The Role Of Mass And Star Formation In The Short Gamma-ray Burst Rate. *Astrophysical Journal*, 2010;725(1):1202-1214).

For additional information, contact C.N. Leibler, Harvard Smithsonian Center Astrophysics, 60 Garden St., Cambridge, MA 02138, USA.

The publisher of the *Astrophysical Journal* can be contacted at: IOP Publishing Ltd., Dirac House, Temple Back, Bristol BS1 6BE, England.

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Record - 7

DIALOG(R)

New device to help confirm Kepler's planetary candidates,

ANI,

Asian News International,

Tuesday, February 15, 2011

TEXT:

Washington, Feb 15 (ANI): The Harvard-Smithsonian Center for Astrophysics (CfA) is part of an international collaboration building a new instrument called HARPS-North, which will complement Kepler by helping to confirm and characterize Kepler's planetary candidates.

HARPS stands for High-Accuracy Radial velocity Planet Searcher and is designed to detect the tiny radial-velocity signal induced by planets as small as Earth.

"The Kepler mission gives us the size of a planet, based on the amount of light it blocks when it passes in front of its star. Now we need to measure planetary masses, so that we can calculate the densities. That will allow us to distinguish rocky planets and water worlds from ones dominated by atmospheres of hydrogen and helium," explained Smithsonian astronomer David Latham.

HARPS-N will be installed on the 3.6-meter Telescopio Nazionale Galileo (TNG) in the Canary Islands. From this location, it will be able to study

the same region of the sky viewed by the Kepler spacecraft, within the northern constellations of Cygnus and Lyra.

"We have set up an enthusiastic collaboration among various institutions to build a northern copy of HARPS. We all expect HARPS-N to be as successful as its southern 'brother,'" said HARPS-N principal investigator Francesco Pepe of the Astronomical Observatory of Geneva.

"HARPS-N will pursue the most interesting targets found by Kepler, at level that no one else in the world can do," said Dimitar Sasselov, Director of the Harvard Origins of Life Initiative.

"HARPS-N will partner with Kepler to characterize worlds enough like Earth that they might be able to support life as we know it." (ANI)

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Record - 8

DIALOG(R)

Strange bubbles in space.,
Hamalainen, Karina,
Science World, v67, n9, p2(2),
Monday, February 14, 2011

TEXT:

The Fermi Gamma Ray Telescope has spotted something unusual in the center of the Milky Way--two huge energy bubbles, pushing out from the center of the galaxy.

What's causing this big burst of electromagnetic radiation in the form of gamma rays? "My favorite option is a black hole," says Doug Finkbeiner, an astronomer at Harvard-Smithsonian Center for Astrophysics in Cambridge, Massachusetts. Black holes are collapsed stars, which have so much gravity, or force that pulls objects together, that even light can't escape their pull. There's a massive one at the center of our galaxy (see Our Galaxy's Black Hole, right).

But not everything that falls into a black hole stays sucked in. "About 10 percent of the matter gets squirted back out at very high energy," says Finkbeiner. This ejected energy could be what's fueling the bubbles, which are as tall as the Milky Way is wide.

[ILLUSTRATION OMITTED]

OUR GALAXY'S BLACK HOLE

When a supermassive star dies and collapses in on itself, it creates a black hole that pulls in nearby matter, energy, and even light.

[VIDEO EXTRA] Watch a video that shows how energy bubbles at the center of our galaxy were discovered at: www.scholastic.com/scienceworld

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Record - 9

DIALOG(R)

Hungarian astronomer receives high US award,

Hungarian News Agency (MTI),

Monday, January 17, 2011

TEXT:

Budapest, January 17 (MTI) - This year's Newton Lacy Pierce Prize of the American Astronomical Society went to a young Hungarian astronomer Gaspar Bakos, the society's Hungarian counterpart announced on its website on Monday.

The prize is given to astronomers under 36 since 1974 each year for their achievements in observing and analysing radiation from astronomical objects.

Bakos, who works for the Harvard Smithsonian Center for Astrophysics, was the initiator of the Hungarian-made Automated Telescope Network, a system of small telescopes deployed in different places in the world to observe extrasolar planets.

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Wolbach Library: CfA in the News ~ Week ending 27 February 2011

1. **Kate Becker: Alone in the universe or not?**, Kate Becker, For the Camera, Boulder Daily Camera (CO)
Thursday, February 24, 2011
2. **PS1 TELESCOPE ESTABLISHES NEAR-EARTH ASTEROID DISCOVERY RECORD**, US Federal News, Thursday, February 24, 2011
3. **NASA STUDY REVEALS MYSTERIES OF NEUTRON STAR**, US Federal News, Wednesday, February 23, 2011
4. **Starless planets could be warm enough for human survival: Study**, ANI, Asian News International,
Tuesday, February 22, 2011
5. **'Wandering' planets may have water, life**, UPI Science News, Monday, February 21, 2011

Record - 1

DIALOG(R)

Kate Becker: Alone in the universe or not?

Kate Becker, For the Camera,
Boulder Daily Camera (CO),
Thursday, February 24, 2011

TEXT:

What if we are alone? And what if we're not?

Astronomers and philosophers spend a lot of time thinking about what it would mean if we discovered evidence of intelligent life beyond Earth.

Would it bring a cultural crisis, a religious upheaval, or a moment of planetary humility and unity? Would the aliens befriend us, teach us or make us their pets? How you answer these questions says more about your particular world view (and perhaps whether you've spent more time with "Star Trek" or "War of the Worlds") than it does about the reality of making contact with ET.

That's not your fault. When we talk about intelligent life on other worlds, we're all guessing. Earlier this week, at the annual meeting of the American Association for the Advancement of Science, a group of

philosophically inclined astrophysicists faced off on the ET question: Will we ever find intelligent life in space, and what would it mean if we do? Their debate illuminated a little bit about the cosmos and a lot about human beings.

In one corner, Howard Smith of the Harvard-Smithsonian Center for Astrophysics, who argues that we are, for all practical purposes, alone. We might not be the only civilization in the cosmos: If the universe is infinite in extent, as many cosmologists believe, then there must be infinitely many smart aliens out there. But, Smith reasons, they are so few and far between that we wouldn't stand a chance of meeting one for at least 100 human generations. If we can't talk to the aliens, says Smith, we might as well be flying solo.

In the other corner, Seth Shostak, who has made his career searching for signals from alien civilizations. The speed and rigor of our search for extraterrestrial intelligence (SETI) is increasing by leaps and bounds thanks to ever-more-powerful computers, says Shostak, and we're right on the cusp of discovering the first evidence of extraterrestrial intelligence. He even bet everyone in our conference room a cup of Starbucks that Earth will pick up an alien signal within our lifetimes. How can two thoughtful scientists come to such different conclusions? In the early 1960s, the astronomer Frank Drake wrote down an equation to estimate how many extraterrestrial civilizations we might be able to make contact with. The Drake equation has seven terms, starting with the number of new stars that form every year and continuing right down to the lifetime of your average technologically advanced civilization. Thanks to missions like the Kepler space telescope, we're finally starting to home in on the values for some of the terms in the middle, like the average number of habitable planets per star. Other Drake equation terms, though, like the odds that life will evolve toward intelligence and the probability that smart beings will broadcast signals into space, are pure speculation. We only have one data point (humanity) on which to base our estimates.

Even if we could answer questions like these for our single data point, Earth, who is to say that Earth and humanity are typical? Here's another point Shostak and Smith disagree on. Smith looks out to the cosmos and sees that we humans are rare, our thriving planet precious. Shostak sees us as ordinary, just one civilization among countless others.

Whether you side with Smith or with Shostak, I think there are some things we can all agree on. If we are alone, says Smith, we can't wait around for friendly aliens to come and save us from ourselves with their advanced technology and peaceful ways. We must embrace our rare and precious place in the cosmos and take responsibility for our planet, our species and each other. Yet if we live in a universe teeming with intelligent life, as

Shostak believes, we should be humble. Our planet is teeming with humans, yet that fact does not detract from the uniqueness or value of any individual.

So, what if we are alone? And what if we're not? Either way, we must treat each other with respect and compassion, knowing that none of us is the center of the universe.

Kate Becker is a science writer living in Boston. Contact her at spacecrafty.com, or connect via Facebook ([facebook.com/katembercker](https://www.facebook.com/katembercker)) or Twitter (@[kmbecker](https://twitter.com/kmbecker)).

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Record - 2

DIALOG(R)

PS1 TELESCOPE ESTABLISHES NEAR-EARTH ASTEROID DISCOVERY RECORD,

US Federal News,

Thursday, February 24, 2011

TEXT:

HONOLULU, Feb. 24 -- The University of Hawaii issued the following news release:

The Pan-STARRS PS1 telescope on Haleakala, Maui, discovered 19 near-Earth asteroids, on the night of January 29, the most asteroids discovered by one telescope on a single night.

"This record number of discoveries shows that PS1 is the world's most powerful telescope for this kind of study," said Nick Kaiser, head of the Pan-STARRS project. "NASA and the U.S. Air Force Research Laboratory's support of this project illustrates how seriously they are taking the threat from near-Earth asteroids."

Pan-STARRS software engineer Larry Denneau spent the night of January 29 in his UH Manoa office processing the PS1 data as it was transmitted from the telescope over the Internet. During the night and into the next afternoon, he and others came up with 30 possible new near-Earth asteroids.

Asteroids are discovered because they appear to move against the background of stars. To confirm asteroid discoveries, scientists must carefully re-observe them several times within 12-72 hours to define their orbits, otherwise they are likely to be "lost."

Denneau and colleagues quickly sent their discoveries to the Minor Planet Center in Cambridge, Massachusetts, which collects and disseminates data about asteroids and comets, so that other astronomers can re-observe the objects.

"Usually there are several mainland observatories that would help us confirm our discoveries, but widespread snowstorms there closed down many of them, so we had to scramble to confirm many of the discoveries ourselves," noted UH Manoa Institute for Astronomy astronomer Richard Wainscoat.

Wainscoat, astronomer David Tholen, and graduate student Marco Micheli spent the next three nights searching for the asteroids using telescopes at Mauna Kea Observatories.

On the evening of January 30, they confirmed that two of the asteroids were near-Earth asteroids before snow on Mauna Kea forced the telescopes to close. Then, on Monday evening, they confirmed nine more before fog set in. On Tuesday evening, they searched for four, but found only one. After Tuesday, the remaining unconfirmed near-Earth asteroids had moved too far to be found again.

Telescopes in Arizona, Illinois, Italy, Japan, Kansas, New Mexico, and the United Kingdom, and the Faulkes Telescope on Haleakala also helped to confirm seven of the discoveries.

Two of the asteroids, it turns out, have orbits that come extremely close to Earth's. There is no immediate danger, but a collision in the next century or so, while unlikely, cannot yet be ruled out. Astronomers will be paying close attention to these objects.

The Pan-STARRS Project is being led by the UH Manoa Institute for Astronomy, and exploits the unique combination of superb observing sites and technical and scientific expertise available in Hawaii. Funding for the development of the observing system has been provided by the United States Air Force Research Laboratory. The PS1 Surveys have been made possible through contributions by the Institute for Astronomy, the University of Hawaii, the Pan-STARRS Project Office, the Max Planck Society and its participating institutes, the Max Planck Institute for Astronomy, Heidelberg and the Max Planck Institute for Extraterrestrial Physics, Garching, the Johns Hopkins University, Durham University, the University of Edinburgh, the Queen's University Belfast, the Harvard-Smithsonian Center for Astrophysics, the Las Cumbres Observatory Global Telescope Network, Incorporated, the National Central University of Taiwan, and the National Aeronautics and Space Administration under Grant No. NNX08AR22G issued through the Planetary Science Division of the NASA Science Mission

Directorate. Any opinions, findings, and conclusions or recommendations expressed in this article are those of the author(s), and do not necessarily reflect the views of the National Aeronautics and Space Administration.

For more information, visit:

<http://www.ifa.hawaii.edu/info/press-releases/19asteroids/> For any query with respect to this article or any other content requirement, please contact Editor at htsyndication@hindustantimes.com

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Record - 3

DIALOG(R)

NASA STUDY REVEALS MYSTERIES OF NEUTRON STAR,

US Federal News,

Wednesday, February 23, 2011

TEXT:

ATHENS, Ohio, Feb. 23 -- Ohio University issued the following news release:

Ohio University astrophysicist Madappa Prakash is part of an international team of researchers that have discovered a remarkable state of matter in a high-density neutron star.

Neutron star Cassiopeia A, the remains of a supernova that occurred 330 years ago, has puzzled scientists by cooling at an unusually fast rate. Researchers now report that the quick cooling is the first direct evidence that the cores of neutron stars are made of superfluids and superconducting materials.

Superfluidity is a friction-free state of matter, and superfluids created in laboratories on Earth exhibit remarkable properties, such as the ability to climb upward and escape airtight containers. Superfluids made of charged particles are also superconductors, which have widespread technological applications for producing superconducting magnets used for magnetic resonance imaging (MRI) machines.

Prakash was involved in one of two independent research teams that used data from NASA's Chandra X-ray Observatory to study the dramatic cooling of Cassiopeia A. Neutron stars have intrigued scientists because they contain the densest known matter directly observable. One teaspoon of neutron star material weighs six billion tons. The pressure in the star's core is high

enough that most of the electrons there are forced to merge with protons, producing neutrons. This leaves a star composed mostly of neutrons, with some protons, electrons and other particles.

During Cassiopeia A's cool-down phase, first proton pairs, and then neutron pairs, enter superconducting and superfluid phases, respectively, the scientists report. During this process, copious amounts of weakly-interacting particles known as neutrinos are emitted. The neutrinos rapidly escape from the star, taking energy with them. These neutrinos are responsible for the observed rapid cooling, according to the research team led by Dany Page of the National Autonomous University in Mexico. Page worked on the project with Prakash, James Lattimer of SUNY Stony Brook and Andrew Steiner of Michigan State University.

Finding a neutron star at this particular young age and at this stage of its life was crucial for the discovery, explained Prakash, an Ohio University professor of physics and astronomy.

"It turns out that Cas A may be a gift from the universe because we would have to catch a very young neutron star at just the right point in time," he said. "Sometimes a little good fortune can go a long way in science."

The new research not only pinpoints the temperature at which superfluidity occurs in neutron stars-between one half a billion to just under a billion degrees Celsius-but is important for understanding a range of behavior in neutron stars, including glitches, neutron star precession and pulsation, magnetar outbursts and the evolution of neutron star magnetic fields.

Astrophysicists should continue to monitor the star, which is expected to rapidly cool over the next few decades, and look for other examples of this activity in the cosmos, Prakash said.

"Can we find other young neutron stars that behave in the same way?" he asked. "Is this a universal phenomenon?"

With forthcoming journal publications from both international research teams this month, the new work on Cassiopeia A has captured the attention of the scientific community. The team including Prakash publishes its study this week in the journal *Physical Review Letters*. The second team, led by Peter Shternin of the Ioffe Institute in St. Petersburg, Russia, is slated for publication in the *Monthly Notices of the Royal Astronomical Society*. The team includes Dmitry Yakovlev of the Ioffe Institute; Daniel Patnaude of the Harvard-Smithsonian Center for Astrophysics; Craig Heinke of the University of Alberta, Canada; and Wynn Ho of the University of Southampton, UK. Heinke and Ho first discovered the Cassiopeia A cooling last year.

Prakash is a member of Ohio University's Institute for Nuclear and Particle Physics (<http://inpp.ohiou.edu/>) and an affiliate member of the Astrophysical Institute (<http://www.phy.ohiou.edu/~astro/astro.html>). His research is funded by the U.S. Department of Energy. For any query with respect to this article or any other content requirement, please contact Editor at htsyndication@hindustantimes.com

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Record - 4

DIALOG(R)

Starless planets could be warm enough for human survival: Study,

ANI,

Asian News International,

Tuesday, February 22, 2011

TEXT:

London, Feb 21 (ANI): It seems that starless planets may be able to harbour human life after all.

In what has offered new possibilities of life around the galaxy, it has emerged that water can remain in its liquid form even in a starless planet.

Regardless of the force of gravity among planets - that could cause the ejection of the solar systems - and the cold of space, the decay of radioactive elements in the rocky cores is enough to keep these wayward worlds to stay warm, reports New Scientist.

This also explains why water in rocky planets - with a similar mass to Earth - remains liquid under thick and insulating ice sheets for over a billion years.

According to Dorian Abbot and Eric Switzer of the University of Chicago, a planet with the same fraction of water as Earth could keep a subsurface ocean liquid if it was 3.5 times Earth's mass. But a planet with 10 times Earth's water concentration could do this if it weighed just one-third as much as Earth.

"It's a really interesting idea," says Lisa Kaltenegger of the Harvard-Smithsonian Center for Astrophysics.

"But we would have to land on [a planet] and burrow down to see if life is possible." (ANI)

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Record - 5

DIALOG(R)

'Wandering' planets may have water, life,

UPI Science News

Monday, February 21, 2011

TEXT:

Liquid water may be found on planets that have gone adrift from their stars and may have acted as stepping stones to spread cosmic life, U.S. researchers say.

Gravitational battles with other planets or passing stars can fling worlds out of their solar systems, but two scientists from the University of Chicago say these wandering worlds could continue to stay warm thanks to the decay of radioactive elements in their cores, NewScientist.com reported Monday.

Dorian Abbot and Eric Switzer say they've calculated that rocky planets with a mass similar to that of Earth could stay warm enough to keep water liquid under thick, insulating ice sheets for more than a billion years. A planet with the same percentage of water as Earth could keep a subsurface ocean liquid if it was 3.5 times Earth's mass, they say, but a planet with 10 times Earth's water concentration could do this even if it weighed just one-third as much as Earth.

"It's a really interesting idea," Lisa Kaltenegger of the Harvard-Smithsonian Center for Astrophysics says of their theory. "But we would have to land on [a planet] and burrow down to see if life is possible."

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Wolbach Library: CfA in the News ~ Week ending 6 March 2011

1. **NASA ANNOUNCES MEDIA TELECONFERENCE TO EXPLAIN MISSING SUNSPOTS**, US Federal News, Monday, February 28, 2011
2. **The Case For Life On Earth**, New York Times (NY), Late Edition - Final ed, p4, Tuesday, March 1, 2011
3. **Starry Lectures**, Boston Globe (MA), p2, Sunday, March 6, 2011
4. **Space sleuths solve riddle of missing sunspots**, Edmonton Journal (Canada), Final ed, pB7, Friday, March 4, 2011
5. **Space sleuths solve mystery of missing sunspots; Sun's conveyor belt 'sped up': scientists**, Montreal Gazette (Canada), Final ed, pA14, Friday, March 4, 2011
6. **Recent Findings from Harvard Smithsonian Center for Astrophysics Highlight Research in Astronomy**, Science Letter, p1067, Tuesday, March 8, 2011
7. **NASA RESCHEDULES TELECONFERENCE TO EXPLAIN MISSING SUNSPOTS**, US Federal News, Tuesday, March 1, 2011
8. **Invisible glory: two unsung space telescopes create eye-opening images of the universe from light we can't see.**, Tucker, Abigail, Smithsonian, v41, n10, p74(6), Tuesday, February 1, 2011
9. **Just another asteroid hurtling toward Earth...**, Carolyn Y. Johnson, Boston Globe (MA), p1, Sunday, February 27, 2011

Record - 1

DIALOG(R)

NASA ANNOUNCES MEDIA TELECONFERENCE TO EXPLAIN MISSING SUNSPOTS,
US Federal News,
Monday, February 28, 2011

TEXT:

WASHINGTON, Feb. 28 -- NASA issued the following media advisory:

NASA will host a media teleconference at 1 p.m. EST on Thursday, March 3, to discuss the first computer model that explains the recent period of decreased solar activity during the sun's 11-year cycle. The recent solar minimum, a period characterized by a lower frequency of sunspots and solar storms, ended in 2008 and was the deepest observed in almost 100 years.

The teleconference panelists are:

Richard Fisher, director, Heliophysics Division, Science Mission Directorate, NASA Headquarters, Washington

Dibyendu Nandi, assistant professor, Indian Institute of Science Education and Research, Kolkata, India

Andres Munoz-Jaramillo, visiting research fellow, Harvard-Smithsonian Center for Astrophysics, Cambridge, Mass.

Delores Knipp, visiting scientist, University of Colorado at Boulder

To participate in the teleconference, reporters must contact Trent Perrotto at 202-358-0321 or trent.j.perrotto@nasa.gov by 10 a.m. EST on March 3 for dial-in instructions. Requests must include media affiliation and telephone number.

Supporting information for the briefing will be posted at:

<http://www.nasa.gov/sunearth>

Audio of the teleconference will be streamed live on the Web at:

<http://www.nasa.gov/newsaudio> For any query with respect to this article or any other content requirement, please contact Editor at htsyndication@hindustantimes.com

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Record - 2

DIALOG(R)

The Case For Life On Earth,

New York Times (NY), Late Edition - Final ed, p4,

Tuesday, March 1, 2011

TEXT:

To the Editor:

"A Romp Through Theories Into the Cradle of Life" (Feb. 22) quotes a scientist as saying that life is a "consequence of geology." This same point was made by the astronomer Percival Lowell in 1908 in making a case

for civilization on Mars -- a case we now know to be wishful thinking.

There are about 30 million stars within 1,000 light-years of us. Even if intelligent civilizations evolve easily in every suitable "warm pond," few if any thinking beings live near us. It will take 2,000 years to hear back from them, if then.

The bottom line is that we are rare and the Earth is precious, and we should treat one another and the planet with great respect and care. No one will come to help us.

Howard A. Smith

Cambridge, Mass.

The writer is a senior astrophysicist at the Harvard-Smithsonian Center for Astrophysics.

DRAWING (DRAWING BY ELWOOD H. SMITH)

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Record - 3

DIALOG(R)

Starry Lectures,
Boston Globe (MA), p2,
Sunday, March 6, 2011

TEXT:

CARLISLE

STARRY LECTURES - The first of two lectures on astronomy and cosmology will be delivered Wednesday at Gleason Public Library, 22 Bedford Road. The second lecture will be on March 16. Both will start at 1:30 p.m. This week's topic is "Superstars," featuring David Aguilar, director of public affairs at the Harvard-Smithsonian Center for Astrophysics and author of a recently published book, "Superstars: 15 Most Amazing Stars in the Milky Way." Next week's topic is "Cosmology at the South Pole," to be presented by physicist Colin Bischoff, also of the Harvard-Smithsonian Center. Admission is free but space is limited, so preregistration is encouraged; call 978-369-4898.

- Nancy Shohet West

Record - 4

DIALOG(R)

Space sleuths solve riddle of missing sunspots,

Edmonton Journal (Canada), Final ed, pB7,

Friday, March 4, 2011

TEXT:

PARIS - Space scientists on Thursday said they could explain why spots disappeared off the face of the sun for two years, a mystery that had challenged a mainstream theory about our star.

The years 2008 and 2009 were marked by a near-absence of sunspots, which reflected an unusually long period of low solar activity.

Astronomers were perplexed, for at that time the sun was supposed to be building toward the climax of an 11-year cycle that has big implications for life on Earth.

Sunspots are highly magnetized globs of charged particles called plasma on the solar surface.

Plasma circulates on the sun in a movement called the "Great Conveyor Belt" that bears similarities to Earth's ocean currents.

The conveyor belt travels along the sun's surface, plunges inward around the poles and then re-emerges near the equator.

When sunspots start to decay, the surface currents sweep up their demagnetized remains and haul them into the bowels of the sun where, at a depth of 300,000 kilometres, their magnetic field is recharged.

The remagnetized plasma then rises back up to the surface -and the sunspot is reborn.

The answer to the sunspots' absence comes in a computer model proposed by Dibyendu Nandi of the Indian Institute of Science Education and Research in Kolkata and colleagues.

It looks at what happened in 2008-9, factoring in the interior of the sun, its magnetic "dynamo," the Great Conveyor Belt and the way sunspots are magnetically recharged and recover buoyancy.

"According to our model, the trouble with sunspots actually began in back

in the late 1990s," co-author Andres Munoz-Jaramillo of the Harvard-Smithsonian Center for Astrophysics said in a news release. "At that time, the conveyor belt sped up."

Put simply, the Great Conveyor belt dragged decaying sunspots down to the heart of the sun for a magnetic reboot -but the process this time was way too fast for the sunspots to be fully reanimated. As a result, new sunspots failed to surface from the hidden production line.

"The stage was set for the deepest solar minimum in a century," said Petrus Martens of the Montana State University Department of Physics.

The findings, published in the British journal Nature, add important knowledge about solar mechanics, the authors hope.

At the solar cycle's most active point -a period called solar maximum -sunspots dot the sun's surface and the star can spew billions of tonnes of plasma that can disrupt communications and electrical grids and short-circuit satellites.

During solar minima, sunspots are rare, as are the displays of anger, but it can still have a significant impact for us on Earth.

The planet's outer atmosphere shrinks closer to the surface, meaning there is less drag on orbiting space junk, and the "solar wind" that blasts from the sun weakens, meaning that more cosmic rays from interstellar space reach our planet.

The latest solar cycle began in 1996 and is likely to end in mid-2013, although a solar "max" is usually preceded by a period of eruptions that can last as much as two and a half years, say experts.

Supplied: Reuters, Nasa / An image of a sunspot taken by the Hinode Satellite. The years 2008 and 2009 were marked by a near-absence of sunspots.;

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Record - 5

DIALOG(R)

Space sleuths solve mystery of missing sunspots; Sun's conveyor belt 'sped up': scientists,

Montreal Gazette (Canada), Final ed, pA14,

Friday, March 4, 2011

TEXT:

PARIS - Space scientists yesterday said they could explain why spots disappeared off the face of the Sun for two years, a mystery that had challenged a mainstream theory about our star.

The years 2008 and 2009 were marked by a near-absence of sunspots, which reflected an unusually long period of low solar activity.

Astronomers were perplexed, because at that time the Sun was supposed to be building toward the climax of an 11-year cycle that has big implications for life on Earth.

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The latest solar cycle began in 1996 and is likely to end mid-2013, but a solar "max" is usually preceded by an eruption period that can last as much as 2 1/2 years, experts say.

Last month, the strongest eruption in five years unleashed auroras in northern skies and disrupted radio communications; damage was limited due to a fortuitous alignment with Earth's protective magnetic field.

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Record - 6

DIALOG(R)

Recent Findings from Harvard Smithsonian Center for Astrophysics Highlight Research in Astronomy,

Science Letter, p1067,

Tuesday, March 8, 2011

TEXT:

According to a study from the United States, "We use 62 185 quasars from the Sloan Digital Sky Survey DR5 sample and standard virial mass scaling laws based on the widths of H beta, Mg ii and C iv lines and adjacent continuum luminosities to explore the maximum mass of quasars as a function of redshift, which we find to be sharp and evolving. This evolution is in the sense that high-mass black holes cease their luminous accretion at higher redshift than lower mass black holes."

"Further, turn-off for quasars at any given mass is more highly synchronized than would be expected given the dynamics of their host galaxies. We investigate potential signatures of the quasar turn-off mechanism, including a dearth of high-mass quasars at low Eddington ratio," wrote C.L. Steinhardt and colleagues, Harvard Smithsonian Center for Astrophysics (see also).

The researchers concluded: "These new results allow a closer examination of several common assumptions used in modelling quasar accretion and turn-off."

Steinhardt and colleagues published their study in Monthly Notices of the Royal Astronomical Society (The quasar mass-luminosity plane - II. High mass turn-off evolution and a synchronization puzzle. Monthly Notices of the Royal Astronomical Society, 2011;410(1):201-209).

For more information, contact C.L. Steinhardt, Harvard Smithsonian Center Astrophysics, 60 Garden St., Cambridge, MA 02138, United States.

Publisher contact information for the journal Monthly Notices of the Royal Astronomical Society is: Wiley-Blackwell Publishing, Inc., Commerce Place, 350 Main St., Malden 02148, MA, USA.

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Record - 7

DIALOG(R)

NASA RESCHEDULES TELECONFERENCE TO EXPLAIN MISSING SUNSPOTS,
US Federal News,
Tuesday, March 1, 2011

TEXT:

WASHINGTON, March 1 -- NASA issued the following media advisory:

NASA has rescheduled a media teleconference for 2 p.m. EST on Wednesday, March 2, to discuss the first computer model that explains the recent period of decreased solar activity during the sun's 11-year cycle. The recent solar minimum, a period characterized by a lower frequency of sunspots and solar storms, ended in 2008 and was the deepest observed in almost 100 years.

The teleconference panelists are:

Richard Fisher, director, Heliophysics Division, Science Mission Directorate, NASA Headquarters, Washington
Dibyendu Nandi, assistant professor, Indian Institute of Science Education and Research, Kolkata, India

Andres Munoz-Jaramillo, visiting research fellow, Harvard-Smithsonian Center for Astrophysics, Cambridge, Mass.

Delores Knipp, visiting scientist, University of Colorado at Boulder

To participate in the teleconference, reporters must contact Trent Perrotto at 202-358-0321 or trent.j.perrotto@nasa.gov by 10 a.m. EST on March 2 for dial-in instructions. Requests must include media affiliation and telephone number.

Supporting information for the briefing will be posted at:

<http://www.nasa.gov/sunearth>

Audio of the teleconference will be streamed live on the Web at:

<http://www.nasa.gov/newsaudio> For any query with respect to this article or any other content requirement, please contact Editor at htsyndication@hindustantimes.com

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Record - 8

DIALOG(R)

Invisible glory: two unsung space telescopes create eye-opening images of the universe from light we can't see.

Tucker, Abigail,
Smithsonian, v41, n10, p74(6),
Tuesday, February 1, 2011

TEXT:

TO HUMAN EYES, THE NIGHT SKY is a confetti of stars. Powerful telescopes show us the remote planets and faraway galaxies that our puny retinas cannot see. But even the Hubble Space Telescope can't reveal everything that's out there. Many objects--the fizzled stars known as brown dwarfs, for instance--are too cool to give off visible light, which represents only a tiny sliver of the electromagnetic spectrum. They do, however, emit energy in an invisible form: longer wavelengths known as infrared radiation.

Incredibly hot objects, like massive exploding stars called supernovas, give off much of their energy in shorter wavelengths that also are invisible: gamma rays and X-rays.

Fortunately, other telescopes translate these spectacles into images we can understand. In the 1990s and early 2000s, NASA launched space-based telescopes known as the Great Observatories. The first and most famous, Hubble, specializes in visible light. Lesser-known but equally vital instruments focus on different wavelengths.

"The object was to have a major telescope in each part of the electromagnetic spectrum," says Giovanni Fazio, an astrophysicist at the Harvard-Smithsonian Center for Astrophysics. "When you look at the universe in different wavelengths, you get a completely different picture. They are all pieces of a puzzle."

Hubble's 1990 launch was followed by that of Compton (1991), which observed gamma rays, Chandra (1999), which studies X-rays, and Spitzer (2003), the infrared telescope. Compton fell to Earth in 2000, disintegrating in the atmosphere and splashing down as planned in the Pacific Ocean. (Another space telescope, Fermi, replaced it in 2008.) But Spitzer and Chandra are still up--way up--and running, unlocking secrets of the universe and surpassing the hopes of the people who helped create them.

The telescopes' pictures of winking newborn stars and gluttonous black holes are composed of false colors that scientists assign to the different wavelengths the telescopes detect. In addition to being data-laden, though, these images are simply wonderful to behold. Pulsing with flamingo pink, indigo and saffron, some are almost psychedelic--a florid galaxy appears to breathe fire--while others recall delicate natural forms: spider webs, windowpane frost, wisps of smoke. A few have an almost spectral quality, particularly "The Hand of God," Chandra's portrait of a young pulsar in which ghostly blue fingers seem to caress the heavens.

Most satellite telescopes, including Hubble, circle Earth, but Spitzer revolves around the Sun, trailing behind Earth in its orbit. Thus Spitzer not only avoids Earth's atmosphere, which would obscure the telescope's view, it also avoids heat from Earth and the Moon. A supply of liquid helium initially cooled the instrument almost to absolute zero--or minus 459 degrees Fahrenheit, the lowest possible temperature--so the telescope's own radiation wouldn't muddle its readings.

Spitzer looks at cooler parts of the universe. Infrared is associated with temperatures from minus 450 to plus 6,000 degrees, and while 6,000 degrees may not sound cold, astronomers are accustomed to recording bodies in the millions of degrees.

The telescope has detected radiation from Jupiter-like exoplanets in tight orbits around other stars, and it has located brown dwarfs, which--if they host their own mini solar systems, as some scientists suspect--could be ideal staging grounds for life. Spitzer can also peer through the choking dust in the spiral arms of distant galaxies to see where stars are being born. These observations can yield insights into how our own solar system formed.

The telescope's most amazing power may be its ability to view the universe in its infancy. Looking deep in space is the same as looking back in time, explains Fazio, who designed part of Spitzer. As the 13.7-billion-year-old universe expands, visible light is stretched into infrared wavelengths, a phenomenon known as redshift. Focusing on infrared light, Spitzer scientists initially hoped to see the universe when it was just two billion years old--but they've gone much farther back in time than that. "Now we've been able to look back to 700 million years old," Fazio said, or about 13 billion years ago. Spitzer's observations suggest that galaxies had already begun to form when the universe was only 400 million to 500 million years old, much earlier than previously theorized.

Chandra, the X-ray telescope, follows an elliptical orbit around Earth, flying 200 times higher than Hubble. Chandra specializes in violent phenomena, such as flares shooting from young stars and the explosions of supernovas. "What we like to know is what was going on inside the star just before it blew up, what are the details of the explosion itself, and what happens following the explosion," says Harvey Tananbaum, director of the Smithsonian Astrophysical Observatory's Chandra X-ray Center.

Chandra also probes objects with extreme gravitational or magnetic fields, like neutron stars and black holes. Some scientists expect Chandra to be crucial in the study of little-understood dark matter and dark energy, mysterious forces that account for most of the material in the universe. But the telescope has also revealed new things about more familiar sights: Saturn's rings, it turns out, glitter with X-rays.

Sometimes astronomers produce images using data from all three telescopes. In 2009, the trio generated a stunning composite view of the Milky Way's core. Hubble showed countless stars, Spitzer captured radiant dust clouds and Chandra tracked X-ray emissions from material near a black hole.

Telescopes can't last forever. Spitzer ran out of coolant last year, though some parts are still cold enough to function, and the telescope has begun to drift away from Earth. "It's going to be sad to see it go," says Fazio. "It's been a major part of my life for the past 25 years. But we're still mining the data and finding new stuff" In 2015, the Webb, a new infrared

telescope with the capacity to collect more than 58 times as much light as Spitzer, is scheduled to pick up where Spitzer leaves off.

Chandra is still functioning well, and scientists expect the instrument to soldier on for at least another decade. Eventually, perhaps a century from now, the worn-out telescope will likely slip too close to Earth and burn up in the atmosphere. But we have many more illuminating images to look forward to before then.

OUR GALAXY, IN LIVING COLOR

The center of our Milky Way galaxy is even more breathtaking when seen as a composite (above) made of data from three space-based instruments sensitive to different wavelengths. The Chandra X-ray Observatory showed gas heated by explosions and by a black hole (near right); the Spitzer Space Telescope gathered infrared light and detected clouds of dust (center); and the Hubble Space Telescope, tuned to the near-infrared, revealed active areas of star formation (far right).

THE VIEW FROM CHANDRA

For almost 12 years, the Chandra space telescope has been observing the X-ray signatures of high-energy objects. The "Hand of God" nebula (far left), 150 light-years long, is formed by hot gas spewed from a pulsar, or rapidly spinning neutron star. The spiral galaxy NGC 4258 (center) has two ghostly blue arms containing gases heated by violent shock waves, the product of particles ejected from a black hole. Chandra excels at capturing chaos. An astronomical feature called Cas A (right), in the constellation Cassiopeia, is a blast of debris expanding at millions of miles an hour; it was fired from a supernova that became visible on Earth only about 300 years ago.

SPITZER'S INFRARED EYE

Nebula M17, the brightest part of the above image, was documented by the astronomer Charles Messier in 1764. The Spitzer telescope, focusing on infrared radiation emanating from heated dust, is able to see structures associated with the nebula. The whole complex is slicing through a spiral arm of the Milky Way, and the gravitational interaction spawns stars. The left region, the first to encounter the galactic arm, is full of older blue stars. M17 is alight with a younger star cluster. The dark streak through the right side of the image may be a ripple of star formation.

WHERE STARS ARE BORN

See "stellar cannibalism," colliding spiral galaxies and other pictures from the space-telescope hit parade, and share this story, at smith.hy.pr/spitzer

ABIGAIL TUCKER is SMITHSONIAN'S Staff Writer.

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Record - 9

DIALOG(R)

Just another asteroid hurtling toward Earth...

Carolyn Y. Johnson,
Boston Globe (MA), p1,
Sunday, February 27, 2011

TEXT:

Hollywood hype aside, close encounters of a rocky kind are fairly common. But they're fascinating to local scientists who want to learn how it all began, and maybe fend off armageddon.

At 4:33 a.m. on a recent Friday, Timothy Spahr was startled awake by a beep from his cellphone: A text message alerted him that a rocky object was hurtling toward Earth. He told his wife it was "some asteroid thing" and went to check his computer

In Hollywood, this would be the opening scene to a doomsday movie. But for Spahr, director of the Minor Planet Center at the Harvard-Smithsonian Center for Astrophysics, it is just another day. About once a month, an object on a potential crash course with Earth disturbs his slumber. They almost always miss - and this time was no different. The asteroid was just a few feet across and on track to miss by about 11,000 miles. He sent a note to contacts at NASA and posted information about it online

People have long been fascinated by the threat of apocalypse by asteroid, as depicted in movies such as the 1998 film "Armageddon" and 1979's "Meteor," which was inspired by an MIT student project to create a plan to avoid a theoretical collision

The screenplays are fictional, and the threat is improbable. Still, a small group of local scientists catalogs and tracks "near-Earth objects" - asteroids and comets - that could be hazardous. Astronomers are intensely interested in these rocks and ice flying by for basic scientific reasons, too - to learn about the origins of our solar system.

Asteroids are essentially ancient chunks of scrap orbiting the sun - un assembled building blocks that never mashed together to form planets. (A

meteor is the light created when a small object enters the atmosphere.) They have become of such interest that President Obama announced a plan last year to land astronauts on one by 2025 as a way of pushing manned spaceflight to unexplored scientific targets that are farther away than the moon.

"We can understand better what are the conditions . . . what were the basic ingredients that built the planets," said Richard Binzel, a professor at the Massachusetts Institute of Technology who studies what asteroids are made of - and which ones might be scientifically interesting destinations. "But the even more exciting question is, what were the raw ingredients that allowed life to come about on Earth itself?"

To answer those basic questions, scientists are learning as much as they can from ground observations. On a Sunday morning earlier this month, postdoctoral researcher Francesca DeMeo directed the movements of a telescope atop Mauna Kea in Hawaii from an MIT lab hung with festive foam meteorites. She talked with a telescope operator over a live video link and took measurements that will help her better understand the diverse makeup of asteroids, which can range from light chunks of carbon to solid iron

In a Cambridge office park about five miles away, Spahr called his team the "nerve center" for all observations of near-Earth objects, collecting sightings from telescopes around the world that arrive by e-mail. The Minor Planet Center, funded by NASA, receives up to 50,000 observations a day - some of nearby asteroids, but many that turn out to be in the main asteroid belt between Jupiter and Mars

Often, these are repeated sightings of the same object - measurements that allow scientists to more precisely calculate its projected path. Those are shared with NASA, which calculates asteroid trajectories for the next century

Other researchers, at MIT's Lincoln Laboratory in Lexington, hunt asteroids utilizing techniques initially developed to help the Air Force detect satellites

The Earth and the moon are pocked with the craters of long-ago collisions, but Binzel, a member of the Ad Hoc Task Force on Planetary Defense, a NASA advisory council, noted that asteroids were not always a topic of much scientific interest. He wrote his first paper on asteroids as a teenager in 1974, using a backyard telescope. Then, they were the "vermin of the sky," he said - drawing astronomers' annoyance because of the blurry streaks they left on long-exposure pictures of the night sky

Gradually, interest in the area grew. In the late 1980s, scientists

proposed that a giant asteroid or comet impact killed off the dinosaurs. In 1994 fragments of the comet Shoemaker-Levy 9 slammed into Jupiter.

"That was a wake-up call," said Grant Stokes, head of the aerospace division at Lincoln Laboratory, which searches for asteroids and comets through its LINEAR program. "It was kind of a reminder that in our lifetime in our solar system, one of our neighbors does get hit by things that are pretty big."

Now, there are congressional mandates to catalog potentially dangerous near-Earth asteroids, and there are committees that mull over what to do if a threat is discovered.

Most asteroids sit in the main asteroid belt. But others are in orbits that come close to Earth, and every day the planet's atmosphere is pelted with small stuff, from 1,000 tons of dust a day to car-size objects about once a year. Most vaporize in the atmosphere, but occasionally one hits the ground. In October 2008, Spahr alerted NASA that a very small object would strike Sudan within 21 hours. It exploded in the atmosphere above the desert - where and when he predicted.

Congress has directed scientists to find 90 percent of the near-Earth objects more than two-thirds of a mile in diameter, big enough to affect the global climate if they hit. As of the end of January, 822 of the estimated 1,000 nearby asteroids in that size range had been discovered. Scientists have also been tasked with finding 90 percent of those that are more than 460 feet in diameter, which could cause major regional damage

"If we find them 10 to 20 years in advance of a threatening encounter, we can do something about them - run a spacecraft into them to slow them down so in 10 to 20 years they miss the Earth," said Donald Yeomans, head of NASA's Near-Earth Object Program Office

Such sci-fi ideas spark the imagination, but everyone who works in the field says you are far more likely to die driving home from work than from an asteroid impact.

"We have one of these problems I call a zero times infinity problem," said Irwin Shapiro, a Harvard professor who chaired a National Research Council committee on near-Earth objects and hazard mitigation strategies.

"Something is very unlikely to happen, but if it were to happen it would be extraordinarily important."

Carolyn Y. Johnson can be reached at cjohnson@globe.com.

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Wolbach Library: CfA in the News ~ Week ending 13 March 2011

1. **Studies in the Area of Astronomy Reported from J.D. Hartman and Co-Researchers**, Science Letter, p4700, Tuesday, March 15, 2011
2. **Studies from A.J. Engell and Co-Researchers Yield New Data on Astronomy**, Science Letter, p4202, Tuesday, March 15, 2011
3. **Research from P. Nutzman and Colleagues Has Provided New Data on Astronomy**, Science Letter, p3181, Tuesday, March 15, 2011
4. **Contract Notice: Smithsonian Institution (Massachusetts) Issues Solicitation for "Fabrication of Lens Mount Assemblies for Binospec Spectrograph"**, US Federal News, Tuesday, March 22, 2011
5. **Meteorite microbes aren't from outer space, NASA says**, Kerry Sheridan, Edmonton Journal (Canada), Final ed, pA16, Tuesday, March 8, 2011
6. **Panel to probe 'alien life' find**, The Australian, 1 - All-round Country ed, p9, Tuesday, March 8, 2011

Record - 1

DIALOG(R)

Studies in the Area of Astronomy Reported from J.D. Hartman and Co-Researchers,
Science Letter, p4700,
Tuesday, March 15, 2011

TEXT:

"We report the discovery of two new transiting extrasolar planets. HAT-P-18b orbits the $V = 12.759$ K2 dwarf star GSC 2594-00646, with a period $P = 5.508023 \pm 0.000006$ days, transit epoch $T-c = 2454715.02174 \pm 0.00020$ (BJD), and transit duration 0.1131 ± 0.0009 days," researchers in the United States report (see also).

"The host star has a mass of $0.77 \pm 0.03 M_{\odot}$, radius of $0.75 \pm 0.04 R_{\odot}$, effective temperature 4803 ± 80 K, and metallicity $[Fe/H] = +0.10 \pm 0.08$. The planetary companion has a mass of $0.197 \pm 0.013 M_{J}$ and radius of $0.995 \pm 0.052 R_{J}$, yielding a mean density of 0.25 ± 0.04 g cm⁻³. HAT-P-19b orbits the $V = 12.901$ K1 dwarf star GSC 2283-00589, with a period $P = 4.008778 \pm 0.000006$ days, transit epoch $T-c = 2455091.53417 \pm 0.00034$ (BJD), and transit duration 0.1182 ± 0.0014

days. The host star has a mass of $0.84 \pm 0.04 M_{\odot}$, radius of $0.82 \pm 0.05 R_{\odot}$, effective temperature 4990 ± 130 K, and metallicity $[Fe/H] = +0.23 \pm 0.08$. The planetary companion has a mass of $0.292 \pm 0.018 M_J$ and radius of $1.132 \pm 0.072 R_J$, yielding a mean density of $0.25 \pm 0.04 \text{ g cm}^{-3}$. The radial velocity residuals for HAT-P-19 exhibit a linear trend in time, which indicates the presence of a third body in the system. Comparing these observations with theoretical models, we find that HAT-P-18b and HAT-P-19b are each consistent with a hydrogen-helium-dominated gas giant planet with negligible core mass. HAT-P-18b and HAT-P-19b join HAT-P-12b and WASP-21b in an emerging group of low-density Saturn-mass planets, with negligible inferred core masses. However, unlike HAT-P-12b and WASP-21b, both HAT-P-18b and HAT-P-19b orbit stars with super-solar metallicity," wrote J.D. Hartman and colleagues.

The researchers concluded: "This calls into question the heretofore suggestive correlation between the inferred core mass and host star metallicity for Saturn-mass planets."

Hartman and colleagues published their study in *Astrophysical Journal* (HAT-P-18b AND HAT-P-19b: TWO LOW-DENSITY SATURN-MASS PLANETS TRANSITING METAL-RICH K STARS. *Astrophysical Journal*, 2011;726(1):52).

For additional information, contact J.D. Hartman, Harvard Smithsonian Center Astrophysics, 60 Garden St., Cambridge, MA 02138, USA.

Publisher contact information for the *Astrophysical Journal* is: IOP Publishing Ltd., Dirac House, Temple Back, Bristol BS1 6BE, England.

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Record - 2

DIALOG(R)

Studies from A.J. Engell and Co-Researchers Yield New Data on Astronomy,
Science Letter, p4202,
Tuesday, March 15, 2011

TEXT:

"SphinX (Solar PHotometer IN X-rays), a full-disk-integrated spectrometer, observed 137 flare-like/transient events with active region (AR) 11024 being the only AR on disk. The Hinode X-Ray Telescope (XRT) and Solar Optical Telescope observe 67 of these events and identified their location from 12:00 UT on July 3 through 24:00 UT 2009 July 7. We find that the predominant mechanisms for flares observed by XRT are (1) flux cancellation

and (2) the shearing of underlying magnetic elements," scientists in the United States report (see also).

"Point-and cusp-like flare morphologies seen by XRT all occur in a magnetic environment where one polarity is impeded by the opposite polarity and vice versa, forcing the flux cancellation process. The shearing is either caused by flux emergence at the center of the AR and separation of polarities along a neutral line or by individual magnetic elements having a rotational motion. Both mechanisms are observed to contribute to single-and multiple-loop flares. We observe that most loop flares occur along a large portion of a polarity inversion line. Point-and cusp-like flares become more infrequent as the AR becomes organized with separation of the positive and negative polarities," wrote A.J. Engell and colleagues.

The researchers concluded: "SphinX, which allows us to identify when these flares occur, provides us with a statistically significant temperature and emission scaling law for A and B class flares: $EM = 6.1 \times 10^{33} T^{-1.9} \pm 0.1$."

Engell and colleagues published their study in *Astrophysical Journal* (Flares And Their Underlying Magnetic Complexity. *Astrophysical Journal*, 2011;726(1):12).

For more information, contact A.J. Engell, Harvard Smithsonian Center Astrophysics, 60 Garden St., Cambridge, MA 02138, USA.

Publisher contact information for the *Astrophysical Journal* is: IOP Publishing Ltd., Dirac House, Temple Back, Bristol BS1 6BE, England.

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Record - 3

DIALOG(R)

Research from P. Nutzman and Colleagues Has Provided New Data on Astronomy,
Science Letter, p3181,
Tuesday, March 15, 2011

TEXT:

"We present observations of three distinct transits of HD 17156b obtained with the Fine Guidance Sensors on board the Hubble Space Telescope. We analyzed both the transit photometry and previously published radial velocities to find the planet-star radius ratio $R_p/R_{\text{star}} = 0.07454 \pm 0.00035$, inclination $i = 86.49(-0.20)(+0.24)$ deg, and scaled semimajor axis

$a/R\text{-star} = 23.19(-0.27)(+0.32)$," scientists in the United States report (see also).

"This last value translates directly to a mean stellar density determination. $\rho(\text{star}) = 0.522(-0.018)(+0.021)$ g cm⁽⁻³⁾. Analysis of asteroseismology observations by the companion paper of Gilliland et al. provides a consistent but significantly refined measurement of $\rho(\text{star}) = 0.5308 \pm 0.0040$. We compare stellar isochrones to this density estimate and find $M\text{-star} = 1.275 \pm 0.018 M\text{-circle dot}$ and a stellar age of $3.37(-0.47)(+0.20)$ Gyr. Using this estimate of $M\text{-star}$ and incorporating the density constraint from asteroseismology, we model both the photometry and published radial velocities to estimate the planet radius $R\text{-p} = 1.0870 \pm 0.0066 R\text{-J}$ and the stellar radius $R\text{-star} = 1.5007 \pm 0.0076 R\text{-circle dot}$. The planet radius is larger than that found in previous studies and consistent with theoretical models of a solar-composition gas giant of the same mass and equilibrium temperature. For the three transits, we determine the times of mid-transit to a precision of 6.2 s, 7.6 s, and 6.9 s, and the transit times for HD 17156 do not show any significant departures from a constant period," wrote P. Nutzman and colleagues.

The researchers concluded: "The joint analysis of transit photometry and asteroseismology presages similar studies that will be enabled by the NASA Kepler Mission."

Nutzman and colleagues published their study in *Astrophysical Journal* (Precise Estimates Of The Physical Parameters For The Exoplanet System Hd 17156 Enabled By Hubble Space Telescope Fine Guidance Sensor Transit And Asteroseismic Observations. *Astrophysical Journal*, 2011;726(1):3).

For additional information, contact P. Nutzman, Harvard Smithsonian Center Astrophysics, 60 Garden St., Cambridge, MA 02138, USA.
The publisher's contact information for the *Astrophysical Journal* is: IOP Publishing Ltd., Dirac House, Temple Back, Bristol BS1 6BE, England.

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Record - 4

DIALOG(R)

Contract Notice: Smithsonian Institution (Massachusetts) Issues Solicitation for "Fabrication of Lens Mount Assemblies for Binospec Spectrograph",

US Federal News,
Tuesday, March 22, 2011

TEXT:

WASHINGTON, March 22 -- Smithsonian Institution, Office of the Chief Financial Officer has a requirement for "Fabrication of Lens Mount Assemblies for Binospec Spectrograph."

The solicitation no. RFP-621-03-11 was posted on March 7, 2011.

All responses are due by Mar 22, 2011 5:15 pm Eastern.

Notice Type: Combined Synopsis/Solicitation

The NAICS code for this requirement is 332710.

Set Aside: Total Small Business.

Place of Performance/Delivery: Deliver to Smithsonian Astrophysical Observatory Cambridge, Massachusetts 02140 United States.

For more information visit:

<https://www.fbo.gov/spg/SI/CFO/CambridgeMA/RFP-621-03-11/listing.html> For any query with respect to this article or any other content requirement, please contact Editor at htsyndication@hindustantimes.com

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Record - 5

DIALOG(R)

Meteorite microbes aren't from outer space, NASA says,

Kerry Sheridan,

Edmonton Journal (Canada), Final ed, pA16,

Tuesday, March 8, 2011

TEXT:

WASHINGTON - Top NASA scientists said Monday there was no scientific evidence to support a colleague's claim that fossils of alien microbes born in outer space had been found in meteorites on Earth.

The U.S. space agency formally distanced itself from the paper by NASA scientist Richard Hoover, whose findings were published Friday in the peer-reviewed Journal of Cosmology, which is available free online.

"That is a claim that Mr. Hoover has been making for some years," said Carl Pilcher, director of NASA's Astrobiology Institute.

"I am not aware of any support from other meteorite researchers for this rather extraordinary claim that this evidence of microbes was present in the meteorite before the meteorite arrived on Earth and was not the result of contamination after the meteorite arrived on Earth," he said.

"The simplest explanation is that there are microbes in the meteorites; they are Earth microbes. In other words, they are contamination."

Pilcher said the meteorites that Hoover studied fell to Earth 100 to 200 years ago and have been heavily handled by humans, "so you would expect to find microbes in these meteorites."

Paul Hertz, chief scientist of NASA's Science Mission Directorate in Washington, also issued a statement saying NASA did not support Hoover's findings.

"While we value the free exchange of ideas, data and information as part of scientific and technical inquiry, NASA cannot stand behind or support a scientific claim unless it has been peer-reviewed or thoroughly examined by other qualified experts," Hertz said.

"NASA also was unaware of the recent submission of the paper to the Journal of Cosmology or of the paper's subsequent publication." He noted that the paper did not complete the peer-review process after being submitted in 2007 to the International Journal of Astrobiology.

According to the study, Hoover sliced open fragments of several types of carbonaceous chondrite meteorites, which can contain relatively high levels of water and organic materials, and looked inside with a powerful microscope, Field Emission Scanning Electron Microscopy.

He found bacteria-like creatures, calling them "indigenous fossils" that originated beyond Earth and were not introduced here after the meteorites landed. Hoover "concludes these fossilized bacteria are not Earthly contaminants but are the fossilized remains of living organisms which lived in the parent bodies of these meteors, e.g. comets, moons and other astral bodies," said the study.

"The implications are that life is everywhere, and that life on Earth may have come from other planets."

The journal's editor-in-chief, Rudy Schild of the Harvard-Smithsonian Center for Astrophysics, hailed Hoover as a "highly respected scientist and astrobiologist with a prestigious record of accomplishment at NASA."

The publication invited experts to weigh in on Hoover's claim, and both

skeptics and supporters began publishing their commentaries on the journal's website Monday.

Journal Of Cosmology, Reuters / A meteorite filament is seen in a microscope image as part of a study published by the Journal of Cosmology that claims tiny fossilized bacteria had been found on three meteorites.;

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Record - 6

DIALOG(R)

Panel to probe 'alien life' find,

The Australian, 1 - All-round Country ed, p9,
Tuesday, March 8, 2011

TEXT:

WASHINGTON: A NASA scientist's claim that he found tiny fossils of alien life in the remnants of a meteorite has stirred both excitement and scepticism, and is being closely reviewed by 100 experts.

Richard Hoover's paper, along with pictures of the microscopic earthworm-like creatures, were published on Friday in the peer-reviewed Journal of Cosmology, which is available free online.

Dr Hoover sliced open fragments of several types of carbonaceous chondrite meteorites, which can contain relatively high levels of water and organic materials, and looked inside with a powerful microscope. He found bacteria-like creatures that he calls "indigenous fossils", which he believes originated beyond Earth and were not introduced here after the meteorites landed. "He concludes these fossilised bacteria are not earthly contaminants, but are the fossilised remains of living organisms which lived in the parent bodies of these meteors, eg, comets, moons and other astral bodies," says the study.

"The implications are that life is everywhere, and that life on Earth may have come from other planets." Studies that suggest alien microbes can be contained in meteorites are not new, and have drawn hefty debate over how such life could survive in space, and how and where life may have originated in the universe.

The journal's editor-in-chief, Rudy Schild of the Centre for Astrophysics, Harvard-Smithsonian, said: "Given the controversial nature of his discovery, we have invited 100 experts and have issued a general invitation

to over 5000 scientists from the scientific community to review the paper and to offer their critical analysis." A NASA-funded study in December suggested a previously unknown form of bacterium that could thrive on arsenic had been found deep in a California lake. That study drew criticism, particularly after NASA touted the announcement as evidence of extraterrestrial life. Scientists are attempting to replicate those findings.

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Wolbach Library: CfA in the News ~ Week ending 20 March 2011

1. **Astronomer mixed diplomacy and stargazing**, National Post (Canada), National ed, pPM9, Friday, March 18, 2011
2. **Victor Blanco, Stargazer, Dies at 92**, DENNIS OVERBYE, New York Times (NY), Late Edition - Final ed, p13, Thursday, March 17, 2011
3. **Study Results from Harvard-Smithsonian Center for Astrophysics Update Understanding of Astronomy**, Science Letter, p4076, Tuesday, March 22, 2011
4. **Study Data from Harvard-Smithsonian Center for Astrophysics Update Knowledge of Astronomy**, Science Letter, p3881, Tuesday, March 22, 2011
5. **Studies from Harvard-Smithsonian Center for Astrophysics Describe New Findings in Astronomy**, Science Letter, p3506, Tuesday, March 22, 2011
6. **Scientists at Harvard-Smithsonian Center for Astrophysics Publish Research in Astronomy**, Science Letter, p3208, Tuesday, March 22, 2011
7. **Researchers from Harvard-Smithsonian Center for Astrophysics Publish New Studies and Findings in the Area of Astronomy**, Science Letter, p2952, Tuesday, March 22, 2011
8. **Researchers from Harvard-Smithsonian Center for Astrophysics Detail Findings in Astronomy**, Science Letter, p2951, Tuesday, March 22, 2011
9. **Researchers from Harvard-Smithsonian Center for Astrophysics Describe Findings in Astronomy**, Science Letter, p2950, Tuesday, March 22, 2011
10. **Research from Harvard-Smithsonian Center for Astrophysics Reveals New Findings on Astronomy**, Science Letter, p2319, Tuesday, March 22, 2011
11. **Findings from Harvard-Smithsonian Center for Astrophysics Advance Knowledge in Astronomy**, Science Letter, p527, Tuesday, March 22, 2011
12. **Data from Harvard-Smithsonian Center for Astrophysics Provide New Insights into Astronomy**, Science Letter, p300, Tuesday, March 22, 2011

13. House Appropriations Subcommittee on Commerce, Justice, Science, and Related Agencies Hearing,

Congressional Documents, Friday, March 11, 2011

14. Fiscal 2012 Appropriations: Commerce, Justice, Science And Related Agencies,

Congressional Testimony via FDCH, Monday, March 14, 2011

Record - 1

DIALOG(R)

Astronomer mixed diplomacy and stargazing,

National Post (Canada), National ed, pPM9,

Friday, March 18, 2011

TEXT:

Victor Blanco, a Puerto Rican astronomer who helped build a major outpost for American science, the Cerro Tololo Inter-American Observatory in Chile, and shepherded it through 14 years of revolution, counter-revolution and economic turmoil, died on March 8. He was 92 and lived in Vero Beach, Fla.

His death, near Vero Beach, was confirmed by his stepdaughter, Elizabeth Vitell.

Astronomers said Blanco would be remembered for his scientific, political and managerial skills as the observatory's director in opening up the Southern sky as a new frontier of cosmic research.

When U.S. astronomers worried that the election of a Marxist government under Salvador Allende in 1970 might threaten plans to build what would be the largest telescope in the Southern Hemisphere at the time -158 inches in diameter -it was Blanco who was dispatched to explain to President Allende what the Americans were doing on his mountaintop.

And when President Allende was overthrown by a military junta and replaced by General Augusto Pinochet three years later amid death squads and disappearances, strikes and food shortages, Blanco was dispatched to General Pinochet, who decided that he wanted to visit the observatory and asked for a list of Chilean staff members and their political affiliations. Blanco demurred, saying that that would be an inappropriate intrusion into Chilean politics.

"General Pinochet visited Cerro Tololo anyway," Blanco wrote in a summary of his life in The Annual Review of Astronomy and Astrophysics in 2001, "and we kept those Chilean staff members we knew to have been pro-Allende away."

Through all the tumult, the observatory stayed open. Historically most astronomers lived in the North and had little access to those Southern wonders. By the late 1950s and early '60s, astronomers had their eyes on the dark dry mountains of Chile. Cerro Tololo, founded in 1961 in northern Chile, was a collaboration of the National Science Foundation, a consortium of colleges called Associated Universities for Research in Astronomy and the University of Chile.

No small part of Blanco's job was to keep these disparate elements working together while getting roads and buildings built. "Victor had a very delicate sense of diplomacy and customs," said Robert Kirshner, an astronomer from the Harvard-Smithsonian Center for Astrophysics.

Blanco's other major accomplishment was building the four-metre telescope, a twin of one already built and installed at the Kitt Peak National Observatory in Arizona, also run by the National Science Foundation. It was completed in 1975, with Blanco helping to align and test the telescope. South American astronomy took off.

Handout / Victor Blanco;

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Record - 2

DIALOG(R)

Victor Blanco, Stargazer, Dies at 92,

DENNIS OVERBYE,

New York Times (NY), Late Edition - Final ed, p13,

Thursday, March 17, 2011

TEXT:

CORRECTION APPENDED

Victor Blanco, a Puerto Rican astronomer who helped build a major outpost for American science, the Cerro Tololo Inter-American Observatory in Chile, and shepherded it through 14 years of revolution, counterrevolution and economic turmoil, died on March 8. He was 92 and lived in Vero Beach, Fla.

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And when President Allende was overthrown by a military junta and replaced by General Augusto Pinochet three years later amid death squads and disappearances, strikes and food shortages, Dr. Blanco was dispatched to General Pinochet, who decided that he wanted to visit the observatory and asked for a list of Chilean staff members and their political affiliations. Dr. Blanco demurred, saying that that would be an inappropriate intrusion into Chilean politics.

"General Pinochet visited Cerro Tololo anyway," Dr. Blanco wrote in a summary of his life in *The Annual Review of Astronomy and Astrophysics* in 2001, "and we kept those Chilean staff members we knew to have been pro-Allende away."

Through all the tumult, the observatory stayed open. The Southern sky offers many of the most exciting sights in the universe, like the center of our own Milky Way galaxy and its attendant star clouds and clusters. But historically most astronomers lived in the North and had little access to those Southern wonders.

By the late 1950s and early '60s, astronomers had their eyes on the dark dry mountains of Chile. Cerro Tololo, founded in 1961 in northern Chile, was a collaboration of the National Science Foundation, a consortium of colleges called Associated Universities for Research in Astronomy and the University of Chile.

No small part of Dr. Blanco's job was to keep these disparate elements working together while getting roads and buildings built. "Victor had a very delicate sense of diplomacy and customs," said Robert Kirshner, an astronomer from the Harvard-Smithsonian Center for Astrophysics, who said that Dr. Blanco and his wife Betty, also an astronomer, kept a list of all the marriages they had helped arrange.

Dr. Blanco's other major accomplishment was building the 158-inch (4-meter) telescope, a twin of one already built and installed at the Kitt Peak National Observatory in Arizona, also run by the National Science Foundation. It was completed in 1975, with Dr. Blanco helping to align and test the telescope. South American astronomy took off.

The Cerro Tololo investment paid off in 1987 when a star erupted in a bright supernova explosion in the Large Magellanic Cloud, practically right overhead. Astronomers flocked to Chile, obtaining a trove of data that is

still being mined for clues to the violent death of at least one star. A decade later, the observatory played a key role in the discovery that the expansion of the universe seems to be accelerating under the influence of a mysterious dark energy, a discovery that has shaken physics and astronomy.

Victor Manuel Blanco was born March 10, 1918, in Guayama, P.R., one of nine children of a policeman, Felipe Blanco, and a housewife, Adelfa Pagan de Blanco. As a boy in San Juan with astronomical dreams, he raised pigs that he named after asteroids and built a backyard telescope. He nevertheless entered a local college intending to study medicine, until an acquaintance of a University of Chicago graduate student reawakened his love of the stars.

He transferred to the University of Chicago, but before he could finish he was drafted into the Army in World War II and spent six years repairing and tuning radar detectors and studying atmospheric effects on radar waves. Granted college credit for his wartime work, he returned briefly to Chicago and then entered the University of California, Berkeley. He received a Ph.D. in 1949.

After six years at what is now Case Western Reserve University in Cleveland, Dr. Blanco joined the Naval Observatory as the director of a program to measure star positions. He left after two years, in 1967, to become the second director of Cerro Tololo.

Dr. Blanco stepped down in 1981 after 14 years, but remained at Cerro Tololo to continue research.

His marriage, to Cicely Woods during the war, ended in divorce. He is survived by a his son from that marriage, Daniel; his second wife, Betty; two stepchildren, David Mintz and Ms. Vitell, from his second marriage; and three grandchildren. Although the 4-meter telescope at Cerro Tololo is no longer the largest in the Southern Hemisphere, it is still at the forefront of research. Equipped with a special digital "dark energy camera" built at the Fermi National Accelerator Laboratory in Illinois, the telescope will embark this year on a survey of some 300 million galaxies in an effort to discern the effect of dark energy on the evolution of the universe.

In a mountaintop ceremony in 1995, the telescope was named the Victor M. Blanco telescope.

Correction: March 18, 2011, Friday

This article has been revised to reflect the following correction: An obituary on Thursday about the astronomer Victor Blanco misstated his first wife's maiden name. She was Cicely Woods, not Brooks.

PHOTOS: The Cerro Tololo Inter-American Observatory in Chile. (PHOTOGRAPH BY DAVID WALKER); Victor Blanco (PHOTOGRAPH BY CERRO TOLOLO INTER-AMERICAN OBSERVATORY)

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Record - 3

DIALOG(R)

Study Results from Harvard-Smithsonian Center for Astrophysics Update,

Understanding of Astronomy,
Science Letter, p4076,
Tuesday, March 22, 2011

TEXT:

"We report the arcsecond resolution Submillimeter Array observations of the (CO)-C-12 (2-1) transition in the massive cluster-forming region G10.6-0.4. In these observations, the high-velocity (CO)-C-12 emission is resolved into individual outflow systems, which have a typical size scale of a few arcseconds," investigators in the United States report (see also).

"These molecular outflows are energetic and are interacting with the ambient molecular gas. By inspecting the shock signatures traced by CH₃OH, SiO, and HCN emissions, we suggest that abundant star formation activities are distributed over the entire 0.5 pc scale dense molecular envelope. The star formation efficiency over one global free-fall timescale (of the 0.5 pc molecular envelope, similar to 10⁵ years) is about a few percent. The total energy feedback of these high-velocity outflows is higher than 10⁴⁷ erg, which is comparable to the total kinetic energy in the rotational motion of the dense molecular envelope. From order-of-magnitude estimations, we suggest that the energy injected from the protostellar outflows is capable of balancing the turbulent energy dissipation," wrote H.B. Liu and colleagues, Harvard-Smithsonian Center for Astrophysics.

The researchers concluded: "No high-velocity bipolar molecular outflow associated with the central OB cluster is directly detected, which can be due to the photoionization."

Liu and colleagues published their study in *Astrophysical Journal* (The High-velocity Molecular Outflows In Massive Cluster-forming Region G10.6-0.4. *Astrophysical Journal*, 2010;725(2):2190-2208).

For additional information, contact H.B. Liu, Harvard Smithsonian Center Astrophysics, 60 Garden St., Cambridge, MA 02138, USA.

The publisher of the Astrophysical Journal can be contacted at: IOP Publishing Ltd., Dirac House, Temple Back, Bristol BS1 6BE, England.

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Record - 4

DIALOG(R)

Study Data from Harvard-Smithsonian Center for Astrophysics Update Knowledge of Astronomy,

Science Letter, p3881,
Tuesday, March 22, 2011

TEXT:

According to recent research published in the Astrophysical Journal, "As part of the NASA EPOXI Mission of Opportunity, we observed seven known transiting extrasolar planet systems in order to construct time series photometry of extremely high phase coverage and precision. Here we present the results for four "hot-Jupiter systems" with near-solar stars-HAT-P-4, TrES-3, TrES-2, and WASP-3."

"We observe 10 transits of HAT-P-4, estimating the planet radius $R_p = 1.332 \pm 0.052 R_{\text{Jup}}$, the stellar radius $R_* = 1.602 \pm 0.061 R_{\odot}$, the inclination $i = 89.67 \pm 0.30$ deg, and the transit duration from first to fourth contact $\tau = 255.6 \pm 1.9$ minutes. For TrES-3, we observe seven transits and find $R_p = 1.320 \pm 0.057 R_{\text{Jup}}$, $R_* = 0.817 \pm 0.022 R_{\odot}$, $i = 81.99 \pm 0.30$ deg, and $\tau = 81.9 \pm 1.1$ minutes. We also note a long-term variability in the TrES-3 light curve, which may be due to star spots. We observe nine transits of TrES-2 and find $R_p = 1.169 \pm 0.034 R_{\text{Jup}}$, $R_* = 0.940 \pm 0.026 R_{\odot}$, $i = 84.15 \pm 0.16$ deg, and $\tau = 107.3 \pm 1.1$ minutes. Finally, we observe eight transits of WASP-3, finding $R_p = 1.385 \pm 0.060 R_{\text{Jup}}$, $R_* = 1.354 \pm 0.056 R_{\odot}$, $i = 84.22 \pm 0.81$ deg, and $\tau = 167.3 \pm 1.3$ minutes. We present refined orbital periods and times of transit for each target. We state 95% confidence upper limits on the secondary eclipse depths in our broadband visible bandpass centered on 650 nm. These limits are 0.073% for HAT-P-4, 0.062% for TrES-3, 0.16% for TrES-2, and 0.11% for WASP-3," wrote J.L. Christiansen and colleagues, Harvard-Smithsonian Center for Astrophysics (see also).

The researchers concluded: "We combine the TrES-3 secondary eclipse information with the existing published data and confirm that the atmosphere likely does not have a temperature inversion."

Christiansen and colleagues published their study in Astrophysical Journal

(SYSTEM PARAMETERS, TRANSIT TIMES, AND SECONDARY ECLIPSE CONSTRAINTS OF THE EXOPLANET SYSTEMS HAT-P-4, TrES-2, TrES-3, and WASP-3 FROM THE NASA EPOXI MISSION OF OPPORTUNITY. *Astrophysical Journal*, 2011;726(2):94).

For additional information, contact J.L. Christiansen, Harvard Smithsonian Center Astrophysics, 60 Garden St., Cambridge, MA 02138, USA.

The publisher's contact information for the *Astrophysical Journal* is: IOP Publishing Ltd., Dirac House, Temple Back, Bristol BS1 6BE, England.

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Record - 5

DIALOG(R)

Studies from Harvard-Smithsonian Center for Astrophysics Describe New Findings in Astronomy,

Science Letter, p3506,
Tuesday, March 22, 2011

TEXT:

"We report the discovery of HAT-P-24b, a transiting extrasolar planet orbiting the moderately bright $V = 11.818$ F8 dwarf star GSC 0774-01441, with a period $P = 3.3552464 \pm 0.0000071$ days, transit epoch $T-c = 2455216.97669 \pm 0.00024$ (BJD) 11, and transit duration 3.653 ± 0.025 hr. The host star has a mass of $1.191 \pm 0.042 M_{\odot}$, radius of $1.317 \pm 0.068 R_{\odot}$, effective temperature 6373 ± 80 K, and a low metallicity of $[Fe/H] = -0.16 \pm 0.08$," scientists in the United States report (see also).

"The planetary companion has a mass of $0.681 \pm 0.031 M_J$ and radius of $1.243 \pm 0.072 R_J$ yielding a mean density of 0.439 ± 0.069 g cm⁻³. By repeating our global fits with different parameter sets, we have performed a critical investigation of the fitting techniques used for previous Hungarian-made Automated Telescope planetary discoveries. We find that the system properties are robust against the choice of priors. The effects of fixed versus fitted limb darkening are also examined. HAT-P-24b probably maintains a small eccentricity of $e = 0.052(-0.017)(+0.022)$, which is accepted over the circular orbit model with false alarm probability 5.8%. In the absence of eccentricity pumping, this result suggests that HAT-P-24b experiences less tidal dissipation than Jupiter," wrote D.M. Kipping and colleagues, Harvard-Smithsonian Center for Astrophysics.

The researchers concluded: "Due to relatively rapid stellar rotation, we

estimate that HAT-P-24b should exhibit one of the largest known Rossiter-McLaughlin effect amplitudes for an exoplanet (Delta V-RM similar or equal to 95 m s(-1)) and thus a precise measurement of the sky-projected spin-orbit alignment should be possible."

Kipping and colleagues published their study in *Astrophysical Journal* (HAT-P-24b: AN INFLATED HOT JUPITER ON A 3.36 DAY PERIOD TRANSITING A HOT, METAL-POOR STAR. *Astrophysical Journal*, 2010;725(2):2017-2028).

For more information, contact D.M. Kipping, Harvard Smithsonian Center Astrophysics, 60 Garden St., Cambridge, MA 02138, USA.

Publisher contact information for the *Astrophysical Journal* is: IOP Publishing Ltd., Dirac House, Temple Back, Bristol BS1 6BE, England.

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Record - 6

DIALOG(R)

Scientists at Harvard-Smithsonian Center for Astrophysics Publish Research in Astronomy,

Science Letter, p3208,
Tuesday, March 22, 2011

TEXT:

According to recent research from the United States, "First discovered in the Magellanic Clouds and in the Milky Way, the largest pools of luminous supersoft X-ray sources (SSSs) now known lie in M31 and in more distant galaxies."

"Hundreds of newly-discovered SSSs are helping us to test models for Type Ia supernovae and to identify SSSs that may represent a wider range of physical systems, including accreting intermediate-mass black holes," wrote R. Distefano and colleagues, Harvard-Smithsonian Center for Astrophysics (see also).

The researchers concluded: "In this short report we list ten intriguing facts about distant SSSs."

Distefano and colleagues published their study in *New Astronomy Reviews* (Ten facts of life for distant supersoft sources. *New Astronomy Reviews*, 2010;54(3-6):72-74).

For additional information, contact R. Distefano, Harvard Smithsonian

Center Astrophysics, 60 Garden St., Cambridge, MA 02138, USA.

Publisher contact information for the journal *New Astronomy Reviews* is: Elsevier Science Ltd., the Boulevard, Langford Lane, Kidlington, Oxford OX5 1GB, Oxon, England.

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DIALOG(R)

Researchers from Harvard-Smithsonian Center for Astrophysics Publish New Studies and Findings in the Area of Astronomy,

Science Letter, p2952,
Tuesday, March 22, 2011

TEXT:

"We characterize the infall rate onto protostellar systems forming in self-gravitating radiation-hydrodynamics simulations. Using two dimensionless parameters to determine the disks' susceptibility to gravitational fragmentation, we infer limits on protostellar system multiplicity and the mechanism of binary formation," investigators in the United States report (see also).

"We show that these parameters give robust predictions even in the case of marginally resolved protostellar disks. We find that protostellar systems with radiation feedback predominately form binaries via turbulent fragmentation, not disk instability, and predict that turbulent fragmentation is the dominant channel for binary formation for low-mass stars," wrote S.S.R. Offner and colleagues, Harvard-Smithsonian Center for Astrophysics.

The researchers concluded: "We clearly demonstrate that systems forming in simulations including radiative feedback have fundamentally different parameters than those in purely hydrodynamics simulations."

Offner and colleagues published their study in *Astrophysical Journal* (The Formation Of Low-mass Binary Star Systems Via Turbulent Fragmentation. *Astrophysical Journal*, 2010;725(2):1485-1494).

For additional information, contact S.S.R. Offner, Harvard Smithsonian Center Astrophysics, Institute Theory & Computational, 60 Garden St., Cambridge, MA 02138, USA.

The publisher of the *Astrophysical Journal* can be contacted at: IOP

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DIALOG(R)

Researchers from Harvard-Smithsonian Center for Astrophysics Detail Findings in Astronomy,

Science Letter, p2951,
Tuesday, March 22, 2011

TEXT:

"We present an analysis of archival X-ray observations of the Type IIL supernova SN 1979C," scientists writing in the journal New Astronomy report (see also).

"We find that its X-ray luminosity is remarkably constant at $(6.5 \pm 0.1) \times 10^{38}$ erg s⁻¹ over a period of 12 years between 1995 and 2007. The high and steady luminosity is considered as possible evidence for a stellar-mass (similar to 5-10 M-circle dot) black hole accreting material from either a supernova fallback disk or from a binary companion, or possibly from emission from a central pulsar wind nebula," wrote D.J. Patnaude and colleagues, Harvard-Smithsonian Center for Astrophysics. The researchers concluded: "We find that the bright and steady X-ray light curve is not consistent with either a model for a supernova powered by magnetic braking of a rapidly rotating magnetar, or a model where the blast wave is expanding into a dense circumstellar wind. ."

Patnaude and colleagues published their study in New Astronomy (Evidence for a possible black hole remnant in the Type IIL Supernova 1979C. New Astronomy, 2011;16(3):187-190).

Additional information can be obtained by contacting D.J. Patnaude, Harvard Smithsonian Center Astrophysics, 60 Garden St., Cambridge, MA 02138, USA.

The publisher of the journal New Astronomy can be contacted at: Elsevier Science BV, PO Box 211, 1000 AE Amsterdam, Netherlands.

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DIALOG(R)

Researchers from Harvard-Smithsonian Center for Astrophysics Describe Findings in Astronomy,

Science Letter, p2950,

Tuesday, March 22, 2011

TEXT:

According to recent research from the United States, "We present results from new Chandra, GMRT, and SOAR observations of NGC 5813, the dominant central galaxy in a nearby galaxy group. The system shows three pairs of collinear cavities at 1 kpc, 8 kpc, and 20 kpc from the central source, from three distinct outbursts of the central active galactic nucleus (AGN), which occurred 3×10^6 , 2×10^7 , and 9×10^7 yr ago."

"The Ha and X-ray observations reveal filaments of cool gas that has been uplifted by the X-ray cavities. The inner two cavity pairs are filled with radio-emitting plasma, and each pair is associated with an elliptical surface brightness edge, which we unambiguously identify as shocks (with measured temperature jumps) with Mach numbers of M approximate to 1.7 and M approximate to 1.5 for the inner and outer shocks, respectively. Such clear signatures from three distinct AGN outbursts in an otherwise dynamically relaxed system provide a unique opportunity to study AGN feedback and outburst history. The mean power of the two most recent outbursts differs by a factor of six, from $(1.5-10) \times 10^{42}$ erg s⁽⁻¹⁾, indicating that the mean jet power changes significantly over long (similar to 10^7 yr) timescales. The total energy output of the most recent outburst is also more than an order of magnitude less than the total energy of the previous outburst (1.5×10^{56} erg versus 4×10^{57} erg), which may be a result of the lower mean power, or may indicate that the most recent outburst is ongoing," wrote S.W. Randall and colleagues, Harvard-Smithsonian Center for Astrophysics (see also).

The researchers concluded: "The outburst interval implied by both the shock and cavity ages (similar to 10^7 yr) indicates that, in this system, shock heating alone is sufficient to balance radiative cooling close to the central AGN, which is the relevant region for regulating feedback between the intracluster medium and the central supermassive black hole."

Randall and colleagues published their study in *Astrophysical Journal* (Shocks And Cavities From Multiple Outbursts In The Galaxy Group Ngc 5813: A Window To Active Galactic Nucleus Feedback. *Astrophysical Journal*, 2011;726(2):86).

For additional information, contact S.W. Randall, Harvard Smithsonian Center Astrophysics, 60 Garden St., Cambridge, MA 02138, USA.

Publisher contact information for the *Astrophysical Journal* is: IOP

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DIALOG(R)

Research from Harvard-Smithsonian Center for Astrophysics Reveals New Findings on Astronomy,

Science Letter, p2319,

Tuesday, March 22, 2011

TEXT:

According to recent research from the United States, "We report a detailed spectral analysis of the population of low-mass X-ray binaries (LMXBs) detected in the elliptical galaxy NGC 4278 with Chandra. Seven luminous sources were studied individually, four in globular clusters (GCs) and three in the stellar field."

"The range of (0.3-8 keV) L-X for these sources is similar to $(3-8) \times 10^{38}$ erg s⁻¹, suggesting that they may be black hole binaries (BHBs). Fitting the data with either single thermal accretion disk or power-law (PO) models results in best-fit temperatures of similar to 0.7-1.7 keV and Gamma similar to 1.2-2.0, consistent with those measured in Galactic BHBs. Comparison of our results with simulations allows us to discriminate between disk and power-law-dominated emission, pointing to spectral/luminosity variability, reminiscent of Galactic BHBs. The BH masses derived from a comparison of our spectral results with the L-X similar to T-in(4) relation of Galactic BHBs are in the 5-15 M-circle dot range, as observed in the Milky Way. The analysis of joint spectra of sources selected in three luminosity ranges ($L-X \geq 1.5 \times 10^{38}$ erg s⁻¹, 6×10^{37} erg s⁻¹ $\leq L-X < 1.5 \times 10^{38}$ erg s⁻¹, and $L-X < 6 \times 10^{37}$ erg s⁻¹) suggests that while the high-luminosity sources have prominent thermal disk emission components, power-law components are likely to be important in the mid-and low-luminosity spectra. Comparing low-luminosity average spectra, we find a relatively larger N-H in the GC spectrum; we speculate that this may point to either a metallicity effect or to intrinsic physical differences between field and GC accreting binaries. Analysis of average sample properties uncovers a previously unreported L-X-R-G correlation (where R-G is the galactocentric radius) in the GC-LMXB sample, implying richer LMXB populations in more central GCs. No such trend is seen in the field LMXB sample," wrote G. Fabbiano and colleagues, Harvard-Smithsonian Center for Astrophysics (see also).

The researchers concluded: "We can exclude that the GC L-X-R-G correlation is the by-product of a luminosity effect and suggest that it may be related to the presence of more compact GCs at smaller galactocentric radii, fostering more efficient binary formation."

Fabbiano and colleagues published their study in *Astrophysical Journal* (Field And Globular Cluster Low-mass X-ray Binaries In Ngc 4278. *Astrophysical Journal*, 2010;725(2):1824-1847).

For additional information, contact G. Fabbiano, Harvard Smithsonian Center Astrophysics, 60 Garden St., Cambridge, MA 02138, USA.

Publisher contact information for the *Astrophysical Journal* is: IOP Publishing Ltd., Dirac House, Temple Back, Bristol BS1 6BE, England.

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DIALOG(R)

Findings from Harvard-Smithsonian Center for Astrophysics Advance Knowledge in Astronomy,

Science Letter, p527,
Tuesday, March 22, 2011

TEXT:

According to recent research from the United States, "L673 and CB188 are two low-mass clouds isolated from large star-forming regions that were observed as part of the Spitzer Legacy Project "From Molecular Clouds to Planet Forming disks" (c2d). We identified and characterized all the young stellar objects (YSOs) of these two regions and modeled their spectral energy distributions (SEDs) to examine whether their physical properties are consistent with values predicted from the theoretical models and with the YSO properties in the c2d survey of larger clouds."

"Overall, 30 YSO candidates were identified by the c2d photometric criteria, 27 in L673 and 3 in CB188. We confirm the YSO nature of 29 of them and remove a false Class III candidate in L673. We further present the discovery of two new YSO candidates, one Class 0 and another possible Class I candidate in L673, therefore bringing the total number of YSO candidates to 31. Multiple sites of star formation are present within L673, closely resembling other well-studied c2d clouds containing small groups such as B59 and L1251B, whereas CB188 seems to consist of only one isolated globule-like core. We measure a star formation efficiency (SFE) of 4.6%, which resembles the SFE of the larger c2d clouds. From the SED modeling of

our YSO sample we obtain envelope masses for Class I and Flat spectrum sources of 0.01-1.0 M_{\odot} . The majority of Class II YSOs show disk accretion rates from 3.3×10^{-10} to $3 \times 10^{-8} M_{\odot} \text{ yr}^{-1}$ and disk masses that peak at 10^{-4} to $10^{-3} M_{\odot}$. Finally, we examined the possibility of thermal fragmentation in L673 as the main star-forming process. We find that the mean density of the regions where significant YSO clustering occurs is of the order of similar to 10^5 cm^{-3} using 850 μm observations and measure a Jeans Length that is greater than the near-neighbor YSO separations by approximately a factor of 3-4," wrote A.E. Tsitali and colleagues, Harvard-Smithsonian Center for Astrophysics (see also).

The researchers concluded: "We therefore suggest that other processes, such as turbulence and shock waves, may have had a significant effect on the cloud's filamentary structure and YSO clustering."

Tsitali and colleagues published their study in *Astrophysical Journal* (THE SPITZER c2d SURVEY OF NEARBY DENSE CORES. X. STAR FORMATION IN L673 AND CB188. *Astrophysical Journal*, 2010;725(2):2461-2479).

For additional information, contact A.E. Tsitali, Harvard Smithsonian Center Astrophysics, 60 Garden St., Cambridge, MA 02138, USA.

Publisher contact information for the *Astrophysical Journal* is: IOP Publishing Ltd., Dirac House, Temple Back, Bristol BS1 6BE, England.

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DIALOG(R)

Data from Harvard-Smithsonian Center for Astrophysics Provide New Insights into Astronomy,

Science Letter, p300

Tuesday, March 22, 2011

TEXT:

"From a deep multi-epoch Chandra observation of the elliptical galaxy NGC 3379 we report the spectral properties of eight luminous LMXBs ($L_X > 1.2 \times 10^{38} \text{ erg s}^{-1}$). We also present a set of spectral simulations, produced to aid the interpretation of low-count single-component spectral modeling," scientists in the United States report (see also).

"These simulations demonstrate that it is possible to infer the spectral states of X-ray binaries from these simple models and thereby constrain the

properties of the source. Of the eight LMXBs studied, three reside within globular clusters (GCs) and one is a confirmed field source. Due to the nature of the luminosity cut, all sources are either neutron star (NS) binaries emitting at or above the Eddington luminosity or black hole (BH) binaries. The spectra from these sources are well described by single-component models, with parameters consistent with Galactic LMXB observations, where hard-state sources have a range in photon index of 1.5-1.9 and thermally dominant (TD) sources have inner-disk temperatures between similar to 0.7 and 1.55 keV. The large variability observed in the brightest GC source ($L_X > 4 \times 10^{38} \text{ erg s}^{-1}$) suggests the presence of a BH binary. At its most luminous this source is observed in a TD state with $kT(\text{in}) = 1.5 \text{ keV}$, consistent with a BH mass of similar to $4 M_{\odot}$. This observation provides further evidence that GCs are able to retain such massive binaries. We also observed a source transitioning from a bright state (L_X similar to $1 \times 10^{39} \text{ erg s}^{-1}$), with prominent thermal and non-thermal components, to a less luminous hard state ($L_X = 3.8 \times 10^{38} \text{ erg s}^{-1}$, $\Gamma = 1.85$). In its high flux emission, this source exhibits a cool-disk component of similar to 0.14 keV, similar to spectra observed in some ultraluminous X-ray sources (ULXs)," wrote N.J. Brassington and colleagues, Harvard-Smithsonian Center for Astrophysics.

The researchers concluded: "Such a similarity indicates a possible link between "normal" stellar-mass BHs in a high accretion state and ULXs."

Brassington and colleagues published their study in *Astrophysical Journal* (THE X-RAY SPECTRA OF THE LUMINOUS LMXBs IN NGC 3379: FIELD AND GLOBULAR CLUSTER SOURCES. *Astrophysical Journal*, 2010;725(2):1805-1823). For additional information, contact N.J. Brassington, Harvard Smithsonian Center Astrophysics, 60 Garden St., Cambridge, MA 02138, USA.

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DIALOG(R)

House Appropriations Subcommittee on Commerce, Justice, Science, and Related Agencies Hearing,
Congressional Documents,
Friday, March 11, 2011

TEXT:

Chairman Wolf, Ranking Member Fattah, and distinguished Members of the

Subcommittee, I greatly appreciate this opportunity to participate in today's hearing and to speak to the importance of national funding for science in general, and the advancement of science education in particular. On behalf of the Mathematical Association of America, I can state that the American mathematical community strongly supports the President's overall Fiscal Year 2012 budget request for the National Science Foundation, and urges that, given the need to improve undergraduate STEM education, funding for Education and Human Resources (EHR) should be supported at a similar level.

Much of America's competitive advantage in the world today is the result of its leadership in science and technology. This was made possible by decades of investment in the infrastructure of the scientific enterprise, both public and private. Our system of university, corporate, and foundational research centers is the envy of the world. The rest of the world has learned from our success. Emerging powerhouses such as China and India are investing heavily in their universities and scientific institutes. As they also realize, promoting scientific and technological innovation requires more than funding laboratories and institutes. It requires educating the next generation of scientists and engineers who will populate those centers of excellence.

As immediate Past-President of the Mathematical Association of America, the world's largest professional association providing expository mathematics, professional development for college mathematics faculty, and resources for the teaching and learning of college-level mathematics, I am intimately aware of the critical shortage of students choosing to pursue scientific, mathematical, and technological careers.

As I travel around this country, I find universities in serious financial straits, forced to replace regular faculty with part-time adjunct instructors, to increase class size, and to decrease support services. A quarter century ago, we regularly graduated 75,000 to 80,000 engineers a year. In 2008, we graduated 69,000 engineers. This has happened while our demand for a technologically savvy workforce has grown. Until now, we have been able to bridge the shortfall in the number of engineers and scientists that we need by drawing large numbers of highly talented immigrants to America. It is not clear that we can continue to do that. Both China and India, as well as other large developing countries such as Brazil and Indonesia, are improving their systems of higher education while sweetening the incentives for their graduates to stay home.

Focusing just on the most mathematically-intensive majors of engineering, the physical sciences, and the mathematical sciences (including statistics), the U.S. has seen no net gain in the past 25 years (see graph 1). The numbers dipped in the mid to late 1990s as we reached the trough in

the college-age population between the baby boom generation and its echo. The number of young people of college age today is essentially back to what it was in 1980. Yet, our production of scientists and engineers is lower than it was then.

Graph 1: Total number of Bachelors Degrees per year. Source: US Dept of Education, National Center for Education Statistics

What I find particularly alarming is how many talented students aspire to careers in engineering or science, but fail to achieve their dream. This past fall, 210,000 students entered as full-time students in four-year undergraduate programs with the intention of majoring in engineering, a physical science, mathematics or statistics. We can expect that no more than half of them will graduate with one of these degrees.

At the same time, this country is undergoing a demographic change. Our college-age population is increasingly Hispanic and African-American. As recently as 1990, 87% of those graduating from college were White. By 2008, it was less than 75%. If we are to continue even to maintain current numbers of graduates with degrees in science, engineering, and mathematics, we must improve the rates of attraction and retention of students from traditionally underrepresented groups into science and engineering. We are doing a lousy job of this.

During the 1990s and early 2000s, there was real progress in U.S. institutions. Women reached 47% of mathematics majors, 42% of all physical science majors, and, from a very low base, climbed to just over 21% of all engineering majors. Today, despite the fact that they now receive 57% of all Bachelors degrees, women have fallen to 44% of mathematics degrees, 41% of physical science majors, and, most discouragingly, only 18% of engineering degrees.

Furthermore, in 2008, Hispanic students earned 8% of all Bachelors degrees, but only 6% of math degrees and of engineering degrees, and only 5% of physical science degrees. The situation is even more problematic for African-Americans. In 2008, they earned 10% of all Bachelors degrees, but only 6% of degrees in the physical sciences, and 5% of math degrees and of engineering degrees. What is especially discouraging is that in mathematics, the absolute numbers of African-Americans earning bachelors has been falling (Graph 2). In the case of mathematics, there has been a 25% decrease since the high point of almost 1100 bachelors degrees in the mathematical sciences earned by African-Americans in 1997.

Graph 2. Number of Bachelors Degrees in Mathematics or Statistics earned by Black, non-Hispanic students. Source: US Dept of Education, NCES

It does not have to be this way. We know what works to support students into and successfully through science and engineering majors. In the Fall of 2009, Dr. Sylvia Bozeman of Spelman College came here to brief Congress on the success of their program, made possible through support from the NSF. By 2007, Spelman, a small liberal arts HBCU for women, was one of the top two producers of African-Americans earning degrees in Mathematics or Statistics. Their Chemistry Department today boasts 46 alumnae who have earned a doctorate degree in chemistry or a related STEM field, as well as hundreds of other chemistry graduates. As Dr. Bozeman said at the time, the key to their success was no more, and no less, than "creating a more welcoming environment, new pathways into science with additional courses of study, and a nurturing environment with exposure to role models and mentors."

This same approach of attention to the additional courses that are needed together with a nurturing environment that includes role models and mentors has worked wonders under the directorship of Dr. Carlos Castillo-Chavez at the Mathematical and Theoretical Biology Institute (MTBI) of Arizona State University. Initially created under the NSF's Research Experiences for Undergraduates (REU) program, MTBI has grown into an extensive program that mentors and supports students from the moment they enter university through post-doctoral programs. In the over eleven years of its existence, it has sent 112 of its alumni from underrepresented minorities on to graduate school, 71 of them on to PhD programs in STEM fields.

These are only two examples of unique NSF programs that provide impetus and seed money for the development of good ideas that are beginning to work to spur the growth of the educated workforce that we need. Distinctive NSF programs such as Integrative Graduate Education and Research Traineeship (IGERT), the Louis Stokes Alliances for Minority Participation (LSAMP), Alliances for Graduate Education and the Professoriate (AGEP), Mentoring through Critical Transition Points (MCTP), and Enhancing the Mathematical Science Workforce for the 21st Century (EMSW21) have invested substantial public resources for the training of American graduate students in the STEM fields and been particularly effective at attracting students from underrepresented groups.

The NSF's Directorate for Education and Human Resources (EHR) also has been a leader in developing and promoting programs that work, and EHR stands virtually alone in supporting innovative approaches to undergraduate science education. This is particularly exemplified by the Transforming Undergraduate Education in Science, Technology, Engineering, and Mathematics (TUES) program of the Division of Undergraduate Education (DUE). With very small sums of money, DUE is able to make a real difference in the quality of science instruction at many of our colleges and universities. The TUES program has encouraged and enabled some of our best

scientists to work on the improvement of science education.

EHR's Division of Research on Learning in Formal and Informal Settings (DRL) has made it possible for science museums to actively engage with elementary and middle school students in our schools, building enthusiasm for science. DRL has also supported groups such as Dr. Phillip Sadler's Science Education Department within the Harvard-Smithsonian Center for Astrophysics that is learning what works--and what doesn't--in preparing high school students to succeed in science, engineering, or mathematics.

For these reasons, the Mathematical Association of America strongly supports the President's FY 2012 budget proposal to fund the NSF. We wish to bring to the attention of this Subcommittee that while this represents an increase of 13% over the enacted NSF funding for 2010, actual NSF funding has fallen behind the growth rates that both the current and prior administrations have proposed. Furthermore, EHR, the critical directorate that oversees the efforts of NSF in scientific education, has long been undervalued and underfunded. Even in this otherwise helpful Fiscal Year 2012 budget request, HER is proposed for a much lower 4.4% increase.

In these tough budget times, there are many worthy programs that must deal with cutbacks. But the maintenance and cultivation of a scientifically capable workforce is critical to our future. To reduce funding for science, and in particular for science education, really would be an act of eating our seed corn.

Thank you again for this opportunity to appear before the Subcommittee.

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DIALOG(R)

Fiscal 2012 Appropriations: Commerce, Justice, Science And Related Agencies,
Congressional Testimony via FDCH,
Monday, March 14, 2011

TEXT:

xfdt FISCAL-2012-COMMERCE sked

TESTIMONY

March 11, 2011

DR. DAVID BRESSOUD

PAST-PRESIDENT

MACALESTER COLLEGE

HOUSE APPROPRIATIONS

Commerce, Justice, Science and Related Agencies

FISCAL 2012 APPROPRIATIONS: COMMERCE, JUSTICE, SCIENCE AND

RELATED AGENCIES

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copyright or other notice from copies of the content. Statement of Dr. David Bressoud Past-President, Mathematical Association of America Dewitt Wallace Professor of Mathematics Macalester College

Committee on House Appropriations Subcommittee on Commerce, Justice, Science and Related Agencies

March 11, 2011

Chairman Wolf, Ranking Member Fattah, and distinguished Members of the

Subcommittee, I greatly appreciate this opportunity to participate in today's hearing and to speak to the importance of national funding for science in general, and the advancement of science education in particular. On behalf of the Mathematical Association of America, I can state that the American mathematical community strongly supports the President's overall Fiscal Year 2012 budget request for the National Science Foundation, and urges that, given the need to improve undergraduate STEM education, funding for Education and Human Resources (EHR) should be supported at a similar level.

Much of America's competitive advantage in the world today is the result of its leadership in science and technology. This was made possible by decades of investment in the infrastructure of the scientific enterprise, both public and private. Our system of university, corporate, and foundational research centers is the envy of the world. The rest of the world has learned from our success. Emerging powerhouses such as China and India are investing heavily in their universities and scientific institutes. As they also realize, promoting scientific and technological innovation requires more than funding laboratories and institutes. It requires educating the next generation of scientists and engineers who will populate those centers of excellence.

As immediate Past-President of the Mathematical Association of America, the world's largest professional association providing expository mathematics, professional development for college mathematics faculty, and resources for the teaching and learning of college-level mathematics, I am intimately aware of the critical shortage of students choosing to pursue scientific, mathematical, and technological careers.

As I travel around this country, I find universities in serious financial straits, forced to replace regular faculty with part-time adjunct instructors, to increase class size, and to decrease support services. A quarter century ago, we regularly graduated 75,000 to 80,000 engineers a year. In 2008, we graduated 69,000 engineers. This has happened while our demand for a technologically savvy workforce has grown. Until now, we have been able to bridge the shortfall in the number of engineers and scientists that we need by drawing large numbers of highly talented immigrants to America. It is not clear that we can continue to do that. Both China and India, as well as other large developing countries such as Brazil and Indonesia, are improving their systems of higher education while sweetening the incentives for their graduates to stay home.

Focusing just on the most mathematically-intensive majors of engineering, the physical sciences, and the mathematical sciences (including statistics), the U.S. has seen no net gain in the past 25 years (see graph 1). The numbers dipped in the mid to late 1990s as we reached the trough in

the college-age population between the baby boom generation and its echo. The number of young people of college age today is essentially back to what it was in 1980. Yet, our production of scientists and engineers is lower than it was then. Graph 1: Total number of Bachelors Degrees per year. Source: US Dept of Education, National Center for Education Statistics

What I find particularly alarming is how many talented students aspire to careers in engineering or science, but fail to achieve their dream. This past fall, 210,000 students entered as full-time students in four-year undergraduate programs with the intention of majoring in engineering, a physical science, mathematics or statistics. We can expect that no more than half of them will graduate with one of these degrees.

At the same time, this country is undergoing a demographic change. Our college-age population is increasingly Hispanic and African-American. As recently as 1990, 87% of those graduating from college were White. By 2008, it was less than 75%. If we are to continue even to maintain current numbers of graduates with degrees in science, engineering, and mathematics, we must improve the rates of attraction and retention of students from traditionally underrepresented groups into science and engineering. We are doing a lousy job of this.

During the 1990s and early 2000s, there was real progress in U.S. institutions. Women reached 47% of mathematics majors, 42% of all physical science majors, and, from a very low base, climbed to just over 21% of all engineering majors. Today, despite the fact that they now receive 57% of all Bachelors degrees, women have fallen to 44% of mathematics degrees, 41% of physical science majors, and, most discouragingly, only 18% of engineering degrees.

Furthermore, in 2008, Hispanic students earned 8% of all Bachelors degrees, but only 6% of math degrees and of engineering degrees, and only 5% of physical science degrees. The situation is even more problematic for African-Americans. In 2008, they earned 10% of all Bachelors degrees, but only 6% of degrees in the physical sciences, and 5% of math degrees and of engineering degrees. What is especially discouraging is that in mathematics, the absolute numbers of African-Americans earning bachelors has been falling (Graph 2). In the case of mathematics, there has been a 25% decrease since the high point of almost 1100 bachelors degrees in the mathematical sciences earned by African-Americans in 1997.

Graph 2. Number of Bachelors Degrees in Mathematics or Statistics earned by Black, non-Hispanic students. Source: US Dept of Education, NCES

It does not have to be this way. We know what works to support students into and successfully through science and engineering majors. In the Fall

of 2009, Dr. Sylvia Bozeman of Spelman College came here to brief Congress on the success of their program, made possible through support from the NSF. By 2007, Spelman, a small liberal arts HBCU for women, was one of the top two producers of African-Americans earning degrees in Mathematics or Statistics. Their Chemistry Department today boasts 46 alumnae who have earned a doctorate degree in chemistry or a related STEM field, as well as hundreds of other chemistry graduates. As Dr. Bozeman said at the time, the key to their success was no more, and no less, than ``creating a more welcoming environment, new pathways into science with additional courses of study, and a nurturing environment with exposure to role models and mentors.``

This same approach of attention to the additional courses that are needed together with a nurturing environment that includes role models and mentors has worked wonders under the directorship of Dr. Carlos Castillo-Chavez at the Mathematical and Theoretical Biology Institute (MTBI) of Arizona State University. Initially created under the NSF`s Research Experiences for Undergraduates (REU) program, MTBI has grown into an extensive program that mentors and supports students from the moment they enter university through post-doctoral programs. In the over eleven years of its existence, it has sent 112 of its alumni from underrepresented minorities on to graduate school, 71 of them on to PhD programs in STEM fields.

These are only two examples of unique NSF programs that provide impetus and seed money for the development of good ideas that are beginning to work to spur the growth of the educated workforce that we need. Distinctive NSF programs such as Integrative Graduate Education and Research Traineeship (IGERT), the Louis Stokes Alliances for Minority Participation (LSAMP), Alliances for Graduate Education and the Professoriate (AGEP), Mentoring through Critical Transition Points (MCTP), and Enhancing the Mathematical Science Workforce for the 21st Century (EMSW21) have invested substantial public resources for the training of American graduate students in the STEM fields and been particularly effective at attracting students from underrepresented groups.

The NSF`s Directorate for Education and Human Resources (EHR) also has been a leader in developing and promoting programs that work, and EHR stands virtually alone in supporting innovative approaches to undergraduate science education. This is particularly exemplified by the Transforming Undergraduate Education in Science, Technology, Engineering, and Mathematics (TUES) program of the Division of Undergraduate Education (DUE). With very small sums of money, DUE is able to make a real difference in the quality of science instruction at many of our colleges and universities. The TUES program has encouraged and enabled some of our best scientists to work on the improvement of science education.

EHR`s Division of Research on Learning in Formal and Informal Settings

(DRL) has made it possible for science museums to actively engage with elementary and middle school students in our schools, building enthusiasm for science. DRL has also supported groups such as Dr. Phillip Sadler's Science Education Department within the Harvard-Smithsonian Center for Astrophysics that is learning what works and what doesn't in preparing high school students to succeed in science, engineering, or mathematics.

For these reasons, the Mathematical Association of America strongly supports the President's FY 2012 budget proposal to fund the NSF. We wish to bring to the attention of this Subcommittee that while this represents an increase of 13% over the enacted NSF funding for 2010, actual NSF funding has fallen behind the growth rates that both the current and prior administrations have proposed. Furthermore, EHR, the critical directorate that oversees the efforts of NSF in scientific education, has long been undervalued and underfunded. Even in this otherwise helpful Fiscal Year 2012 budget request, HER is proposed for a much lower 4.4% increase.

In these tough budget times, there are many worthy programs that must deal with cutbacks. But the maintenance and cultivation of a scientifically capable workforce is critical to our future. To reduce funding for science, and in particular for science education, really would be an act of eating our seed corn.

Thank you again for this opportunity to appear before the Subcommittee.

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Wolbach Library: CfA in the News ~ Week ending 3 April 2011

1. **Bridging the two cultures: a conversation between Alan Lightman and Rebecca Newberger Goldstein: in their recent exchange, physicist Alan Lightman...**, Lightman, Alan, Goldstein, Rebecca Newberger, World Literature Today, v85, n1, p30(6), Saturday, January 1, 2011
2. **Reports from Harvard-Smithsonian Center for Astrophysics Describe Recent Advances in Astronomy**, Science Letter, p1859, Tuesday, April 5, 2011
3. **New Astronomy Study Findings Reported from Harvard-Smithsonian Center for Astrophysics**, Science Letter, p853, Tuesday, April 5, 2011
4. **Studies from Harvard-Smithsonian Center for Astrophysics Reveal New Findings on Astronomy**, Science Letter, p3541, Tuesday, April 5, 2011
5. **Scientists at Harvard-Smithsonian Center for Astrophysics Target Astronomy**, Science Letter, p3236, Tuesday, April 5, 2011
6. **Climate Change Policy Issues**, Congressional Testimony via FDCH, Thursday, March 31, 2011
7. **NASA Announces 2011 Carl Sagan Fellows**, NewsPress, Thursday, March 31, 2011
8. **A learning cycle for all students: modifying the 5E instructional model to address the needs of all learners.**, Duran, Emilio, Duran, Lena, Haney, Jodi, Scheuermann, Amy, Science Teacher, v78, n3, p56, Tuesday, March 1, 2011
9. **Bewitching moons**. Braffman-Miller, Judith, USA Today (Magazine), v139, n2790, p50(3), Tuesday, March 1, 2011
10. **Astronomy lecture**, Brian Hall, Public Opinion (Chambersburg, PA), Monday, March 28, 2011

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DIALOG(R)

Bridging the two cultures: a conversation between Alan Lightman and Rebecca Newberger Goldstein: in their recent exchange, physicist Alan Lightman...

Lightman, Alan, Goldstein, Rebecca Newberger,
World Literature Today, v85, n1, p30(6)

Saturday, January 1, 2011

TEXT:

Bridging the two cultures: a conversation between Alan Lightman and Rebecca Newberger Goldstein: in their recent exchange, physicist Alan Lightman and philosopher Rebecca Newberger Goldstein reflected on "thinking and feeling our ways beyond what we can know," and how they devise "emotional experiments" in their fiction in order to probe the limits of rational thought.

Dear Alan,

I want to thank you, first of all, for allowing this conversation to take place electronically, a form of communication that I know you have some serious qualms about. You're as averse to it as I am to the telephone. (I hate the telephone because it doesn't allow for long periods of silence. If one is quiet for too long, the other person invariably asks, "Are you still there?")

I thought I'd start off by asking the fairly obvious question centered on a similarity between us. We've both had what some might consider "irregular" writing careers, as we both started as academics in somewhat technical areas--you in physics and cosmology, me in analytic philosophy, with a concentration in philosophy of science--and only switched to writing after we'd earned our credentials in those other fields. Was this always your plan, or have you found yourself surprised by the turn your career has taken?

I have to confess that, in my own case, the literary turn took me somewhat by surprise. I've always loved literature--it's almost a physical need for me to gorge myself regularly on fiction and poetry--but I never planned on this passion shaping my career until I found myself ... well, writing a novel, almost in a trance. Looking back, I see how I might have been preparing to be a novelist with all that gorging, but I certainly wasn't conscious of any literary intentions until the voice of a character announced herself to me in the first sentence of my first book: "I'm often asked what it's like to be married to a genius." It was what Henry James called a *donnee*, and I accepted it as that and just sat down and wrote the novel, *The Mind-Body Problem*. I have to say, none of my other books, neither fiction nor nonfiction, ever arrived in quite the same peremptory way.

Tell me about your experience in broadening out into fiction. Have you always been aware that both science and literature were paths you would follow? Were you surprised to find yourself writing the extraordinary *Einstein's Dreams*?

With eager anticipation, Rebecca

Dear Rebecca,

It will be a delight for me to talk about our careers together, although I wish that the conversation were in person. I understand that you are traveling a lot now, and this e-form is the only way possible.

I was both surprised and not surprised about the blooming of my literary career. Since a young age, I did have a passion for both the sciences and the arts. I built rockets and gadgets and looked at things under my microscope. I created a small laboratory in a storage room next to my bedroom, where I kept various chemicals, Bunsen burners, test tubes, batteries, and electrical wire, resistors and capacitors, etc. I also loved to read, and I wrote poetry. Poetry was my first writing form. Almost none of the poetry I wrote at that age (8-16) was worth anything, but it was a vehicle for expressing my emotions and my thoughts. I was philosophical from a young age (as I am sure you were) and wrote poems about death and the puzzle of existence as well as odes to thirteen-year-old girls I was in infatuated with. I also loved the meter and sound of poetry. I loved the sound of interesting words.

My friends separated clearly into two groups: the "artists" (intuitive, spontaneous, etc.) and the "scientists" (logical, deliberate, etc.). I passed between the two groups of friends (who did not mix with each other) easily and found myself behaving like an "artist" when I was with my artist friends and like a "scientist" when I was with my scientist friends. So, I knew very well that I had these two different capacities and interests, and that the combination of the two was unusual. My friends, parents, and teachers did not exactly discourage my dual capacities, but they made it clear that life would be easier for me if I went in one direction or the other, not both. I had no role models for people who were both scientists and artists, although in high school I became aware of C. P. Snow, and I read some of Rachel Carson's book *Silent Spring* and realized, "Hey, here is a scientist who can write in a literary form."

I am not sure that I had a clear idea of exactly what career I wanted to pursue, but I did not want to give up my "dual capacities." At some point, it became a practical matter. I had to choose a major. I knew of a few scientists who later became writers (Snow, Carson) but no artists who later in life became scientists, so without understanding the basis for this fact but just accepting it, I majored in physics (at Princeton). However, I took lots of courses in literature, philosophy, etc., and even a studio class in sculpture with the prominent Princeton sculptor Joe Brown. Again, as a practical matter, I went to graduate school in physics (Caltech), but even

there I took some courses in philosophy. At this point, I was publishing poetry in small literary magazines. I did not start spending a lot of time writing until around 1980, six years after my PhD and after I had a secure job in science (at the Harvard-Smithsonian Center for Astrophysics). At this point, I began writing essays about science for a magazine called *Science 80*, published by the American Association for the Advancement of Science. (My first couple of essays about science had been published in *Smithsonian* magazine.) I found the essay a wonderful form of writing in which I could be informative, personal, philosophical, and poetic. I am still proud of some of those early essays. After a couple of years of this, I published a collection of my essays in book form and also published a couple of essays in the *New Yorker*. I was encouraged by William Shawn, the editor of the *New Yorker*, and by John McPhee, both of whom read my stuff. With that encouragement, I began to experiment with the essay, stretching its limits, adding fictional elements. Around 1991, shortly after moving from Harvard to MIT (where I had been given a joint position in science and humanities), I got the idea for *Einstein's Dreams*, which was my first book of fiction. But as you can see, I arrived there in gradual steps. In fact, I had already published some stand-alone "fantasy" type essays that were not dissimilar from the chapters of *Einstein's Dreams*. So, I was not so surprised to have arrived at that point, but I was extremely surprised (as was everyone) at the success of that book.

So, this is a very long answer to your question about whether I was surprised or not surprised by the onset of my literary career. I can add that I remember I was worried, in the early and mid-1980s, about whether my scientific colleagues would disapprove of my writing for the public. At that time, I was quite immersed in the scientific community, and there were very few practicing scientists who were writing for the public. Rachel Carson, Lewis Thomas, Stephen Jay Gould, and Loren Eiseley had not been writing for long at that time. In the scientific community, there was definitely an ethos that you were going soft if you wrote for the public instead of spending 100 percent of your time doing research. Of course, the situation today is much different. Now there are many practicing scientists who are also literary writers, and they are celebrated. But in the early and mid-1980s, when I started, there were only a few. I remember that I had lunch with Stephen Jay Gould once in the mid-1980s, and we talked about just this issue.

With much appreciation and affection, Alan

Dear Alan,

You seem to have been far more clearheaded about plans for your future than I. I just seem to have bumbled my way unwittingly. I suspect this had something to do with my being raised in a very religious household. The idea of a girl having any large plans for her future was unthinkable, and I

never learned the art of cultivating personal ambitions. I've just been led along, almost blindly, by the things I'm interested in.

And, like you, my tendencies showed themselves early. We were not very well-off in my family, and children's books were far beyond our means. So every Friday afternoon, I was taken, along with my siblings, to the public library to get our Sabbath reading material, since we weren't permitted to do much else other than read from sundown Friday to sundown Saturday. From the moment that I could read books for myself, I imposed a strict rule. On each weekly library visit, I would take out two books, one that I called a "good-for-me" book, which was always nonfiction, and the other that I called a "fun" book, which was always make-believe. And I wouldn't allow myself to read the fun book until I had read the good-for-me book. So I think the lifelong pattern of loving but slightly dismissing fiction was there from the beginning.

It happened to be one of the good-for-me books that first lit my fire. It was a book about atoms, and it delivered the absolutely astounding news to me that the seemingly solid objects all around me were not as they seemed but were composed of little colorless bits whirring around in orderly ways through empty space. My six-year-old world was rocked! It seemed that the world as I saw it--including all the pretty colors I loved so much--weren't "out there" in the objects at all, but were somehow due to the interaction between those whirring bits and me. How altogether changed the world became with this astonishing news. I remember just sort of walking around in a daze, thinking, "In here it's like this, but out there it's like ... what?" This whole idea of an "in here" and "out there" just blew me away. I didn't have anyone I could talk all this over with, of course, so I just kept reading whatever I could. There were people who knew what really was "out there," and they were called "scientists." Man, these scientists were something else! They seemed to be performing an almost unimaginable feat, getting outside of their own minds. How'd they do that? My awe with scientists didn't make me want to be a scientist--as I said, I completely lacked the art of thinking about my own future--but I did want to learn about how they did the things they did, and maybe even to meet one of them in my lifetime and then ply him with questions. That was as far as my ambition at that time went. But as I got older I did want, quite ardently, to get out of the "in here" of my own insular world and "out there" to where knowledge about the great large world was being pursued.

When I got to college--Barnard College at Columbia University, and the great privilege of getting to go there was a saga in itself--I enjoyed my math and physics classes immensely, but found that it was the philosophy classes--most especially the epistemology and philosophy of science and philosophy of mathematics classes--that touched my interests the most deeply. I was still consumed with knowing how we manage to know the things

we know, how we traversed the space between "in here" and "out there," if indeed we did. And here's a confession: I never took a single literature course, or art course of any sort, for that matter. I perpetuated my childhood bias that fiction was just fun, something I would allow myself to indulge in only after I'd put in the good hard work of mastering "real" knowledge. Perhaps because my education was nothing I could take for granted, I felt I couldn't squander it on studying things that gave me nothing but drunken joy.

I went on to Princeton, after I graduated Barnard, and got a PhD in philosophy. Not so surprisingly, given my childhood obsession with the "in here" and the "out there," my dissertation topic was on what we now call "the hard problem of consciousness," though at that time we simply referred to it as "the mind-body problem." I'd come to Princeton thinking I would do hard-core philosophy of science--foundations of quantum mechanics, perhaps--but I got rather seduced by Tom Nagel's seminal paper "What Is It Like to Be a Bat?" and decided to work with him (he was then at Princeton). Very little did I ever dream that, within a few years of getting my doctorate and a desirable job, I would publish a novel--a novel, of all things!--called *The Mind-Body Problem*. I still hadn't learned how to think ambitiously about my own future, or I never would have dared to do it. I would have realized that publishing a novel was not the sort of thing for a very young woman in a male-dominated field to do if she wished to be taken seriously by her colleagues. Perhaps only someone from my insular background could manage to be as clueless as I've managed to be.

I've brought up my religious past, and that brings me to the next question I'd love to ask you, one which concerns another surprising parallel between our two careers. Both you and I have recently published works that explore the fraught space between--to put it somewhat crudely--reason and faith. Your novel, *Ghost*, concerns a person who perhaps has a supernatural experience, one that he himself is not altogether ready to believe in, and the way in which this ambiguous experience gets co-opted by others. My novel *36 Arguments for the Existence of God: A Work of Fiction* is focused on the contemporary debate between science and religion. My protagonist, Cass Seltzer, is a psychologist of religion who has published a runaway atheist best-seller and become a poster boy for secularism, but he, too, has a tendency toward transcendent experience and gets dubbed "the atheist with a soul."

I suspect that, if asked to place yourself on one side of the reason/faith divide, you, like me, would go stand over with the reason people; and yet we both, I think, have a tendency to see "the other side" with some sympathy, to perhaps tolerate more ambiguity and conflict in this area than others of our rationalist persuasion do. Is that why you felt compelled to write a novel on the subject, because of what a novel can encompass when it

comes to human dilemmas concerning the limits of human understanding? And while you're at it, perhaps you could address this general question of what the novel can encompass that other forms of writing can't. What determines you to write a novel--or, for that matter, in your case, a poem--about a particular intellectual theme or dilemma, rather than an essay or a nonfiction book?

Warmest wishes, Rebecca

Dear Rebecca,

If I may attempt to answer the second question first: Why write about ideas and intellectual themes in fiction rather than in nonfiction? First of all, I would argue that as far as human beings are concerned, there are no purely intellectual themes. Everything we care about has an emotional dimension. I am far from an expert on the brain, but the amygdala, the part of our brain that deals with emotions, is a very primitive organ created millions of years ago for survival, and it is probably involved at some level with every thought we have, whether we like it or not. Homo sapiens has evolved a lot intellectually, but not much emotionally. Look at all the judges and senators and generals who throw their professional careers away for extramarital affairs. If you want a person to really care about something, intellectual or not, you need to hit him or her in the amygdala. Reading a novel is a far different experience from reading a book on history or astrophysics or, dare I say, philosophy. When we read a novel, we are taken to the scene, we smell the scent of linseed oil, we hear the cracking voice of a grandfather, we see the smoke rising from a burning house in the distance. We feel the joy and suffering of good characters. Either consciously or unconsciously, we enter the world created by the novelist and experience things at a visceral level. Words and actions and scenes make an emotional impression on us, and that impression is deep. Nonfiction, of course, is extremely important in its own right, and has its own advantages, and there are some readers who wouldn't touch fiction with a ten-foot-thick dictionary. In nonfiction, we can give the reader lots of facts and even understanding of the facts. (I believe that Harold Ross, the first editor of the New Yorker, said, "I never met a fact I didn't like.") But if we want to get deep inside the primitive brain of our reader (and in her skin and blood as well), fiction has its advantages. When I began working on the book that eventually became my novel *The Diagnosis*, which, roughly speaking, is about the American obsession with money, speed, and information, I first outlined a nonfiction book like Jonathan Schell's *Fate of the Earth*. I actually wrote a number of factual chapters about the subject, documenting such things as consumption, productivity, loss of leisure time, etc. Then, halfway through, I realized that what I was really after was a mentality, a way of living in the world, a bankruptcy of the spirit. I decided that these psychological issues would be better treated

in novelistic form. In fiction, I could make the reader feel the frenzy of modern life in America and get inside the head of a particular victim of that frenzy.

Now turning to your second question: Why did I use fiction as a way to write about the divide between science and religion? Why not just discuss the two different approaches to the world, their celebrated histories, perhaps give a few case studies, give the pluses and minuses of each worldview, and finally come down on one side or the other? First of all, I feel that science and religion are the two greatest forces that have shaped civilization as we know it. Whatever one's view as to which should have the upper hand, one cannot dismiss one endeavor or the other (as Richard Dawkins, Sam Harris, and others have done). Instead, one should try to understand why each worldview has been so powerful. Personally, I certainly endorse the scientific worldview as a necessary way of understanding the physical universe. But I also believe that there are realms of thought and interesting questions beyond the reach of science, such as "What is the nature of love?" or "Is it right to kill other human beings in war?" Personally, I do not believe that an intelligent being created the universe. But science can never disprove that assertion. After reading a great work like William James's *Varieties of Religious Experience*, a thinking person must acknowledge that religion satisfies deep emotional and psychological needs that we all have. In *Ghost*, I wanted to explore and try to understand better those needs. I started with a rational kind of person and subjected him to an irrational, "supernatural" experience. What would he make of such an experience? Would he deny it? Or would he desperately try to explain it away, to find some rational explanation of irrational events? Or would he alter his worldview? As my main character reacts to the experience and evolves, he goes through all of these phases. I wanted to both understand and convey to the reader a largely emotional experience, a grueling and psychologically tumultuous reexamination of one's understanding of the nature of things. How could I do better than have the reader herself involved emotionally with the text--namely, portray the narrative in novelistic form, with all the techniques available to the novelist? In a way, this novel, and many novels, are like emotional experiments. You put your characters in a difficult situation, and you see how they will react. You, the writer, should not figure out their reaction in advance. You should not work out the plot in advance. If you do, it is not an honest experiment. It is a prejudged experiment, like the physicists who measured the wrong number for the speed of light for decades because they thought they knew what the number should be, so they kept kicking the equipment until it gave the number they were expecting. You, the writer, should, after putting your characters in a difficult situation, stand back and wait and listen, and eventually your characters will react in an authentic and sometimes surprising way. It is always good when a character surprises the writer, because then you know you have done an honest

experiment and found out something new. I have never had a supernatural experience myself, but I wanted to know how a person such as myself might react to such an experience, so I created the experiment in the novel. And I got a deeper understanding of what the religious experience is all about. I hope that I conveyed some of that understanding to the reader.

[ILLUSTRATION OMITTED]

[ILLUSTRATION OMITTED]

October 2010

Alan Lightman is a physicist, novelist, and essayist. He was educated at Princeton University and at the California Institute of Technology, where he received a PhD in theoretical physics. He has served on the faculties of Harvard University and MIT and was the first person to receive dual faculty appointments at MIT in science and in the humanities. Lightman is the author of five novels, two collections of essays, a book-length narrative poem, and several books on science. His novel *Einstein's Dreams* was an international best-seller and has been translated into thirty languages. His novel *The Diagnosis* was a finalist for the National Book Award in fiction.

Rebecca Newberger Goldstein is the author of nine books, including *Incompleteness: The Proof and Paradox of Kurt Godel*, which was chosen by *Discover* magazine as one of the ten best science books published in 2005, and *Betraying Spinoza: The Renegade Jew Who Gave Us Modernity*, which won the Koret international Award for Jewish Thought. She has won numerous awards for her fiction and nonfiction, including a MacArthur "genius" grant. The paperback edition of her latest novel, *36 Arguments for the Existence of God: A Work of Fiction*, is forthcoming in February 2011.

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DIALOG(R)

Reports from Harvard-Smithsonian Center for Astrophysics Describe Recent Advances in Astronomy,

Science Letter, p1859

Tuesday, April 5, 2011

TEXT:

According to a study from Cambridge, United States, "We present rotation

period measurements for 41 field M-dwarfs, all of which have masses inferred (from their parallaxes and Two Micron All Sky Survey K-band magnitudes) to be between the hydrogen burning limit and 0.35 M-circle dot and thus should remain fully convective throughout their lifetimes. We measure a wide range of rotation periods, from 0.28 to 154 days, with the latter commensurate with the typical sensitivity limit of our observations."

"Using kinematics as a proxy for age, we find that the majority of objects likely to be thick disk or halo members (and hence, on average, older) rotate very slowly, with a median period of 92 days, compared with 0.7 days for those likely to be thin disk members (on average, younger), although there are still some rapid rotators in the thick disk sample. When combined with literature measurements for M-dwarfs, these results indicate an increase in spin-down times with decreasing stellar mass, in agreement with previous work, and that the spin-down time becomes comparable to the age of the thick disk sample below the fully convective boundary," wrote J. Irwin and colleagues, Harvard-Smithsonian Center for Astrophysics (see also).

The researchers concluded: "We additionally infer that the spin-down must remove a substantial amount of angular momentum once it begins in order to produce the slow rotators we observe in the thick disk candidates, suggesting that fully convective M-dwarfs may still experience strong winds."

Irwin and colleagues published the results of their research in *Astrophysical Journal* (ON THE ANGULAR MOMENTUM EVOLUTION OF FULLY CONVECTIVE STARS: ROTATION PERIODS FOR FIELD M-DWARFS FROM THE M-Earth TRANSIT SURVEY. *Astrophysical Journal*, 2011;727(1):56).

For additional information, contact J. Irwin, Harvard Smithsonian Center Astrophysics, 60 Garden St., Cambridge, MA 02138, United States..

The publisher of the *Astrophysical Journal* can be contacted at: IOP Publishing Ltd., Dirac House, Temple Back, Bristol BS1 6BE, England. Copyright (c) 2011 Science Letter via NewsRx.com

Record - 3

DIALOG(R)

New Astronomy Study Findings Reported from Harvard-Smithsonian Center for Astrophysics,
Science Letter, p853,
Tuesday, April 5, 2011

TEXT:

According to recent research published in the Astrophysical Journal, "Light curves from the Kepler Mission contain valuable information on the nature of the phenomena producing the transit-like signals. To assist in exploring the possibility that they are due to an astrophysical false positive, we describe a procedure (BLENDER) to model the photometry in terms of a "blend" rather than a planet orbiting a star."

"A blend may consist of a background or foreground eclipsing binary (or star-planet pair) whose eclipses are attenuated by the light of the candidate and possibly other stars within the photometric aperture. We apply BLENDER to the case of Kepler-9 (KIC 3323887), a target harboring two previously confirmed Saturn-size planets (Kepler-9 b and Kepler-9 c) showing transit timing variations, and an additional shallower signal with a 1.59 day period suggesting the presence of a super-Earth-size planet. Using BLENDER together with constraints from other follow-up observations we are able to rule out all blends for the two deeper signals and provide independent validation of their planetary nature. For the shallower signal, we rule out a large fraction of the false positives that might mimic the transits. The false alarm rate for remaining blends depends in part (and inversely) on the unknown frequency of small-size planets. Based on several realistic estimates of this frequency, we conclude with very high confidence that this small signal is due to a super-Earth-size planet (Kepler-9 d) in a multiple system, rather than a false positive," wrote G. Torres and colleagues, Harvard-Smithsonian Center for Astrophysics (see also).

The researchers concluded: "The radius is determined to be $1.64(-0.14)(+0.19)$ R-circle plus, and current spectroscopic observations are as yet insufficient to establish its mass."

Torres and colleagues published their study in Astrophysical Journal (MODELING KEPLER TRANSIT LIGHT CURVES AS FALSE POSITIVES: REJECTION OF BLEND SCENARIOS FOR KEPLER-9, AND VALIDATION OF KEPLER-9 d, A SUPER-EARTH-SIZE PLANET IN A MULTIPLE SYSTEM. Astrophysical Journal, 2011;727(1):24).

For additional information, contact G. Torres, Harvard Smithsonian Center Astrophysics, 60 Garden St., Cambridge, MA 02138, United States..

The publisher's contact information for the Astrophysical Journal is: IOP Publishing Ltd., Dirac House, Temple Back, Bristol BS1 6BE, England.

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Record - 4

DIALOG(R)

Studies from Harvard-Smithsonian Center for Astrophysics Reveal New Findings on Astronomy,

Science Letter, p3541,

Tuesday, April 5, 2011

TEXT:

According to a study from Cambridge, United States, "We report the results of a large-area study of water vapor along the Orion Molecular Cloud ridge, the purpose of which was to determine the depth-dependent distribution of gas-phase water in dense molecular clouds. We find that the water vapor measured toward 77 spatial positions along the face-on Orion ridge, excluding positions surrounding the outflow associated with BN/KL and IRC2, display integrated intensities that correlate strongly with known cloud surface tracers such as CN, C₂H, (CO)-C-13 J = 5-4, and HCN, and less well with the volume tracer N₂H⁺."

"Moreover, at total column densities corresponding to $A(V) < 15$ mag, the ratio of H₂O to (CO)-O-18 integrated intensities shows a clear rise approaching the cloud surface. We show that this behavior cannot be accounted for by either optical depth or excitation effects, but suggests that gas-phase water abundances fall at large AV. These results are important as they affect measures of the true water-vapor abundance in molecular clouds by highlighting the limitations of comparing measured water-vapor column densities with such traditional cloud tracers as (CO)-C-13 or (CO)-O-18," wrote G.J. Melnick and colleagues, Harvard-Smithsonian Center for Astrophysics (see also).

The researchers concluded: "These results also support cloud models that incorporate freeze out of molecules as a critical component in determining the depth-dependent abundance of water vapor."

Melnick and colleagues published their study in *Astrophysical Journal* (Distribution Of Water Vapor In Molecular Clouds. *Astrophysical Journal*, 2011;727(1):13).

For more information, contact G.J. Melnick, Harvard Smithsonian Center Astrophysics, 60 Garden St., Cambridge, MA 02138, United States..

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Record - 5

DIALOG(R)

Scientists at Harvard-Smithsonian Center for Astrophysics Target Astronomy,
Science Letter, p3236
Tuesday, April 5, 2011

TEXT:

According to recent research from Cambridge, United States, "We present results from a 100 ks XMM-Newton observation of the hot gas in the Virgo cluster elliptical galaxy NGC 4472. We find a surface brightness discontinuity similar to 21 kpc north of the nucleus, consistent with being a contact discontinuity between two moving fluids."

"We also detect a >60 kpc long ram-pressure stripped tail. The pressure across the discontinuity implies an infall velocity, $v(\text{infall})$, of $1000 \text{ km s}^{-1} < v(\text{infall}) < 2200 \text{ km s}^{-1}$ depending on what assumptions are made about the density and pressure of the external gas. We suggest that the NGC 4472 group is falling into a collapsing filament, which is itself falling into the Virgo cluster. The gas of a collapsing filament is rapidly decelerated as it crosses the standoff shock, but the apparent high velocity of infall for NGC 4472 could be simply due to the fact that the gravitating potential of the NGC 4472 group is unaffected by this shock. While the group falls through the shock its gas will be stripped as it passes through the stalled gas of the filament. Additionally, we find two sets of cool filamentary arms to the east and the southwest of the nucleus. One of the southwest arms is coincident with a sharp filament seen with Chandra. We interpret these arms as filaments of cool gas that have been driven out from the center of the galaxy by the buoyant evolution of a radio bubble," wrote R.P. Kraft and colleagues, Harvard-Smithsonian Center for Astrophysics (see also).

The researchers concluded: "The age of this outburst is similar to $10(8)$ yr assuming that the buoyant bubble rises with a velocity of similar to $0.4c(s) = 200 \text{ km s}^{-1}$; the energy of the outburst is a modest similar to $2 \times 10(56)$ erg."

Kraft and colleagues published their study in Astrophysical Journal (The Gas Dynamics Of Ngc 4472 Revealed By Xmm-newton. Astrophysical Journal, 2011;727(1):41).

For additional information, contact R.P. Kraft, Harvard Smithsonian Center Astrophysics, 60 Garden St., MS 4, Cambridge, MA 02138, United States..

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Record - 6

DIALOG(R)
Climate Change Policy Issues,
Congressional Testimony via FDCH,
Thursday, March 31, 2011

TEXT:
xfdt CLIMATE-CHANGE-POLICY sked

TESTIMONY

March 31, 2011

J. SCOTT ARMSTRONG

PROFESSOR

UNIVERSITY OF PENNSYLVANIA

HOUSE SCIENCE, SPACE AND TECHNOLOGY
CLIMATE CHANGE POLICY ISSUES

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Statement of J. Scott Armstrong Professor University of Pennsylvania

Kesten C. Green University of South Australia

Willie Soon Harvard-Smithsonian Center for Astrophysics

Committee on House Science, Space and Technology

March 31, 2011

Introduction

The Earth's climate clearly varies as can be seen from plots of temperature proxy data over hundreds, thousands, and hundreds-of-thousands of years, so the existence of climate change is not a matter of dispute. Global warming alarmist analysis is concentrated on the years from 1850, a period of widespread direct temperature measurement, increasing industrialization, and increasing concentrations of carbon dioxide in the atmosphere. As with other periods, during this period one can retrospectively identify upward trends and downward trends, depending on the starting and ending dates one chooses. Over the whole period that we examined, 1850 through 2007, global annual temperature proxy series constructed for the Intergovernmental Panel on Climate Change (IPCC) show a small upward trend of about 0.004C per year. There is some dispute over the veracity of the proxy temperature series (Christy, et al. 2010). For our analyses, however, we treat the data as if they were correct. In particular, we use the U.K. Hadley Centre's "best estimate" series, HadCRUt31 as described in Brohan et al. (2006). We approach the issue of alarm over dangerous manmade global warming as a problem of forecasting temperatures over the long term. The global warming alarm is not based on what has happened, but on what will happen. In other words, it is a forecasting problem. And it is a very complex problem.

To address this forecasting problem we first describe the basis of the scientific principles behind forecasting. We then examine the processes that have been used to forecast that dangerous manmade global warming will occur and the validation procedures used to demonstrate predictive

validity. We then summarize a validation study that we conducted. We limit our discussion to forecasting. Those who are interested in the relevant aspects of climate science can find summaries in Robinson, Robinson and Soon (2007) and in Idso and Singer (2009). Based on our analyses, especially with respect to the violations of the principles regarding objectivity and full disclosure, we conclude that the manmade global warming alarm is an anti- scientific political movement. In an ongoing study, we identified analogous situations and report on their forecasts and outcomes.

The basis of scientific forecasting

Research on proper forecasting methods has been conducted for roughly a century. Progress increased over the past four decades due to an emphasis among researchers on experiments that were designed to test the effectiveness of alternative methods under varied conditions. Forecasting research has led to many surprising conclusions. To make this knowledge useful to forecasters in all domains, I, along with an international and inter-disciplinary group of 39 co- authors and 123 reviewers, expert in various aspects of forecasting, summarized the evidence as a set of principles. A principle is a conditional action, such as ``forecast conservatively in situations of uncertainty``. There are now 140 forecasting principles. The principles are described and the evidence for them is fully disclosed in the Principles of Forecasting handbook (Armstrong 2001). The principles are also provided on the forecastingprinciples.com site (ForPrin.com), on which we invite researchers to contribute evidence either for or against the principles.

In practice, nearly everyone believes that their situation is different and that the principles do not apply. I suggest to such people that they conduct experiments for their own situation and publish their findings, especially if they contradict the principles, and by doing so advance the science of forecasting. There can never be enough situation-specific evidence for some people but, given the evidence that many common forecasting practices are invalid, it would be in unwise to reject the principles without strong evidence for doing so.

Conditions that apply in forecasting climate change

The global warming alarm is based on a chain of three linked elements, each depending on the preceding element and each element highly complex due to the number of variables and the types of relationships. It is much like a three-legged stool. Each leg involves much uncertainty (Idso and Singer 2009).

The alarm requires:

--a substantive long-term rise in global mean temperatures in the absence of regulations, serious net harmful effects due to global warming, and

--cost-effective regulations that would produce net beneficial effects versus alternatives such as doing nothing.

Effective policy-making requires scientific forecasts for all three elements. Without proper forecasts, there can be no sound basis for making policy decisions. Surprisingly, then, despite repeated appeals to global warming alarmists, we have been unable to find scientific forecasts for any of the three elements.

Of course, there have been many forecasts based on what we refer to as unaided expert judgment: judgments made without the use of evidence-based forecasting principles. For example, in 1896 the Swedish Nobel Prize winner in chemistry, Svante Arrhenius, speculated about the effect of increases in atmospheric carbon dioxide (CO₂) and concluded that higher concentrations would cause warming. His conclusion was drawn from an extrapolation of observational data². Arrhenius's idea attracted little attention at the time, perhaps because he expected benefits from warming, rather than an impending disaster. As noted, the forecasting principles provide advice about how to forecast given the conditions. Here the evidence yields a finding that is surprising to many researchers: use simple methods when forecasting in a complex uncertain situation. This was a central theme in my 1978 book on long-range forecasting. Those involved in the global warming alarm have violated the "simple methods" principle.

Audit of methods used to forecast dangerous manmade global warming

Kesten Green surveyed climate experts (many of whom were IPCC authors and editors) to find the most credible source for forecasts on climate change. Most respondents referred to the IPCC report and some specifically to Chapter 8, the key IPCC chapter on forecasting (Randall et al. 2007). Kesten Green and I examined the references to determine whether the authors of Chapter 8 were familiar with the evidence-based literature on forecasting. We found that none of their 788 references related to that body of literature. We could find no references that validated their choice of forecasting procedures. In other words, the IPCC report contained no evidence that the forecasting procedures they used were based on evidence of their predictive validity.

We then conducted an audit of the forecasting procedures using Forecasting Audit Software, which is freely available on forprin.com. Kesten Green and I independently coded the IPCC procedures against the 140 forecasting principles, and then we discussed differences in order to reach agreement.

We also invited comments and suggestions from the authors of the IPCC report that we were able to contact in the hope of filling in missing information. None of them replied with suggestions and one threatened to lodge a complaint if he received any further correspondence. We described the coding procedures we used for our audit in Green and Armstrong (2007).

We concluded from our audit that invalid procedures were used for forecasting global mean temperatures. Our findings, described in Green and Armstrong (2007), are summarized in Exhibit 1. Based on the available information, 81% of the 89 relevant principles were violated. There were an additional 38 relevant principles, but the IPCC chapter provided insufficient information for coding and the IPCC authors did not supply the information that we requested.

Much of the problem revolves around the use of computer modelers' scenarios as a forecasting method. As stated correctly by Trenberth (2007), a leading spokesperson for the IPCC researchers, the IPCC provides scenarios, not forecasts. Scenarios are not a valid forecasting method (Gregory Duran 2001), but simply descriptions of their authors' speculations about what might happen in the future.

Warming forecasts and polar bears

We also examined two forecasts that were developed to support proposed policy changes. The reports assumed that there would be global warming as predicted by the IPCC. We examined the two reports that presented forecasts in line with the stated goal, mentioned on the first page of the report ``to support US Fish and Wildlife Service Polar Bear Listing decision`` which we coded as a violation of objectivity. Our procedures were similar to those in our audit of the IPCC forecasts except that we also obtained coding by a climate scientist who has published papers on climate change in the Arctic. On average, these two reports violated 85% of the 90 relevant principles. For example, long-term forecasts were made using only five years of selected data.

One key violation was that they did not provide full disclosure of the data in their paper, and they refused our requests for the data. They also refused to answer our questions about key aspects of their procedures that were not fully described in their papers. They refused to provide peer review of our paper prior to publication. At our request, the editor of the journal invited them to provide commentary. They missed the deadline and our paper was published with commentary by other authors and with our replies to the commentary. We were surprised when their commentary appeared in the journal some months later without us having been offered an opportunity to respond. In their commentary, the polar bear scientists claimed ``every major point in Armstrong et al. (2008) was wrong or

misleading. You can read their commentary in Amstrup, et al. (2009) and form your own opinion.

Tests of predictive validity by global warming alarmists

For important problems, it is important to test the predictive validity of the forecasting methods used. Validation tests are normally done by simulating the conditions involved in making actual forecasts (called ex ante forecasts) by, for example, withholding some data and forecasting what that data will be. Thus, if one wanted to test the accuracy of a method for forecasting 50 years from now, one would make a series of 50-year-ahead forecasts using the method and one or more competitive alternative methods in order to compare the accuracy of the forecasts from the different methods. We were unable to find any ex ante comparisons of forecasts by the alarmists.

In the spirit of doing a systematic evaluation of forecasts, in 2007 I invited former Vice President Gore to join with me in a test as to the whether forecasts by manmade global warming alarmists would be more accurate than forecasts from a no-change model. Each of us would contribute \$10,000 to go to the winner's favorite charity. The period of the bet was to be 10 years so that I would be around to see the outcome. Note that this is a short time period, such that the probability of my winning is only about 70%, based on our simulations. Had we used 100 years for the term of the bet, I would have been almost certain to win. Mr. Gore eventually refused to take the bet (the correspondence is provided on theclimatebet.com). So we proceeded to track the bet on the basis of "What if Mr. Gore had taken the bet" by using the IPCC 0.03C per-year projection as his forecast and the global average temperature in 2007 as mine. The status of this bet is being reported on theclimatebet.com.

Claims of predictive validity by alarmists

The claim by alarmists that nearly all scientists agree with the dangerous manmade global warming forecasts is not a scientific way to validate forecasts. In addition, the alarmists are either misrepresenting the facts or they are unaware of the literature. International surveys of climate scientists from 27 countries, obtained by Bray and von Storch in 1996 and 2003, summarized by Bast and Taylor (2007), found that many scientists were skeptical about the predictive validity of climate models. Of more than 1,060 respondents, 35% agreed with the statement "Climate models can accurately predict future climates," while 47% percent disagreed. More recently, nearly 32,000 scientists have disputed the claim of "scientific consensus" by signing the "Oregon Petition"³.

Perhaps in recognition that alarmist claims of predictive validity cannot

sustain scrutiny, expressions of doubt about the alarm are often parried with an appeal to the so-called precautionary principle. The precautionary principle is an anti-scientific principle designed to silence people who have reached different conclusions. Alarmists, such as James Hansen of NASA, have even suggested publicly that people who reach different conclusions about global warming have committed crimes against the state (reported in Revkin 2008). Such attempts to suppress contrary evidence were ridiculed by George Orwell in his book 1984: The Ministry of Truth building was inscribed with the motto "Ignorance is truth." For a closer examination of the precautionary principle from a forecasting perspective, see Green and Armstrong (2009).

Experts' opinions about what will happen have repeatedly been shown by research to be of no value in situations that are complex and uncertain. In 1980 I surveyed the evidence on the accuracy of experts' judgmental forecasts and found that experts were no better at forecasting about complex and uncertain situations than were novices (Armstrong 1980). Bemused at the resistance to this evidence, I proposed my Seer-sucker theory: "No matter how much evidence exists that seers do not exist, seers will find suckers." More recently, Tetlock (2005) presented the findings of 20 years of research over the course of which he obtained over 82,000 forecasts from 284 experts on "commenting or offering advice on political and economic trends," which represented complex and uncertain problems. Consistent with earlier research, he found that the experts' forecasts were no more accurate than novices' and naive model forecasts.

Our validation test of IPCC forecasting model

We conducted a validation test of the IPCC forecast of 0.03C per-year increase in global mean temperatures. We did this starting roughly with the date used for the start of the Industrial Revolution, 1850. As it happens, that was also the start of the collecting of temperature from weather stations around the world. We used the U.K. Met Office Hadley Centre's annual average thermometer data from 1850 through 2007. Note that the IPCC forecast had the benefit of using these data in preparing the forecasts. Thus, it had an advantage over the no-change model.

To simulate the forecasting situation, we needed unconditional (ex ante) forecasts. These were obtained through 100-year forecasts for the years from 1850 through 2007. The period was one of exponentially increasing atmospheric CO₂ concentrations, which is what the IPCC modelers assumed for their "business as usual" model forecasts of 0.03C per-year increase in global mean temperatures. Relative forecasting errors are provided in Exhibit 3.

Note that the errors do not differ substantially in the short term (e.g.,

forecasting horizons from 1 through 10 years). As a consequence, the chances that I will win my 10-year bet with former Vice President Gore are not overwhelming. The IPCC model forecast errors for forecasts 91 to 100 years in the future, however, were 12.6 times larger than those for our evidence-based ``no change`` model forecasts. In an extension, we also examined a no-change model that used ten-year periods (instead of annual data) to forecast subsequent ten-year periods, updating this to make a forecast each year. The results were quite similar to those in exhibit 3.

Exhibit 3 shows relative errors, but it is also important for policy makers to look at absolute errors. Absolute errors for the no-change model are presented in Exhibit 4. The accuracy of forecasts from the no-change model are such that even perfectly accurate forecasts of global mean temperatures would not provide much help to policymakers. For example, the mean absolute errors for 50-year ahead no-change forecasts averaged only 0.24C. The alarmists claim that validation tests cannot be done because things have changed. Such claims are commonly, but illogically, made by people who believe that their situation is new or so different from other situations that they cannot learn from the past or from other domains.

Conclusions from our analysis of the procedures used to forecast alarming manmade global warming

Global warming alarmists have used improper procedures and, most importantly, have violated the general scientific principles of objectivity and full disclosure. They also fail to correct errors or to cite relevant literature that reaches conclusion that are unfavorable. They also have been deleting information from Wikipedia that is unfavorable to the alarmists` viewpoint⁴ (e.g., my entry has been frequently revised by them). These departures from the scientific method are apparently intentional. Some alarmists claim that there is no need for them to follow scientific principles. For example, the late Stanford University biology professor Stephen Schneider said, ``each of us has to decide what is the right balance between being effective and being honest.`` He also said ``we have to offer up scary scenarios`` (October 1989, Discover Magazine interview). Interestingly, Schneider had been a leader in the 1970s movement to get the government to take action to prevent global cooling. ClimateGate also documented many violations of objectivity and full disclosure committed by some of the climate experts that were in one way or another associated with the IPCC.

The alarmists` lack of interest in scientific forecasting procedures⁵ and the evidence from opinion polls (Pew Research Center 2008) have led us to conclude that global warming is a political movement in the U.S. and elsewhere (Klaus 2009). It is a product of advocacy, rather than of the scientific testing of multiple hypotheses.

Forecasts of outcomes of the manmade global warming alarmist movement

Using a process known as ``structured analogies,`` we predicted the likely outcome of the global warming movement. Our validation test of structured analogies method was provided in (Green and Armstrong 2009).

Global warming alarmism has the characteristics of a political movement. In an ongoing study, we have been searching for situations that are ``alarms over predictions of serious environmental harm that could only be averted at great cost.`` We have searched the literature, contacted various researchers -- especially those who believe in the global warming alarm. We have also posted appeals on email lists and on websites such as publicpolicyforecasting.com. We repeat this appeal here. To date, we have identified 26 analogous alarmist situations in the past. Kesten Green and I independently coded the alarms. We coded them for:

Forecasting method.

Did the proposed action involve substantive government intervention?
Accuracy of forecasts was rated on a -1 to +1 scale (-1 =wrong direction, 0=no, or minor, effect; +1=accurate)

Did substantive government intervention take place, or not?

Outcome of government policies to date on the value of their net benefit on a -1 to +1 scale

Persistence of government policies, to-date, on a 0 to 2 scale (0=reversed; 1=no or little change; 2=strengthened)

The descriptions include the following elements and references to sources of information:

Forecasts of impending catastrophe

Methods used to forecast the catastrophe

Actions called for (actions by government or by others)

Salient endorsements of the forecast by scientists and politicians

Challenges to the forecast

Outcomes of each conflict over the alarming forecast and calls for action, including forecast accuracy

We have posted full disclosure of our procedures at publicpolicyforecasting.com, and have sent announcements to websites and individual requests to people to comment. Thumbnail descriptions are available for nine of the 26 situations (indicated by italics in Exhibit 5) at publicpolicyforecasting.com.

Forecast of impending disaster: Based on a book, Rachel Carson's *Silent Spring*, DDT was claimed to be a dangerous cancer-causing chemical. Publication of the book was followed by what some called a national hysteria. The alarm over forecasts of DDT's harmful effects combined concerns about the health and wellbeing of people with concerns about other species. Papers by scientists purported to demonstrate harmful effects on people from DDT exposure.

Forecasting method: A scenario based on the author's speculations from various pieces of information about the effects of DDT. There was no direct evidence that DDT harmed people.

Actions called for: Governments were asked to ban exports of DDT and World Bank loans would be banned to countries that used DDT.

Endorsements of and challenges to the forecast: Leading scientists from institutions (such as Stanford University), politicians (such as Senator Al Gore,) and a report by a commission appointed by President Carter. The reports of the dangers were widely covered by the mass media.

Outcomes of the conflict: The U.S. Environmental Protection Agency (EPA) banned the use of DDT following an 80-day hearing in 1972. Europe and Africa, under pressure from international agencies, did too. No actual harmful effects on humans have been found to result from DDT. Millions of people have died from mosquito-borne diseases such as malaria. The EPA decision was based on two studies of animals: the first could not be replicated and the second used a flawed experimental design.

Here are our preliminary findings. None of these alarming forecasts were correct. Twenty-five of them called for government intervention. In the 23 cases where interventions occurred, none were effective. The policy changes caused harm in 20 of the cases. The findings will change as the project progresses and as we identify new analogies, provide more and better description of the analogies, and obtain codings from others, especially from experts in the various areas. We were not surprised by the outcomes, as none of the alarms were based on scientific forecasts. They typically began with stories and progressed from there with appeals to scientific support. Another reason that we were not surprised is that our findings had been anticipated by others. For example, after compiling a list of analogous situations (source), Julian Simon said, in 1990, "As soon as one predicted disaster doesn't occur, the doomsayers skip to another... why

don't [they] see that, in the aggregate, things are getting better? Why do they always think we're at a turning point or at the end of the road?" And considerably earlier, in 1830, Thomas Babington Macaulay concluded, "On what principle is it that when we see nothing but improvement behind us, we are to expect nothing but deterioration before us?"

As with our other publications related to climate change, we have received no funding, so we expect this study to drag on. The good news is that it will allow an opportunity for researchers to provide peer review and to suggest further improvements in our study - or, better, to conduct independent studies of analogies.

Recommendations

Efforts to forecast climate change should include those who have expertise in evidence-based forecasting methods. After all, public policy changes are avowedly implemented in the expectation that they will make things better in the future than they would otherwise have been.

To help ensure objectivity, government funding should not be provided for climate-change forecasting. Kealey (1996) summarized evidence on the dangers of bias in government-funded research. The government should instead rely on independent forecasters.

As we have noted, simple methods are appropriate for forecasting for climate change. Large budgets are therefore not necessary. Private individuals have been willing to invest much time and effort in examining the global warming alarm without external rewards. In fact, a number of them have engaged in research on the global warming alarm at great personal cost. The cost has been at least in part because governments have almost universally sponsored scientists who have supported the manmade global warming alarm and these scientists have, as a consequence, attained considerable power over learned societies, journals, funding, and universities. With the power has come influence over the news media that, by their nature, are attracted to stories such as environmentalist alarms that grab the attention of audiences.

The burden of proof should be on government to provide convincing scientific proof before increasing the burden of laws and regulations. It is not defensible to use anti-scientific procedures such as asking scientists or scientific organizations to "vote" on policy recommendations, even when the experts are provided with excellent information. This is especially so given the evidence that that expert opinions are useless for complex problems such as climate change.

Instead government should look for strict standards of objectivity in the

evidence. Thus we suggest that government should address each of the legs on the three-legged stool involving climate change, effects of climate change, and outcomes of alternative proposed policy changes, including ``don't just do something, stand there!``

The following should be included for each leg:

evidence, rather than experts' opinions,

research from scientists with diverse views,

research that involves testing of multiple reasonable hypotheses,

use of scientific (evidence-based) forecasting methods

full disclosure of data and research methods,

criticism, replications, and extensions, and

testimony from scientists who have nothing to gain from the acceptance of their evidence.

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Record - 7

DIALOG(R)

NASA Announces 2011 Carl Sagan Fellows,

NewsPress,

Thursday, March 31, 2011

TEXT:

NASA has selected five potential discoverers as the recipients of the 2011 Carl Sagan Postdoctoral Fellowships, named after the late astronomer. The Carl Sagan Fellowship takes a theme-based approach, in which fellows will focus on compelling scientific questions, such as "Are there Earth-like planets orbiting other stars?"

Sagan once said, "Somewhere, something incredible is waiting to be known," which is in line with the Sagan Fellowship's primary goal: to discover and characterize planetary systems and Earth-like planets around other stars. Planets outside of our solar system are called exoplanets. The fellowship also aims to support outstanding recent postdoctoral scientists in conducting independent research broadly related to the science goals of NASA's Exoplanet

Exploration Program.

Previous Sagan Fellows have contributed significant discoveries in exoplanet exploration. including: the first characterizations of a super-Earth's atmosphere using a ground-based telescope; and the discovery of a massive disk of dust and gas encircling a giant young star, which could potentially answer the long-standing question of how massive stars are born.

"The Sagan Fellowship program seeks to identify the most highly qualified young researchers in the field of exoplanets. Nowhere is the dynamism of this young branch of astronomy demonstrated more dramatically than by the intellectual quality and enthusiasm of these five new Sagan Fellows," said Charles Beichman, executive director of the NASA Exoplanet Science Institute at the California Institute of Technology in Pasadena.

"These scientists are certain to be leaders of this exciting and rapidly growing field for many years to come."

The program, created in 2008, awards selected postdoctoral scientists with annual stipends of approximately \$64,500 for up to three years, plus an annual research budget of up to \$16,000. Topics range from techniques for detecting the glow of a dim planet in the blinding glare of its host star, to searching for the crucial ingredients of life in other planetary systems.

The 2011 Sagan Fellows are:

-- David Kipping, who will work at the Harvard-Smithsonian Center for Astrophysics, Cambridge, to combine theory and observation to conduct a search for the moons of exoplanets.

-- Bryce Croll, who will work at the Massachusetts Institute of Technology, Cambridge, Mass., to characterize the atmospheres of both large and small exoplanets using a variety of telescopes.

--Wladimir Lyra, who will work at NASA's Jet Propulsion Laboratory, Pasadena, Calif., to study planet-forming disks and exoplanet formation.

-- Katie Morzinski, who will work at the University of Arizona, Tucson, to commission and employ high-contrast adaptive optics systems that will directly image Jupiter-like exoplanets.

-- Sloane Wiktorowicz, who will work at the University of California, Santa Cruz to use a technique called optical polarimetry to directly detect exoplanets.

NASA has two other astrophysics theme-based fellowship programs: the

Einstein Fellowship Program, which supports research into the physics of the cosmos, and the Hubble Fellowship Program, which supports research into cosmic origins. The Sagan Fellowship Program is administered by the NASA Exoplanet Science Institute as part of NASA's Exoplanet Exploration Program at JPL in Pasadena, Calif. The California Institute of Technology manages JPL for NASA.

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Record - 8

DIALOG(R)

A learning cycle for all students: modifying the 5E instructional model to address the needs of all learners.

Duran, Emilio, Duran, Lena, Haney, Jodi, Scheuermann, Amy
Science Teacher, v78, n3, p56
Tuesday, March 1, 2011

TEXT:

[ILLUSTRATION OMITTED]

"Science in our schools must be for all students: All students, regardless of age, sex, cultural or ethnic background, disabilities, aspirations, or interest and motivation in science, should have the opportunity to attain high levels of scientific literacy."

--National Science Education Standards (NRC 1996, p. 20)

The National Science Education Standards are designed to provide a vision of scientific literacy for all students--regardless of age, race, ethnic background, English-language proficiency, socioeconomic status, disability, or giftedness. The Standards delineate what all students should know and be able to do by the time they graduate high school (NRC 1996). But how do we, as teachers, provide each student with the opportunity to attain scientific literacy without compromising these Standards?

One of the most powerful strategies in science instruction--which aligns with the Standards--is the use of learning cycles and instructional models. The Biological Sciences Curriculum Study (BSCS) 5E--Engage, Explore, Explain, Elaborate, and Evaluate--instructional model is perhaps the most popular and widely used in the classroom (BSCS and IBM 1989). This model has been shown to have a positive impact on science education (Bybee et al. 2006) and is constantly being refined as new research emerges to support its effectiveness.

In this article, we suggest modifying the 5E model by inserting a conscious pause in the learning cycle--what we call the Express phase--to assess and ensure that all students are progressing adequately through the early phases of the cycle.

Ultimately, this revised cycle enables all learners to meet the Standards addressed in a particular lesson by providing differentiated opportunities.

Modifying the model

One of the most widely accepted principles in science learning is the idea that students must be provided the opportunity to construct their own knowledge and understanding (Yager 2000). In this student-centered environment, the use of learning cycles in the classroom helps students construct concepts, develop reasoning patterns, (Lawson 2001) and connect their new knowledge to real-life situations (Blank 2000). The 5E instructional model is supported by current cognitive research on learning (Bransford, Brown, and Cocking 1999).

[ILLUSTRATION OMITTED]

Many have modified and adjusted this model to meet the needs of teachers and students in the classroom. For example, one modification incorporates another "E"--E-search--by infusing technology in each phase (Chessin and Moore 2004). Another adds analogies to each phase to motivate students and clear up misconceptions (Orgill and Thomas 2007). And in the 7E model (Eisenkraft 2003), the Engage phase is expanded into two components--Elicit and Engage--and the Elaborate and Evaluate phases are divided into three components--Elaborate, Evaluate, and Extend. This 7E model emphasizes eliciting prior knowledge and ensures opportunities for the transfer of learning.

Our modification to the 5E model seeks to confirm that all students are progressing adequately through the learning cycle. Specifically, our version is based on the need to encourage evaluation throughout the entire cycle and not just during the Evaluate phase (Volkman and Abell 2003).

This modification involves a conscious pause in the learning cycle--the Express phase--which allows the teacher to conduct active formative assessment of learning after the Explain phase (Figure 1, p. 57). The goal is to inform and guide additional differentiated instruction during the Elaborate phase. This type of assessment is different than the sometimes informal and anecdotal assessment that occurs during the Explain component.

The Express phase

We often hear teachers say the following: "I don't know why students did so poorly on the test; they participated in the exploration and seemed to enjoy themselves." To address this situation, the Express phase provides an opportunity for all students to safely express their ideas about the teaching and learning that has occurred at this point in the learning cycle. The teacher also confirms whether students are mastering the content or expected outcome.

Furthermore, this phase provides an opportunity to assess whether misconceptions identified during the Engage phase have been corrected during the Explore and Explain phases. In that regard, the Express phase allows teachers to analyze and assess their own teaching effectiveness. Based on each student's response in this phase, the teacher can provide a three-tiered, student-specific, and differentiated Elaborate phase to meet each student's individual needs. This ensures that all learners (e.g., high achievers, average achievers, low achievers, English language learners, and special needs students) have encountered and mastered the intended lesson outcomes before the formal or final evaluation is given (Figure 1).

What it looks like

In our experience, formative assessment probes are a powerful and effective way to carry out the Express phase (Keeley 2005; Keeley, Eberle, and Farrin 2005). These probes uncover students' ideas and provide the teacher with specific feedback to inform further instruction. The probes are especially helpful because they incorporate content from the Standards and findings from student misconceptions research--they ultimately force students to confront their own thinking and misconceptions.

Answers to the assessment probes will vary according to student readiness, learning profile, and interests. The teacher then uses these responses to design three-tiered, differentiated instruction that is optimized for each student. Though these tiered activities focus on the same content and skills, they provide different challenges and levels of complexity.

Typically, the majority of students (Tier II) proceed adequately through the learning cycle and are ready for the Elaborate phase to develop deeper understanding. But perhaps a group of gifted students (Tier III) needs a more challenging Elaborate phase to keep them deeply engaged in the lesson. And perhaps students with limited English-language proficiency (Tier I) require a modified activity during this phase that accounts for their cultural background and level of language proficiency.

Depending on the results of the Express phase, students with disabilities that have Individualized Education Plans (also Tier I) may need another Explore phase with similar or adjusted activities and content, perhaps

followed by another Explain phase. The goal is to differentiate instruction and address the needs of each student so that ultimately they succeed during the summative assessment (Evaluate phase).

It is important to note that tier-placing is content-specific. In other words, a student in Tier II during the photosynthesis unit might be in Tier III in the evolution unit. However, flexible grouping and cooperative teaching strategies should be used to deal with struggling students so they do not feel like "permanent members" of the Tier I group.

An example

During the Engage phase in a lesson on the role of the carbon cycle in photosynthesis (see "On the web"), students watch a video called Minds of Their Own Video: Seeds to Logs (Harvard-Smithsonian Center for Astrophysics 1995). In the first segment of this video, students are asked how they think a large piece of a log was formed, or "Where did all that 'stuff' come from?"

After watching this portion of the video, students complete a "Think-Pair-Share" activity. First, they think about the question individually for several minutes, then pair up to discuss and reconstruct their ideas, and finally, share their ideas through whole-group discussion.

During the Explore phase, students complete a lab exercise that involves planting, growing, and observing seeds in a closed system. They weigh the system periodically over 12 days and record observations accordingly. Students present their data and respond to the focus question: "Where did all the 'stuff' to make the new plants come from?"

During the Explain phase, students present their lab data and discuss their ideas regarding the focus question. The teacher then leads a discussion about the carbon cycle and the role it plays in photosynthesis.

In the Express phase, students are given the "Giant Sequoia Tree" assessment probe (Keeley, Eberle, and Farrin 2005). This probe is designed to assess whether students comprehend the counterintuitive concept that a gas (carbon dioxide) contributes most of the mass to the plant's structure. Students look at a picture of a giant sequoia tree and answer the question: "Where did most of the matter that makes up the wood and the leaves of this huge tree originally come from?" Students circle the best answer in a multiple-choice question and explain their thinking.

According to the authors of this assessment probe, students with novice level understanding (Tier I) may not believe that air is made up of matter or that it has mass. Tier II students may use models of atoms as they

communicate their understanding of photosynthesis, though they may still have a difficult time expressing that a gas (carbon dioxide) contributes mass to the reaction. Tier III students may demonstrate an understanding that gas contributes mass, but may also reveal "intuitive" explanations that most of the mass comes from water or soil.

After students' levels of understanding are identified, they are matched to the appropriate Elaborate phase activity. Tier I students, and Tier II and III students if deemed appropriate by the teacher, are provided additional opportunities to explore the concept that gases have mass (e.g., dry ice teacher demonstrations), and then proceed to a computer simulation showing the flow of carbon through the environment (e.g., The Carbon Cycle Game; see "On the web").

Tier II students design and conduct an experiment to determine the role of carbon dioxide in plant photosynthesis using elodea plants and bromothymol blue indicator.

Tier III students first work alongside the Tier II students to assist in the design of the experiments; after the designs are complete, these students go off and work in small teams to develop computer animations using open-source educational software, such as Alice (see "On the web"), to illustrate the carbon cycle's role in photosynthesis.

Finally, during the Evaluate phase, all students are given a short multiple-choice assessment of the related concepts, written across Bloom's levels of thinking. They then receive an additional assessment probe--"Seedlings in a Jar" (Keeley 2005). During this probe, students receive a prompt (with a picture) explaining that a 12-day experiment was conducted in which five seeds were planted in a container of soil, watered, and placed in the light. The container was sealed after watering. Plants sprouted and grew as a result.

Students must determine how much the container weighs after the 12 days of growth, in comparison to how much it weighed before growth, and explain their responses. This probe can be modified to have students include concepts learned during the lesson sequence in their answer.

Conclusion

Learning cycles are research-based teaching tools that can help students explore concepts in science and assist teachers as they plan lessons intended to facilitate meaningful and deep understanding of the concepts being taught. There is a growing body of empirical evidence that the 5E instructional model positively affects mastery of subject matter, scientific reasoning, and interest and attitudes toward science (Bybee et al. 2006). However, the model should be a reference for teachers--not a

rigid template.

In this article, we have added a new formative assessment phase--Express--to monitor the progress of individual students and their depths of understanding through the cycle. Here, students express their ideas and confront their thinking when answering formative assessment probes. The phase also reinforces a student-centered approach by showing students that their ideas are fully valued and used when designing instructional strategies.

More important, the results from the Express phase are used to design optimal learning opportunities for individual students based on their current understanding. This phase is different than the ongoing informal evaluation that occurs during the other phases and distinct from the summative Evaluate phase at the end of the cycle.

Specifically, the Express phase is based on student-"expressed" performance that leads into a three-tiered, student-specific, and differentiated Elaborate phase. Teachers can use the Express phase as a self-analysis of their teaching effectiveness by monitoring how students progress through the learning cycle.

A comment from one of the teachers who received professional development on this revised 5E model and had an opportunity to implement it in the classroom summarizes our initial goal: "I have completely changed my teaching strategies so that each [student] has a fair and equal opportunity to learn without being bored or not understanding."

Naturally, many teachers will need additional training to effectively and seamlessly incorporate this modified model in their classrooms--but this new phase can have a profound effect on science learning for all.

Keywords: Carbon cycle at www.scilinks.org Enter code: TST031101

The tiers, explained.

* Tier I: Novice learning level

* Tier II: On-target learning level

* Tier III: Advanced learning level

On the web

Alice, Carnegie Mellon University: www.alice.org

Northwest Ohio Center for Excellence in STEM Education's 6E lesson on the

carbon cycle's role in photosynthesis: http://cosmos.bgsu.edu/resources/6E_Model.htm

The Carbon Cycle Game: www.windows.ucar.edu/earth/climate/carbon_cycle.html

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FIGURE 1

5E model with Express phase and modified Elaborate phase.

Adapted from Bybee et al. 2006.

Phase	Summary
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Engage	The teacher accesses students' prior knowledge and helps them become engaged in a new concept through the use of short activities that promote curiosity and elicit prior knowledge. The activity should make connections between past and present learning experiences, expose prior conceptions, and organize students' thinking toward the learning outcomes of current activities.
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Explore	Explore experiences provide students with a common base of activities within which current concepts, misconceptions, processes, and skills are identified and conceptual change is facilitated. Learners may complete lab activities that help them use prior knowledge to generate new ideas, explore questions and possibilities, and design and conduct a preliminary investigation.
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Explain	The Explain phase is initiated when students have a distinctive opportunity to articulate their own understanding of the concepts encountered during the lesson cycle thus far. During this phase, the teacher helps focus students' attention on a particular aspect of their phase or exploration experiences by providing scientific explanations, introducing important vocabulary, or discussing
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and clarifying misconceptions. This phase provides opportunities for teachers to introduce a concept, process, or skill that capitalizes on the student explanations and experiences from the Explore or Engage parts of the lesson.

Express The Express phase provides active formative assessment of learning that informs and guides additional differentiated instruction during the Elaborate phase.

Elaborate Teachers challenge and extend students' conceptual understanding and skills. Through new experiences- in a three-tiered, differentiated instruction model-students develop deeper and broader understanding, more information, and adequate skills. Students apply their understanding of the concept by conducting additional activities.

Evaluate The Evaluate phase encourages students to assess their understanding and abilities and provides opportunities for teachers to evaluate student progress toward achieving the educational objectives.

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Record - 9

DIALOG(R)

Bewitching moons.

Braffman-Miller, Judith

USA Today (Magazine), v139, n2790, p50(3),

Tuesday, March 1, 2011

TEXT:

[ILLUSTRATION OMITTED]

EARTH'S MOON is a luminous silver-white charm--a gleaming, beckoning object, as well as an ancient symbol for that which is feminine. As the largest and brightest object in the star-splattered night sky, it long has inspired wonder and curiosity. It also is associated with love and frequently serves as a sign of elusive beauty. Yet, it is the only natural body beyond our Earth that we have set foot upon.

A moon can be defined as a natural body that has attained orbit around a planet. It is kept in its orbit by the force of the host planet's gravity

and the gravity of the moon itself. Some planets host a moon and some do not. There are a few theories about where Earth's moon came from and how it managed to form. The most credible is termed the giant impact theory, which sometimes is termed the Big Whack or Big Splash theory by astronomers when they are in a playful frame of mind. These impish nicknames arise from the fundamental basis of the theory: a Mars-sized protoplanet, named Theia by astronomers, crashed into the primordial Earth billions of years ago. The collision caused part of the Earth's crust to be blasted off into space. Some of this debris was captured into Earth-or-bit, where it eventually was pulled together by the force of gravity to become our moon.

Most of the Big Whack theory first was suggested back in 1975 by William K. Hartmann and Donald R. Davis of the Planetary Science Institute in Tucson, Ariz. Their theory is based on geological evidence gathered by Apollo astronauts when they made their historic journey to the moon in July 1969. Oxygen isotopes embedded in moon rocks proved to be almost identical to those on Earth. Also, other pieces of evidence indicate that the moon is made up of, at least in part, the same material as Earth's mantle.

Our closest--and very bewitching--companion, however, hardly is unique in the cosmic scheme of things. More than 100 moons circle planets in our solar system. Most of them are frozen bodies, composed of ices and rocky material. Yet, a few may not be lifeless after all. In particular, Europa of Jupiter may harbor a subsurface ocean beneath its cracked icy crust, warmed by tidal flexing into a life-loving, liquid water state. Primitive forms of aquatic life may be swimming around in Europa's still-hypothetical global, subsurface ocean. In addition, the second largest moon in our solar system, Titan of Saturn, possesses an environment hauntingly akin to that of our Earth before life developed here (prebiotic). Large raindrops of liquid hydrocarbons fall to the surface of this cold, tortured moon, creating seas and lakes composed of liquid methane and ethane that play the same role as water on our Earth. It is possible that life, as we do not know it, can develop using liquids other than water.

Meanwhile, the largest moon in our solar system, Ganymede of Jupiter, is bigger than the planet Mercury. Like its sister moon Europa, Ganymede may harbor a global ocean of liquid water beneath its crust of icy rock. Likewise, a tiny frozen moon, Enceladus of Saturn, sprays out geysers of ammonia-laced water from its so-called "tiger stripes." Hence, Enceladus may bear water beneath its devastatingly frigid crust of ice.

We have known since 1995 that our solar system is not the only game in town. There are hundreds of extrasolar planets circling stars other than our own sun. Astronomers believe that our Milky Way could be bursting with billions of planets--and an even greater number of moons. Some of these moons could possess the precious, mysterious recipe that allows them to

become bubbling cauldrons of life. "Moons form so commonly in our solar system that it would be ludicrous to think that Ibis is unique," indicates Peter Ward, coauthor of *Rare Earth*.

As far back as ancient Greece, humanity has suspected that there are other solar systems in the universe in addition to our own. This speculation has not always been met with open arms by the powers that be. For instance, in 1584, when the Catholic monk Giordano Bruno asserted that there were "countless suns and countless earths all rotating around their suns," he was accused of heresy, and burned at the stake. Our Earth was booted out of its exalted status as the most important entity in the universe early in the 16th century, when Nicolaus Copernicus calculated that our planet orbits the sun, instead of the other way around. His revolutionary insight, although reluctantly accepted, shattered the traditional Judeo-Christian dogma that we and our planet hold a special, central place in the cosmos.

Astronomers are discovering extrasolar planets at a frenetic pace. In the 1990s, they uncovered about two planets every year. For most of the past decade, however, the rate has accelerated to a pair per month. Today, extrasolar planets are being discovered on an almost daily basis.

Astronomers are on the verge of finding an Earthanalog--a small rocky planet that is just the right distance from its star for an abundance of liquid water to exist--and where there is water, there is the possibility of life.

In our own solar system, moons are becoming primary targets of future space missions. Yet, when we look beyond our own extended solar family, it only is the extrasolar planets that astronomers have been able to detect so far. However, contends David Kipping, a predoctoral fellow at the Harvard-Smithsonian Center for Astrophysics, "I think exomoons are just as interesting as exoplanets."

Our solar system has eight planets (sorry, Pluto) and 170 moons (at last count). Most of these moons are frigid, barren rocks. However, as we have noted, a few of these icy baubles may be sanctuaries for some sort of living material. Other stellar systems very well may have similar numbers of planets and moons, and a subgroup of these bodies could dwell at just the right "Goldilocks" distance from their star for liquid water to exist. "There may be just as many habitable moons as habitable planets in our galaxy," Kipping maintains.

[ILLUSTRATION OMITTED]

Astronomers have considered how these enticing extrasolar moons might be detected. These modes of detection usually demand a chance, fortuitous alignment of parent star, extrasolar planet, and moon--although Kipping and his colleagues are proposing an alternative to this chancy mode of

detection that should increase the odds of astronomers finally bagging an exomoon. Their new method depends on the careful observation of a transiting planet. Just as a witch flies across the luminous face of our moon on her broomstick, a transiting extrasolar planet crosses in front of the face of its star.

"If a transiting planet has a moon, it will cause a wobble in the planet's orbit," Kipping explains. The much sought-after wobble shows itself as an alteration in the time between two transits, which is how long it takes for the extrasolar planet to complete a single orbit around its star.

Astronomers have, in the past, searched for transit timing variations (TTVs), but so far no sign of a remote exomoon has been spotted.

One of the primary difficulties is that several things can cause the TTVs, although Kipping's group has devised a method to avoid this conundrum. They have demonstrated that, by measuring alterations in the speed at which an extrasolar planet floats in front of its star's transit timing duration (TTD)--a moon hunter unambiguously can detect the desired exomoon. Furthermore, by measuring the two effects--TTVs and TTDs--and combining the variations, an astronomer can calculate the moon's orbital period and mass.

Lisa Kaltenegger, also of the Harvard-Smithsonian Center for Astrophysics, has written a paper discussing whether any definitive statements about the habitability of such moons can be made. Her contention is yes--provided astronomers are using the right technologies, such as the 6.5-meter instrument on the upcoming James Webb Space Telescope, a large, infrared optimized instrument scheduled for launch in 2014. In addition, the exomoon in question should be close to maximum separation so that astronomers are able to make the necessary measurements to characterize it.

Life on moons

Caleb Scharf, an astrobiologist at Columbia University, suggests that exomoons circling giant hot Jupiter-like planets could be life-supporting oases in the otherwise hellish orbits of such masting planets. "They might be the most likely places to find life in the galaxy." Scharf believes that life could thrive much farther away from stars than scientists ever supposed. This is, of course, relevant news for astrobiologists, who study what life might be like beyond our own planet.

Gravitational interactions among moons can be strong. The gravitational interactions among Europa and its sister moons--orbiting very close to Jupiter and each other--is what provides the energy and warmth necessary to sustain a subsurface global ocean of liquid water beneath a cracked icy crust.

This "tidal heating" makes Jupiter's four Galilean moons much balmer than

astronomers would expect from the relatively meager quantity of sunlight bathing them, according to Scharf: "Exactly the same thing will happen in moon systems around extrasolar gas giants." His calculations have revealed that extrasolar moons as large as Earth could undergo at least 100 times as much heating as Io, the innermost Galilean moon. He thinks this combination of tidal heating and warmth from the parent star could keep such fortunate exomoons snug enough for water to remain a life-friendly liquid. "I believe it could double the size of the habitable zone around a star."

Kaltenegger adds, "Habitable-zone exomoons may be detected in the near future with missions like Kepler and could be orbiting their planet at a distance that allows for spatially separate transit events."

NASA's planet-hunting Kepler space telescope--that astronomers hope will spot Earthanalogs circling other stars--also might be capable of discovering those very elusive and possibly life-friendly exomoons that dwell in other solar systems. Kepler's main mission is to monitor thousands of stars, searching for telltale dips in brightness as orbiting planets float in front of them in transit events. The orbiting observatory was launched in March 2009 aboard a Delta-2 rocket.

It is possible for Earth-bound observatories, and some space-borne telescopes, such as Spitzer and Hubble, to bag Jupiter-sized extrasolar planets. Kepler, however, is the first telescope designed especially to detect alien worlds close to Earth in size. Astronomers have studied a large number of hypothetical planetary systems, and discovered that a bouncy Saturn-like planet, which would be low in mass for its size, provides the best of all possible chances for detecting a moon. A Saturn-like planet is preferable to a heavier Jupiter-like world. This is because planets such as Saturn are very large, and are capable of blotting out a great amount of light as they float in front of their parent star--however, because Saturn-like planets are very light, they will wobble much more than a more massive planet such as Jupiter.

"For the first time, we have demonstrated that potentially habitable moons up to hundreds of light-years away may be detected with current instrumentation," Kipping asserted in Space News. His team found that habitable exomoons down to 0.2 times the mass of Earth are spied easily by Kepler. "As we ran the simulations, even we were surprised that moons as small as one-fifth of the Earth's mass could be spotted.

Kepler will look for Earth-mass habitable exomoons around 25,000 stars up to 500 light-years away from our sun. "It seems probable that many thousands, possible millions, of habitable exomoons exist in the galaxy and now we can start to look for them," Kipping concludes.

Judith Braffman-Miller is a freelance journalist.

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Record - 10

DIALOG(R)

Astronomy lecture,

Brian Hall,

Public Opinion (Chambersburg, PA)

Monday, March 28, 2011

TEXT:

March 28 –

- Astronomy lecture: A Harvard professor of astronomy will present the annual Kirkland/Spizuoco Memorial Science Lecture at 7:30 p.m. Wednesday at Shippensburg University.

Robert Kirshner, who is also an associate director of the Harvard-Smithsonian Center, is one of this world's few experts on the size, shape and speed of the universe. Kirshner has authored more than 200 research papers and is also the author of "The Extravagant Universe: Exploding Stars, Dark Energy, and the Accelerating Cosmos."

His free program in the H. Ric Luhrs Performing Arts Center is titled "Dark Energy and the Accelerating Universe: Einstein's Blunder Undone."

The annual lecture is conducted in memory of Dr. Gordon L. Kirkland Jr. and Dr. Joseph Spizuoco, who both died in 1999. The series was started to honor the two long-time faculty members for their dedication and commitment to SU students and to their academic fields of biology and physics.

Brian Hall can be reached at 262-4811 or bkhall@publicopinionnews.com.

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Wolbach Library: CfA in the News ~ Week ending 10 April 2011

1. **Newly Merged Black Hole Eagerly Shreds Stars**, Fars News Agency (Iran), Sunday, April 10, 2011
2. **Two Dying Stars Reborn as One**, Cihan News Agency, Saturday, April 9, 2011
3. **NASA's WISE mission discovers 'horseshoe' asteroid**, Hindustan Times, Saturday, April 9, 2011
4. **Qatar steady as region shakes**, Haroon Siddiqui Toronto Star, Toronto Star, v2011040816035232, ONT ed, pA14, Friday, April 8, 2011
5. **Signs of mining may lead to alien-life**, Korea Times, Tuesday, April 5, 2011
6. **'Two' white dwarf stars 'to collide and become one'**, Hindustan Times, Thursday, April 7, 2011
7. **Look for signs of mining in asteroid belts to find alien life**, say scientists, Hindustan Times, Tuesday, April 5, 2011
8. **Mine of alien evidence**, MX (Australia), 1 - Melbourne ed, p11, Tuesday, April 5, 2011
9. **Miner signs of alien life**, Brisbane News (Australia), 1 - BRIS ed, p10, Tuesday, April 5, 2011
10. **Mine of alien evidence ET HUNTING**, MX Sydney (Australia), 1 - SYD ed, p11, Tuesday, April 5, 2011

Record - 1

DIALOG(R)

Newly Merged Black Hole Eagerly Shreds Stars,
Fars News Agency (Iran),
Sunday, April 10, 2011

TEXT:

A galaxy's core is a busy place, crowded with stars swarming around an enormous black hole. When galaxies collide, it gets even messier as the two black holes spiral toward each other, merging to make an even bigger gravitational monster.

Once it is created, the monster goes on a rampage. The merger kicks the black hole into surrounding stars. There it finds a hearty meal, shredding and swallowing stars at a rapid clip. According to new research by Nick Stone and Avi Loeb (Harvard-Smithsonian Center for Astrophysics), upcoming sky surveys might offer astronomers a way to catch a gorging black hole "in the act."

Before the merger, as the two black holes whirl around each other, they stir the galactic center like the blade of a blender. Their strong gravity warps space, sending out ripples known as gravitational waves. When the black holes merge, they emit gravitational waves more strongly in one direction. That inequality kicks the black hole in the opposite direction like a rocket engine.

"That kick is very important. It can shove the black hole toward stars that otherwise would have been at a safe distance," said Stone.

"Essentially, the black hole can go from starving to enjoying an all-you-can-eat buffet," he added.

When tidal forces rip a star apart, its remains will spiral around the black hole, smashing and rubbing together, heating up enough to shine in the ultraviolet or X-rays. The black hole will glow as brightly as an exploding star, or supernova, before gradually fading in a distinctive way.

Importantly, a wandering, supermassive black hole is expected to swallow many more stars than a black hole in an undisturbed galactic center. A stationary black hole disrupts one star every 100,000 years. In the best-case scenario, a wandering black hole could disrupt a star every decade. This would give astronomers a much better opportunity of spotting these events, particularly with new survey facilities like Pan-STARRS and the Large Synoptic Survey Telescope.

Catching the signal from a disrupted star is a good start. However, astronomers really want to combine that information with gravitational wave data from the black hole merger. The Laser Interferometer Space Antenna (LISA), a future mission designed to detect and study gravitational waves, could provide that data.

Gravitational wave measurements yield very accurate distances (to better than one part in a hundred, or 1 percent). However, they don't provide precise sky coordinates. A star's tidal disruption will let astronomers pinpoint the galaxy containing the recently merged black-hole binary.

By correlating the galaxy's redshift (a change in its light that's caused by the expanding universe) with an accurate distance, astronomers can infer the equation of state of dark energy. In other words, they can learn more about the force that's accelerating cosmic expansion, and which dominates the cosmic mass/energy budget today.

"Instead of 'standard candles' like supernovae, the black hole binary would be a 'standard siren.' Using it, we could create the most accurate cosmic 'ruler' possible," stated Loeb.

Finding a merged black hole also would allow theorists to explore a new regime of Einstein's general theory of relativity.

"We could test general relativity in the regime of strong gravity with unprecedented precision," said Loeb.

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Record - 2

DIALOG(R)

Two Dying Stars Reborn as One,

Cihan News Agency,

Saturday, April 9, 2011

TEXT:

Mukremin Kilic (Harvard-Smithsonian Center for Astrophysics), lead author on the paper announcing the discovery, said that these stars had already lived a full life. When they merged, they will essentially be 'reborn' and enjoy a second life.

Out of the 100 billion stars in the Milky Way, only a handful of merging white dwarf systems is known to exist. Most were found by Kilic and his colleagues. The latest discovery will be the first of the group to merge and be reborn.

Meanwhile, the newly identified binary star (designated SDSS J010657.39 - 100003.3) is located about 7,800 light-years away in the constellation Cetus. It consists of two white dwarfs, a visible star and an unseen companion whose presence is betrayed by the visible star's motion around it. The visible white dwarf weighs about 17 percent as much as the Sun, while the second white dwarf weighs 43 per cent as much. Astronomers believe that both are made of helium.

On the other hand, the two white dwarfs orbit each other at a distance of 140,000 miles - less than the distance from the Earth to the Moon. They whirl around at speeds of 270 miles per second (1 million miles per hour), completing one orbit in only 39 minutes.

The fate of these stars is already sealed. Because they wheel around so close to each other, the white dwarfs stir the space-time continuum, creating expanding ripples known as gravitational waves. Those waves carry

away orbital energy, causing the stars to spiral closer and closer together. In about 37 million years, they will collide and merge.

When some white dwarfs collide, they explode as a supernova. However, to explode the two combined have to weigh 40 percent more than our Sun. This white dwarf pair isn't heavy enough to go supernova. Instead, they will experience a second life. The merged remnant will begin fusing helium and shine like a normal star once more. We will witness starlight reborn.

This binary white dwarf was discovered as part of a survey program being conducted with the MMT Observatory on Mount Hopkins, Ariz. The survey has uncovered a dozen previously unknown white dwarf pairs. Half of those are merging and might explode as supernovae in the astronomically near future.

The paper on this newfound binary star will be published in the Monthly Notices of the Royal Astronomical Society and is available online. Kilic's co-authors are Warren Brown and Scott Kenyon (Smithsonian Astrophysical Observatory); Carlos Allende Prieto (Instituto de Astrofísica de Canarias); J. Andrews (Columbia Astrophysics Laboratory); Scot Kleinman (Gemini Observatory); and K. Winget, D. Winget, and J. Hermes (University of Texas at Austin).

Headquartered in Cambridge, Mass., the Harvard-Smithsonian Center for Astrophysics (CfA) is a joint collaboration between the Smithsonian Astrophysical Observatory and the Harvard College Observatory. CfA scientists, organized into six research divisions, study the origin, evolution and ultimate fate of the universe.

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Record - 3

DIALOG(R)
NASA's WISE mission discovers 'horseshoe' asteroid,
Hindustan Time,
Saturday, April 9, 2011

TEXT:

Washington, April 09 -- An asteroid, which has recently been discovered by NASA's Wide-field Infrared Survey Explorer (WISE), is a bit different from most near-Earth asteroids (NEAs).

The orbit of the new object, designated 2010 SO16, is almost circular such that it cannot come close to any other planet in the solar system except Earth.

However, even though the asteroid rides around with Earth, it never gets that close.

"It keeps well away from Earth," said Apostolos "Tolis" Christou, who, together with David Asher of the Armagh Observatory in Northern Ireland, analyzed the orbit of the body after it was discovered in infrared images taken by WISE.

"So well, in fact, that it has likely been in this orbit for several hundred thousand years, never coming closer to our planet than 50 times the distance to the Moon," added Christou.

The asteroid is one of a few that trace out a horseshoe shape relative to Earth. As the asteroid approaches Earth, the planet's gravity causes the object to shift back into a larger orbit that takes longer to go around the Sun than Earth. Alternately, as Earth catches up with the asteroid, the planet's gravity causes it to fall into a closer orbit that takes less time to go around the Sun than Earth. The asteroid therefore never completely passes our planet. This slingshot-like effect results in a horseshoe-shaped path as seen from Earth, in which 2010 SO16 takes 175 years to get from one end of the horseshoe to the other.

Data on the orbits of asteroids and comets detected by the project, including near-Earth objects, are catalogued at the NASA-funded International Astronomical Union's Minor Planet Center, at the Smithsonian Astrophysical Observatory in Cambridge, Mass. Published by HT Syndication with permission from Asian News International. For any query with respect to this article or any other content requirement, please contact Editor at htsyndication@hindustantimes.com

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Record - 4

DIALOG(R)

Qatar steady as region shakes,

Haroon Siddiqui Toronto Star,

Toronto Star, v2011040816035232, ONT ed, pA14,

Friday, April 8, 2011

TEXT:

DOHA, QATAR - As revolutions rage on across the Middle East, with millions in the streets demanding democracy, the absolute monarch of this oil- and gas-rich emirate is not feeling threatened. Not one bit.

For good reason. Neither his 600,000 citizens nor the 900,000 expats working here are clamouring for change, even as they cheer on the changes elsewhere.

People at a regional conference here clapped when Lula da Silva, the former president of Brazil, declared, "I am against any ruler who is a ruler for life," oblivious that Sheikh Hamad bin Khalifa Al-Thani, 59, is ruler for life.

A day later, at the funeral of an Al Jazeera cameraman killed on assignment in Libya, a cleric cursed Moammar Gadhafi: "Gadhafi the dictator will soon follow the path of Hosni Mubarak and Ben Ali."

For the Qataris, the bad guys are somewhere else. Their sheikh is wealthy and wise - ruling with a light touch and no visible security apparatus; liberalizing and modernizing the emirate at a dizzying pace; and pursuing an independent foreign policy that's as self-serving as, say, that of the United States.

Qatar was the first Arab state to dispatch fighter jets to join NATO in Libya. But it also approved of Saudi troops marching into neighbouring Bahrain to support the minority Sunni king against a rebellious Shiite majority.

This "Switzerland of the Gulf" is the least likely place to have a revolution.

Oil is flowing at one million barrels a day. More natural gas is exported from here than from anywhere else. The economy galloped at 19 per cent last year - the highest growth of any country in the world.

Transparency International rates Qatar as the least corrupt nation in the Middle East - ahead of a fifth of Europe (including the U.K., Belgium and France), and also the United States.

"That's a jaw-dropping rating," says Patrick Theros, former American ambassador to Qatar, who heads the U.S. Qatar Business Council, Washington, D.C.

Per capita income is among the highest in the world. No income tax. Free health care. Free education, including studies abroad.

There's a lot to be content about. But Sheikh Hamad is obsessed with preparing Qatar for the post-carbon era. He's haunted by the past, when the economy collapsed almost overnight following the Japanese discovery of artificial pearls.

Qatar must be more than a gas station to the world.

Thus an array of initiatives, from research in bio-tech and high-tech to spectacular campuses for prestigious American universities to fine museums designed by the world's leading architects.

This is a thinking man's Dubai.

Hamad came to power in 1995 in a bloodless coup against his father, thought by the family to be decent but inept. The house of al-Thani was feeling vulnerable, traumatized by Kuwait, invaded by Saddam Hussein and rescued by the Americans (1991) at a cost of billions.

Qatar had fewer resources and a smaller defence capacity. What was its insurance policy going to be?

Put the country on the map. Get it to punch above its geopolitical and economic weight.

Host the forward headquarters of the U.S. Central Command that oversees American operations from the Gulf to Afghanistan.

Get along with Iran, with which you share your biggest gas field. Get out from under the tutelage of your other big neighbour, Saudi Arabia, fellow-Wahhabis, but far more conservative than you.

Become a global mediator, offering Doha as a neutral site for warring parties from conflicts.

Start Al Jazeera (1995). It'd end up rattling most governments in the region but develop a pan-Arab constituency, plus an audience of 200 million in 100 countries.

Contribute to humanitarian relief - civil strife in Darfur, Hurricane Katrina, floods in Pakistan, etc.

Host the World Trade Organization's trade talks (2001), forever after known as the Doha round.

Host the Asian Games (2006).

Win the World Cup of Soccer (2022), beating the United States by promising \$4 billion worth of stadiums with outdoor air conditioning for the 48 C summer, and pledging to dismantle them and donate to poor nations.

"We want to change people's thinking: How could 'a camel country' put on one of the best World Cups ever? But we will," says Dr. Saif Ali Al-Hajari, vice-chair of Qatar Foundation, the umbrella organization that's supervising the leap into the future.

It's a parallel government with a seemingly unlimited budget, headed by Sheikha Mozah, the second of the emir's three wives. Her high public profile and political heft gets her ranked among the most powerful women in the world.

Qatar dedicates 2.8 per cent of its GDP to research and development - among the highest percentages in the world.

That has spawned a staggering range of projects, including a stem cell bank. It's available to every pregnant mother, to store the child's cells for future usage in regenerative medicine.

"We are more liberal than the United States in what all we can do with stem cells," Dr. Ayman Bassil, head of research and training, tells me. "We got Islamic scholars to provide guidelines."

Renewable energy and environmental protection is a priority. Qatar lacks water and greenery. Most trees must be watered and the grass here must be the most expensive. Yet water is subsidized, as is oil.

"This is crazy," says Dr. Rabi Mohtar, head of the Energy and Environmental Research Institute. "Decades of bad habits have to be broken."

He was a professor at Purdue University when, in November 2005, he got a phone call in the middle of mowing his lawn.

"It was Doha calling, saying Qatar was trying to tap into the Arab expats in environment, computing and biotechnology. So here I am."

Dr. Khalid Alsubai, a Qatari native, is leading an international team with the Harvard-Smithsonian Center for Astrophysics. They discovered a new planet and named it Qatar-1.

"Not surprising," he says. "Arabs have a long heritage of cataloguing the stars. All the bright stars have Arabic names."

The foundation's flagship is Education City, covering 14 million square metres and featuring six American universities, including Carnegie Mellon and Georgetown.

Qatar Real Estate Investment Company is not only developing housing and commercial property at home but 32 projects in 21 countries, worth \$88 billion. It has invested in Syria, Morocco, Sudan, Egypt, Yemen, West Bank, Tajikistan and Britain (Chelsea Barracks, a former army barracks near Westminster, Britain's most expensive residential development).

There's a mega-railway project on the drawing board linking Qatar to Saudi Arabia, and across the waterway to Bahrain, by 2022.

What makes Qatar tick?

The ruling family and also the Qatari character, I am told by Theros, the former ambassador.

"The emir is a bit of a revolutionary. He was from a young age, it seems. He studied at Sandhurst (the famed British army training centre) and is well-read.

"Sheikha Mozah is a remarkably determined woman.

"And the Qataris themselves are a self-confident bunch. They don't have an inferiority complex. They tend to be religious but very tolerant. When they travel abroad, they behave the same way as at home. They don't feel the need to break out."

He adds: "The top people here do want something approaching a constitutional monarchy." When it comes.

hsiddiqui@thestar.ca

16034007

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Record - 5

DIALOG(R)

Signs of mining may lead to alien-life,

Korea Times,

Tuesday, April 5, 2011

TEXT:

Scientists have spent 50 years sending radio signals deep into space in an attempt to establish contact with extra-terrestrials.

But it now appears there might be a much simpler way of finding alien life we should look for signs of mining in asteroid belts, reported British Daily Mail on Monday.

The theory goes that materials such as gold, platinum, iron and silicon are plentiful in asteroids, so intelligent alien life would be likely to exploit this.

Any extrasolar mining would produce three effects that should be detected from Earth.

Firstly, scientists are aware of the specific ratio of elements found in common debris belts. Therefore, using spectroscopy, they should be able to spot asteroid belts where this ratio is different.

Secondly, aliens would be more likely to mine large asteroid belts because they have more elements and minerals for harvesting.

Lastly, any large scale mining would result in a great deal of dust that would take heat from the nearby star and generate an identifiable thermal signature.

The claims were made by Dr Duncan Forgan, of the University of Edinburgh, and Dr Martin Elvis, of the Harvard Smithsonian Center for Astrophysics in Cambridge, Massachusetts.

However, they admit that all three also occur naturally and that their recommendations only increase the chance of finding alien life.

We find that individual observational signatures of asteroid mining can be explained by natural phenomena, and as such they cannot provide conclusive detections of extra-terrestrial intelligences, Dr Forgan said.

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Record - 6

DIALOG(R)

'Two' white dwarf stars 'to collide and become one'

Hindustan Times

Thursday, April 7, 2011

TEXT:

Washington, April 7 -- US astronomers have discovered that an amazing pair of white dwarfs whirling around each other once every 39 minutes will collide and merge to create a single star in a few million years.

"These stars have already lived a full life. When they merge, they'll essentially be 'reborn' and enjoy a second life," said Smithsonian astronomer Mukremin Kilic, lead author of the study announcing the discovery.

Out of the 100 billion stars in the Milky Way, only a handful of merging white dwarf systems are known to exist, and most have been discovered by Kilic and his colleagues at the Harvard-Smithsonian Center for Astrophysics.

The newly identified binary star (designated SDSS J010657.39-100003.3) is about 7,800 light-years away in the constellation Cetus. It consists of two white dwarfs, a visible star and an unseen companion whose presence is betrayed by the visible star's motion around it.

The visible white dwarf weighs about 17 percent as much as the Sun, while the second white dwarf weighs 43 percent as much. Astronomers believe that both are made of helium.

The two white dwarfs orbit each other at a distance of 140,000 miles -- less than the distance from the Earth to the Moon. They whirl around at speeds of 270 miles per second, completing one orbit in only 39 minutes.

The fate of these stars is already sealed. Because they wheel around so close to each other, the white dwarfs stir the space-time continuum, creating expanding ripples known as gravitational waves.

Those waves carry away orbital energy, causing the stars to spiral closer and closer together. In about 37 million years, they will collide and merge.

This binary white dwarf was discovered as part of a survey program being conducted with the MMT Observatory on Mount Hopkins, Ariz.

The finding will be published in the Monthly Notices of the Royal Astronomical Society and is available online. Published by HT Syndication with permission from Asian News International. For any query with respect to this article or any other content requirement, please contact Editor at htsyndication@hindustantimes.com

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Record - 7

DIALOG(R)

Look for signs of mining in asteroid belts to find alien life, say Scientists,

Hindustan Times,
Tuesday, April 5, 2011

TEXT:

London, April 5 -- For decades, scientists have been trying to establish contact with extra-terrestrials by sending radio signals deep into space.

Now, there's a quicker way to reach them ' just search for signs of mining in asteroid belts, reports the Daily Mail.

The claims were made by Duncan Forgan of the University of Edinburgh and Martin Elvis, of the Harvard Smithsonian Center For Astrophysics in Cambridge, Massachusetts.

Mining should be easy to spot because it would create lots of dust due to its effect on local temperatures, or so the theory goes.

The researchers believe that aliens would also be more likely to mine large objects instead of smaller ones.

They suggested that as materials such as gold, platinum, iron and silicon are plentiful in asteroids, then intelligent alien life would be likelier to exploit this.

Any extra solar mining would produce three effects that should, in theory, be detected from Earth.

Firstly, scientists are aware of the specific ratio of elements found in common debris belts. Therefore, using spectroscopy, they should be able to spot asteroid belts where this ratio is different.

Secondly, aliens would be more likely to mine large asteroid belts due to their having more elements and minerals for harvesting.

Lastly, any large-scale mining would result in a great deal of dust that would take heat from the nearby star and generate an identifiable thermal signature.

Forgan and Elvis claim that spotting all of these telltale signs raises the likelihood of pinpointing extra-terrestrials.

They, however, admitted that all three also occur naturally and that their recommendations only increase the chance of finding alien life.

'We find that individual observational signatures of asteroid mining can be explained by natural phenomena, and as such they cannot provide conclusive detections of extra-terrestrial intelligences,' they wrote in a paper published recently.

'They could provide a means of identifying unusual candidate systems for further study using other techniques,' they added. Published by HT Syndication with permission from Asian News International. For any query with respect to this article or any other content requirement, please contact Editor at htsyndication@hindustantimes.com

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Record - 8

DIALOG(R)

Mine of alien evidence,

MX (Australia), 1 - Melbourne ed, p11,

Tuesday, April 5, 2011

TEXT:

ET HUNTING After spending 50 years sending radio signals deep into space in an attempt to find aliens, scientists now suggest there may be a much simpler way to go about it just look for signs of mining in asteroid belts

That, at least, is the theory proposed by Dr Duncan Forgan, of the University of Edinburgh, and Dr Martin Elvis, of the Harvard Smithsonian Centre For Astrophysics, in Cambridge, Massachusetts

They suggest that intelligent alien life is likely to exploit the gold, platinum, iron and silicon, that are known to be plentiful in asteroids

And they say asteroid mining would produce three effects that are theoretically detectable from Earth

Firstly, because science is aware of the specific ratio of elements found in common asteroid belts, using spectroscopy should be able to spot where this ratio is different

Secondly, aliens would be more likely to mine large asteroid belts because they have more elements and minerals for harvesting

And lastly, any large-scale mining would produce a great deal of dust that would take heat from the nearby star and generate an identifiable thermal

signature

Forgan and Elvis claim that spotting all of these tell-tale signs raises the likelihood of pinpointing extra-terrestrials

But they admit that because all three effects also occur naturally, such observations would not provide conclusive proof of alien life but only identify systems worthy of further study.

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Record - 9

DIALOG(R)

Miner signs of alien life,

Brisbane News (Australia), 1 - BRIS ed, p10,

Tuesday, April 5, 2011

TEXT:

ET HUNTING After spending 50 years sending radio signals deep into space in an attempt to find aliens, scientists now suggest there may be a much simpler way to go about it just look for signs of mining in asteroid belts

That, at least, is the theory proposed by Dr Duncan Forgan, of the University of Edinburgh, and Dr Martin Elvis, of the Harvard Smithsonian Centre for Astrophysics, in Cambridge, Massachusetts

They suggest intelligent alien life is likely to exploit the gold, platinum, iron and silicon, that are known to be plentiful in asteroids.

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Record - 10

DIALOG(R)

Mine of alien evidence ET HUNTING,

MX Sydney (Australia), 1 - SYD ed, p11

Tuesday, April 5, 2011

TEXT:

After spending 50 years sending radio signals deep into space in an attempt to find aliens, scientists now suggest there may be a much simpler way to

go about it just look for signs of mining in asteroid belts

That, at least, is the theory proposed by Dr Duncan Forgan, of the University of Edinburgh, and Dr Martin Elvis, of the Harvard Smithsonian Centre For Astrophysics, in Cambridge, Massachusetts

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And lastly, any large-scale mining would produce a great deal of dust that would take heat from the nearby star and generate an identifiable thermal signature

Forgan and Elvis claim that spotting all of these tell-tale signs raises the likelihood of pinpointing extra-terrestrials

But they admit that because all three effects also occur naturally, such observations would not provide conclusive proof of alien life but only identify systems worthy of further study.

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Wolbach Library: CfA in the News ~ Week ending 17 April 2011

1. **... & bogus forecasting**, Pittsburgh Tribune Review, Saturday, April 16, 2011
2. **How merging black holes go on a rampage of star-eating**, Hindustan Times, Monday, April 11, 2011

Record - 1

DIALOG(R)

... & bogus forecasting,
Pittsburgh Tribune Review,
Saturday, April 16, 2011

TEXT:

Researchers who reviewed global-warming "forecasting" have found that procedures followed by the United Nations' chief climate cluckers violated 81 percent of 89 relevant forecasting principles.

Along with other experts who have peeked behind the curtain of climate change, these researchers have come to a common conclusion: The alarm over man-made global warming is an anti-scientific political movement.

In a presentation to Congress, J. Scott Armstrong of the Wharton School at the University of Pennsylvania -- whose own work in forecasting methods is internationally known -- said the U.N.'s Intergovernmental Panel on Climate Change (IPCC) has failed to demonstrate the "predictive validity" of its procedures.

And yet the IPCC's calls for action are based on predicted climate conditions, says Dr. Armstrong, who worked with researchers from the Harvard-Smithsonian Center for Astrophysics and the University of South Australia.

Rather than defend its dubious predictions, the IPCC insists "that nearly all scientists agree with the forecast," according to the researchers' findings published by The Heartland Institute (heartland.org), a nonprofit research organization. "Such an appeal to 'voting' is contrary to the scientific method. It is also incorrect."

As forecasts go, the IPCC's future credibility is especially bleak.

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Record - 2

DIALOG(R)

How merging black holes go on a rampage of star-eating,

Hindustan Times,

Monday, April 11, 2011

TEXT:

Washington, April 11 -- A new research indicates that when two galaxies collide, it causes the black holes at their cores to spiral toward each other, merge, then go on a rampage of star-eating.

The merger kicks the resulting monster black hole into surrounding stars. There, the black hole shreds and swallows stars at a rapid clip.

The research by Nick Stone and Avi Loeb of Harvard-Smithsonian Center for Astrophysics suggests that an upcoming sky survey might offer astronomers a way to catch a gorging black hole 'in the act'.

Before the merger, as the two black holes whirl around each other, they stir the galactic center like the blade of a blender. Their strong gravity warps space, sending out ripples known as gravitational waves. When the black holes merge, they emit gravitational waves more strongly in one direction. That inequality kicks the black hole in the opposite direction like a rocket engine.

'That kick is very important. It can shove the black hole toward stars that otherwise would have been at a safe distance,' said Stone.

'Essentially, the black hole can go from starving to enjoying an all-you-can-eat buffet,' he added.

When tidal forces rip a star apart, its remains will spiral around the black hole, smashing and rubbing together, heating up enough to shine in the ultraviolet or X-rays.

The black hole will glow as brightly as an exploding star, or supernova, before gradually fading in a distinctive way.

Importantly, a wandering, supermassive black hole is expected to swallow many more stars than a black hole in an undisrupted galactic center. A stationary black hole disrupts one star every 100,000 years.

In the best-case scenario, a wandering black hole could disrupt a star every decade. This would give astronomers a much better opportunity of spotting these events, particularly with new survey facilities like Pan-STARRS and the Large Synoptic Survey Telescope.

Finding a merged black hole also would allow theorists to explore a new regime of Einstein's general theory of relativity.

'We could test general relativity in the regime of strong gravity with unprecedented precision,' said Loeb.

The study is published in the March 2011 issue of Monthly Notices of the Royal Astronomical Society. Published by HT Syndication with permission from Asian News International. For any query with respect to this article or any other content requirement, please contact Editor at htsyndication@hindustantimes.com

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Wolbach Library: CfA in the News ~ Week ending 24 April 2011

- 1. Scientists at Harvard-Smithsonian Center for Astrophysics Discuss Research in Astronomy**, Science Letter, p3993, Tuesday, April 26, 2011
- 2. Scientists at Harvard-Smithsonian Center for Astrophysics Describe Research in Astronomy**, Science Letter, p3993, Tuesday, April 26, 2011
- 3. Researchers at Harvard-Smithsonian Center for Astrophysics Have Published New Data on Astronomy**, Science Letter, p3519, Tuesday, April 26, 2011
- 4. New Research on Astronomy from Harvard-Smithsonian Center for Astrophysics Summarized**, Science Letter, p1800, Tuesday, April 26, 2011
- 5. Duluth math whiz earns entry into MIT**, Jana Hollingsworth, Duluth News-Tribune (Duluth, MN) Thursday, April 21, 2011
- 6. Something new under the Sun: scientists are probing deep beneath the surface of our nearest star to calculate its profound effects on Earth.**, Irion, Robert, Smithsonian, v42, n1, p46(8), Friday, April 1, 2011

Record - 1

DIALOG(R)

Scientists at Harvard-Smithsonian Center for Astrophysics Discuss Research in Astronomy,
Science Letter, p3993,
Tuesday, April 26, 2011

TEXT:

"We present arcsecond-scale Submillimeter Array observations of the CO(3-2) line emission from the disks around the young stars HD 163296 and TW Hya at a spectral resolution of 44 m s⁻¹. These observations probe below the similar to 100 m s⁻¹ turbulent linewidth inferred from lower-resolution observations, and allow us to place constraints on the turbulent linewidth in the disk atmospheres," investigators in Cambridge, United States report (see also).

"We reproduce the observed CO(3-2) emission using two physical models of disk structure: (1) a power-law temperature distribution with a tapered density distribution following a simple functional form for an evolving accretion disk, and (2) the radiative transfer models developed by D'Alessio et al. that can reproduce the dust emission probed by the

spectral energy distribution. Both types of models yield a low upper limit on the turbulent linewidth (Doppler b-parameter) in the TW Hya system (less than or similar to 40 m s⁻¹) and a tentative (3 sigma) detection of a similar to 300 m s⁻¹ turbulent linewidth in the upper layers of the HD 163296 disk. These correspond to roughly $\leq 10\%$ and 40% of the sound speed at size scales commensurate with the resolution of the data," wrote A.M. Hughes and colleagues, Harvard-Smithsonian Center for Astrophysics.

The researchers concluded: "The derived linewidths imply a turbulent viscosity coefficient, α , of order 0.01 and provide observational support for theoretical predictions of subsonic turbulence in protoplanetary accretion disks."

Hughes and colleagues published their study in *Astrophysical Journal* (Empirical Constraints On Turbulence In Protoplanetary Accretion Disks. *Astrophysical Journal*, 2011;727(2):85).

For additional information, contact A.M. Hughes, Harvard Smithsonian Center Astrophysics, 60 Garden St., Cambridge, MA 02138, United States.

The publisher of the *Astrophysical Journal* can be contacted at: IOP Publishing Ltd., Dirac House, Temple Back, Bristol BS1 6BE, England. Copyright (c) 2011 Science Letter via NewsRx.com

Record - 2

DIALOG(R)

Scientists at Harvard-Smithsonian Center for Astrophysics Describe Research in Astronomy,
Science Letter, p3993,
Tuesday, April 26, 2011

TEXT:

According to a study from Cambridge, United States, "We present a Spitzer IRS study of variability in 14 T Tauri stars in the Taurus and Chamaeleon star-forming regions. The sample is composed of transitional and pre-transitional objects which contain holes and gaps in their disks."

"We detect variability between 5 and 38 μ m in all but two of our objects on timescales of 2-3 years. Most of the variability observed can be classified as seesaw behavior, whereby the emission at shorter wavelengths varies inversely with the emission at longer wavelengths. For many of the objects we can reasonably reproduce the observed variability using irradiated disk models, particularly by changing the height of the inner

disk wall by similar to 20%. When the inner wall is taller, the emission at the shorter wavelengths is higher since the inner wall dominates the emission at 2-8 μ m. The taller inner wall casts a larger shadow on the outer disk wall, leading to less emission at wavelengths beyond 20 μ m where the outer wall dominates. We discuss how the possible presence of planets in these disks could lead to warps that cause changes in the height of the inner wall. We also find that crystalline silicates are common in the outer disks of our objects and that in the four disks in the sample with the most crystalline silicates, variability on timescales of 1 week is present," wrote C. Espaillat and colleagues, Harvard-Smithsonian Center for Astrophysics (see also).

The researchers concluded: "In addition to explaining the infrared variability described above, planets can create shocks and collisions which can crystallize the dust and lead to short timescale variability."

Espaillat and colleagues published the results of their research in *Astrophysical Journal* (A Spitzer Irs Study Of Infrared Variability In Transitional And Pre-transitional Disks Around T Tauri Stars. *Astrophysical Journal*, 2011;728(1):49).

For additional information, contact C. Espaillat, Harvard Smithsonian Center Astrophysics, 60 Garden St., MS 78, Cambridge, MA 02138, United States.

The publisher of the *Astrophysical Journal* can be contacted at: IOP Publishing Ltd., Dirac House, Temple Back, Bristol BS1 6BE, England.

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Record - 3

DIALOG(R)

Researchers at Harvard-Smithsonian Center for Astrophysics Have Published New Data on Astronomy,

Science Letter, p3519,
Tuesday, April 26, 2011

TEXT:

"We present a high-resolution set of adiabatic binary galaxy cluster merger simulations using FLASH. These are the highest resolution simulations to date of such mergers using an adaptive mesh refinement grid-based code with Eulerian hydrodynamics," scientists in Cambridge, United States report (see also).

"In this first paper in a series, we investigate the effects of merging on the entropy of the hot intracluster gas, specifically with regard to the ability of merging to heat and disrupt cluster "cool cores." We find, in line with recent works, that the effect of fluid instabilities that are well resolved in grid-based codes is to significantly mix the gases of the two clusters and to significantly increase the entropy of the gas of the final merger remnant. This result is characteristic of mergers over a range of initial mass ratio and impact parameter. In line with this, we find that the kinetic energy associated with random motions is higher in our merger remnants which have high-entropy floors, indicating that the motions have efficiently mixed the gas and heated the cluster core with gas of initially high entropy," wrote J.A. Zuhone and colleagues, Harvard-Smithsonian Center for Astrophysics.

The researchers concluded: "We examine the implications of this result for the maintenance of high-entropy floors in the centers of galaxy clusters and the derivation of the properties of dark matter from the thermal properties of the X-ray-emitting gas."

Zuhone and colleagues published their study in *Astrophysical Journal* (A Parameter Space Exploration Of Galaxy Cluster Mergers. I. Gas Mixing And The Generation Of Cluster Entropy. *Astrophysical Journal*, 2011;728(1):54).

For more information, contact J.A. Zuhone, Harvard Smithsonian Center Astrophysics, 60 Garden St., Cambridge, MA 02138, United States.

Publisher contact information for the *Astrophysical Journal* is: IOP Publishing Ltd., Dirac House, Temple Back, Bristol BS1 6BE, England.

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Record - 4

DIALOG(R)

New Research on Astronomy from Harvard-Smithsonian Center for Astrophysics Summarized,

Science Letter, p1800,
Tuesday, April 26, 2011

TEXT:

"Radiative transfer and radiation hydrodynamics use the relativistic Boltzmann equation to describe the kinetics of photons. It is difficult to solve the six-dimensional time-dependent transfer equation unless the problem is highly symmetric or in equilibrium," scientists in Cambridge,

United States report (see also).

"When the radiation field is smooth, it is natural to take angular moments of the transfer equation to reduce the degrees of freedom. However, low order moment equations contain terms that depend on higher order moments. To close the system of moment equations, approximations are made to truncate this hierarchy. Popular closures used in astrophysics include flux-limited diffusion and the M-1 closure, which are rather ad hoc and do not necessarily capture the correct physics. In this paper, we propose a new class of closures for radiative transfer and radiation hydrodynamics. We start from a different perspective and highlight the consistency of a fully relativistic formalism. We present a generic framework to approximate radiative transfer based on relativistic Grad's moment method," wrote C.K. Chan and colleagues, Harvard-Smithsonian Center for Astrophysics.

The researchers concluded: "We then derive a 14-field method that minimizes unphysical photon self-interaction."

Chan and colleagues published their study in *Astrophysical Journal* (A Class Of Physically Motivated Closures For Radiation Hydrodynamics. *Astrophysical Journal*, 2011;727(2):67).

For more information, contact C.K. Chan, Harvard Smithsonian Center Astrophysics, Institute Theory & Computational, 60 Garden St., Cambridge, MA 02138, United States.

Publisher contact information for the *Astrophysical Journal* is: IOP Publishing Ltd., Dirac House, Temple Back, Bristol BS1 6BE, England.

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Record - 5

DIALOG(R)

Duluth math whiz earns entry into MIT,

Jana Hollingsworth,

Duluth News-Tribune (Duluth, MN),

Thursday, April 21, 2011

TEXT:

April 21--At one point, Duluthian Vicki Surges wasn't sure if her son, Vinnie, would finish high school.

Surges home-schools her children, and Vinnie learned at a much slower pace

than his siblings.

"I didn't push him," she said.

There was no need, it turns out. Surges, a senior math major at the College of St. Scholastica, has accepted a spot in the Massachusetts Institute of Technology aeronautics and astronautics doctoral program in Cambridge, Mass., with tuition and stipend provided. And that's only one of the 10 doctoral program slots he was offered.

Other schools with offers included the University of Minnesota, University of Michigan, Penn State and Purdue -- all highly competitive schools, said Luther Qson, chairman of the mathematics department at St. Scholastica.

Qson said he's never known a student to be accepted into so many Ph.D. programs.

"It's interesting that a pure mathematics major got into engineering programs," he said. "It's the result of the work he did to get summer and fall internships."

Those internships happened to be for the Harvard-Smithsonian Center for Astrophysics and NASA's Goddard Space Flight Center.

Surges wasn't satisfied with the idea of pursuing a doctorate in math. He applied to become a McNair Scholar, which is a program for racially under-represented, first-generation or low-income college students with high academic potential. Surges' heritage is Hispanic.

The McNair program prepares students for doctoral work through a research project. That research, which he did at Harvard and NASA, set him on a different path.

"By doing that, it changed everything," Vinnie Surges said. "It's almost strange. I'm a student from a small school with no engineering, going into an engineering program at one of the best schools in the world."

During the Harvard internship, which he was offered after being rejected by a University of Minnesota Duluth math internship program, he worked on a solar physics project. That led to the NASA internship. At NASA, he tested software and discovered bugs that hadn't been found by others.

"That was important to them," he said.

Competition for summer research spots has increased four-fold in recent years, said Kathleen Cargill, director of St. Scholastica's McNair Scholars program, and most Ph.D. programs have two to 12 slots for 200 to 400

applicants.

Cargill has been trying for years to get a student into a NASA slot, she said. Surges was the first for St. Scholastica. He's also the leader among 247 St. Scholastica McNair Scholars in the program's 16-year history in terms of the number of doctoral program acceptances.

Surges is a quiet, humble, unassuming student -- the kind "you'd invite home to dinner," Cargill said. "But when we wound him up, he just went."

Vicki Surges said she noticed her son's math ability when he was 2 years old. She could no longer keep up with him as a teenager when he sailed through pre-calculus. But he saw everything in black and white, she said, and had to be "led totally in the beginning."

He recognized at a young age that it wasn't just going to come to him," she said. "He's worked really, really hard."

He studied at lower levels in some subjects and higher levels in others, he said, attributing his success today to going at his own pace during his early years and taking time to understand what he was learning.

Surges, who has a 3.99 grade-point average, spent a lot of time in Qson's office asking questions in ways different from other students.

"He had such an internal motivation to really understand the material," Qson said. "He would have determined exactly what about the problem he wasn't sure about -- not that he didn't know what to do, but he wasn't certain about the reasoning behind what he did. Most students are happy if they get the correct answer."

The married 23-year-old loves sports statistics, and he spends a lot of time rattling them off, his mother said. He's interested in a career in the airline industry, where he could work on "optimization" of pricing, air traffic control or site scheduling. He would also love to be a sports statistician. He's grateful for the opportunities he's been offered and he's thankful to faculty who wrote letters on his behalf.

"I wanted to prove to myself that I can do this," he said. "That if you spend the appropriate amount of time, you can do well."

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DIALOG(R)

Something new under the Sun: scientists are probing deep beneath the surface of our nearest star to calculate its profound effects on Earth.,

Irion, Robert,

Smithsonian, v42, n1, p46(8),

Friday, April 1, 2011

TEXT:

ON AN UNCHARACTERISTICALLY tropical morning in the San Francisco Bay Area, the ground shimmers with waves of heat, and it's impossible to look to the sky without squinting. But the real heat is inside the Lockheed Martin Solar and Astrophysics Laboratory in Palo Alto. There, in a dark room stacked with computer processors, a high-definition view of the Sun fills nine conjoined TV screens to create a seven-foot-wide, theater-quality solar extravaganza.

Solar physicist Karel Schrijver types commands to start the show: an accelerated movie of a sequence of explosions that wracked the Sun on August 1, 2010. "This is one of the most stunning days I've ever seen on the Sun," Schrijver says. He's been looking at our nearest star for two decades.

'At the beginning this tiny little region decides it's not happy" he says, sounding like an astronomical psychiatrist coping with solar neuroses. He points to a flare, a modest spasm of whitish light. "Then, this nearby region begins to get unhappy and it flares. Then a huge filament erupts and cuts through the [magnetic] field like a knife. We see this are of glowing material, and it grows with time. A little filament under the are says, 'I don't like that one bit,' and it becomes unstable and goes off."

Who knew the Sun has so much personality?

Within hours--sped up to minutes in the digitized replay--much of its magnetic field "gets upset," Schrijver says, and rearranges itself, unleashing flares and vast belches of magnetized gas. The chain reaction is more vivid than any Hollywood depiction. "When we show these movies to our colleagues for the first time," says Schrijver, "the professional expression is generally, 'Whoa!'"

The torrent of images comes from the most advanced satellite ever to study the Sun: NASA's Solar Dynamics Observatory or SDO. Launched in February 2010, SDO stares at the star from a point 22,300 miles above Earth. The satellite's orbit keeps it at a steady position in view of two radio antennas in New Mexico. Every second, 24 hours a day, SDO beams 18 megabytes of data to the ground. The high-resolution pictures, as well as

maps of the Sun's tortured magnetic fields, show the genesis of sunspots and the origins of their outbursts.

This solar movie should provide new insights into space weather--the impacts felt on Earth when the Sun's ejections head our way. Sometimes the weather is mild. The August 1, 2010, eruptions set off colorful displays of aurora borealis over the United States two days later when a fast-moving storm of charged gas disturbed Earth's magnetic field. But when the Sun truly gets angry, the northern lights can signal potentially disabling threats.

The most intense solar storm ever recorded struck in the summer of 1859. British astronomer Richard Carrington observed a giant network of sunspots on September 1, followed by the most intense flare ever reported. Within 18 hours, Earth was under magnetic siege. Dazzling northern lights glowed as far south as the Caribbean Sea and Mexico, and sparking wires shut down telegraph networks--the Internet of the day--across Europe and North America.

A magnetic storm in 1921 knocked out the signaling system for New York City's rail lines. A solar storm in March 1989 crippled the power grid in Quebec, depriving millions of customers of electricity for nine hours. And in 2003, a series of storms caused blackouts in Sweden, destroyed a \$640 million Japanese science satellite and forced airlines to divert flights away from the North Pole at a cost of \$10,000 to \$100,000 each.

Our modern, globally connected electronic society is now so reliant on far-flung transformers and swarms of satellites that a major blast from the Sun could bring much of it down. According to a 2008 report from the National Research Council, a solar storm the size of the 1859 or 1921 events could zap satellites, disable communication networks and GPS systems and fry power grids at a cost of \$1 trillion or more.

"The space around us isn't as benign, friendly and accommodating to our technology as we had assumed," Schrijver says.

By documenting the origins of these storms in unprecedented detail, SDO gives researchers their best chance yet to understand the Sun's destructive capabilities. The goal is to forecast space weather--to read the Sun's moods far enough in advance that we can take precautions against them. Success will rely upon gazing through the Sun's surface to see magnetic outbursts as they develop, in much the same way that meteorologists use cloud-penetrating radar to see signs of a tornado before it roars to the ground.

But for now, the Sun's activity is so complex that its convulsions baffle

the field's top minds. When asked to explain the physics that drives the Sun's violence, SDO scientist Philip Scherrer of Stanford University minces no words: "We fundamentally don't know."

OUR PARENT STAR IS JUST eight minutes away, as the light flies. The Sun gets more telescope time than any other object in space, and the research is a global enterprise. The most successful satellite prior to SDO, a joint NASA-European Space Agency mission called the Solar and Heliospheric Observatory (SOHO), still sends back images of the Sun 15 years after its launch. A smaller explorer now in space, called Hinode, is a Japan-NASA collaboration that studies how the Sun's magnetic fields store and release energy. And NASA's Solar Terrestrial Relations Observatory (STEREO) mission consists of two nearly identical satellites traveling in Earth's orbit, one in front of our planet and one behind. The satellites allow scientists to create 3-D images of solar ejections. Now on opposite sides of the Sun, this past February they took the first photo of the Sun's entire surface. On the ground, telescopes in the Canary Islands, California and elsewhere examine the Sun with techniques that eliminate the blurring effects of Earth's atmosphere.

The Sun is a spinning ball of gas large enough to contain 1.3 million Earths. Its core is a furnace of nuclear fusion, converting 655 million tons of hydrogen into helium every second at a temperature of 28 million degrees Fahrenheit. This fusion creates energy that ultimately reaches us as sunlight. But the core and inner layers of the Sun are so dense that it may take a million years for a photon of the energy to fight just two-thirds of the way out. There it reaches what solar physicists call the "convective zone." Above that is a thin layer we perceive as the Sun's surface. Solar gases continue far into space beyond this visible edge in a blazing hot atmosphere called the corona. A tenuous solar wind blows through the entire solar system.

Things get especially interesting in the convective zone. Giant gyres of charged gas rise and fall, as in a pot of boiling water, only more turbulent. The Sun rotates at different speeds--about once every 24 days at its equator and more slowly, about every 30 days, at its poles. This difference in velocity shears the gas and tangles its electrical currents, fueling the Sun's magnetic fields. The overall magnetic field has a direction, just as Earth's north and south poles attract our compasses. However, the Sun's field is full of curves and kinks, and every 11 years, it flips: the north pole becomes the south, then back to north again 11 years later. It's a dynamic cycle that scientists don't fully grasp, and it's at the heart of most efforts to understand how the Sun behaves.

During those flips, the Sun's deep magnetic field gets really gnarled. It rises up and pokes through the visible surface to create sunspots. These

dark patches of gas are cooler than the rest of the Sun's surface because the knotted magnetic fields act as barriers, preventing some of the Sun's energy from escaping into space. The fields in sunspots have the potential to erupt. Above sunspots, the Sun's magnetic field loops and swirls through the corona. These writhings ignite the explosions on Lockheed's video screens in Palo Alto.

Schrijver and his boss, Alan Title, have worked together for 16 years, long enough to complete each other's sentences. Their group's latest creation, the Atmospheric Imaging Assembly--a set of four telescopes that take pictures of million-degree gases in the corona--is one of three instruments deployed on SDO. NASA compares it to an IMAX camera for the Sun.

"This bubble of gas blowing off is 30 times Earth's diameter, moving at a million miles an hour," Title says, pointing on the screen to an expanding red vortex caught by SDO soon after the satellite's launch. And, he notes almost casually, this was a fairly minor eruption.

Magnetic fields keep the Sun's gases in line as they arch into space, Title says, much as a bar magnet puts iron filings into neat patterns. The more tangled the fields become, the less stable they are. Solar outbursts happen when the magnetic fields snap into a new pattern--an event that physicists call "reconnection."

A typical solar outburst expelled toward Earth, called a coronal mass ejection, might contain ten billion tons of charged gas racing across space. "You have to imagine a set of forces sufficient to launch all of the water in the Mississippi River to a velocity 3,000 times faster than a jet plane flies, in 15 to 30 seconds," he says, pausing a moment to let that sink in. "There is no counterpart to this on Earth. We have trouble explaining these processes."

Previous solar missions took fuzzy snapshots of large coronal mass ejections. Other telescopes zoomed in for fine details but could focus on only a tiny portion of the Sun. SDO's high resolution of an entire hemisphere of the Sun and its rapid-fire recordings reveal how the surface and atmosphere change minute to minute. Some features are so unexpected that the scientists haven't yet named them, such as a corkscrew-like pattern of gas that Schrijver traces on the screen with his finger. He thinks it's a spiraling magnetic field seen along its edge, lacing through gas as it ascends into space. "It's like [the gas] is being lifted in slings," he says.

Before the mission was a year old, the scientists had analyzed hundreds of events, covering many thousands of hours. (The August 1 eruptions, they found, were linked by magnetic "fault zones" spanning hundreds of thousands

of miles.) The team is working under pressure, from NASA and elsewhere, for better forecasts of space weather.

"Good Lord, this is complicated," says Schrijver, playing a movie of the Sun's mood on another day "There is no quiet day on the Sun."

A FEW MILES AWAY, ON THE CAMPUS of Stanford, solar physicist Philip Scherrer is wrestling with the same question that animates the Lockheed Martin group: Will we be able to predict when the Sun will cataclysmically hurl charged gas toward Earth? "We'd like to give a good estimate whether a given active region will produce flares or mass ejections, or if it will just go away," he says.

Scherrer, who uses a satellite downlink for television reception, explains the impact of space weather by recalling an event in 1997. "One Saturday, we woke up and all we saw was fuzz," he says. A coronal mass ejection had swept past Earth the night before. The magnetic cloud apparently took out the Telstar 401 satellite used by UPN and other networks.

"I took that personally, because it was 'Star Trek' [I was unable to watch]," Scherrer says with a wry smile. "If it had happened on the morning of the Super Bowl, everyone would have known about it."

Scherrer's team and Lockheed Martin engineers developed SDO's Helioseismic and Magnetic Imager, an instrument that probes into the Sun's churning interior and monitors the direction and strength of the magnetic field, creating black-and-white maps called magnetograms. When sunspots come along, the maps show magnetic turmoil at the bases of arching structures in the Sun's atmosphere.

The instrument also measures vibrations on the Sun's surface. On Earth, seismologists measure surface vibrations to reveal earthquake faults and geologic structures far underground. On the Sun, vibrations come not from sun-quakes but from pulsations caused by gases heaving up and down on the surface at speeds of some 700 miles per hour. As each blob of gas crashes down, it propels sound waves into the Sun, and they jiggle the entire star.

Scherrer's device gauges those vibrations across the Sun's face.

The key, says Scherrer, a leading expert in helioseismology, as this science is known, is that the sound waves move faster through hotter gas, such as turbulent knots far below the surface that often presage sunspots. The sound waves also accelerate when they move through gases flowing in the same direction. Although these measurements create mathematical nightmares, computers can create pictures of what's happening under the Sun's surface.

In this way, Scherrer's team can detect sunspots on the far side of the Sun days before they rotate into view and before they are in position to spew harmful particles and gas toward Earth. The scientists also hope to spot

active regions bubbling up from within the Sun a day or more before they are visible as sunspots.

These techniques provide previews of coming attractions. The challenge, Scherrer says, is finding the right signs of magnetic entanglement that--like the radar images of a newly forming tornado--give reliable warnings. Some researchers have keyed in on the shapes of magnetic fields, noting that a particular S-shaped curvature often heralds an outburst. Others look at whether magnetic strength across the center of a sunspot changes quickly--an indication that it might be ready to snap.

Scherrer calls up some pictures on his screen, apologizing that they don't rival the Lockheed movies. The helioseismic images remind me of the knobby surface of an orange, with nodules of gas surging upward across the Sun's entire sphere. The magnetic graphics cast the Sun in mottled gray tones, but when Scherrer zooms in, black and white flecks grow into irregular patches. These are the ribbons of magnetic force, poking into or out of the Sun's constantly moving surface.

When magnetic field lines reconnect high in the Sun's atmosphere, Scherrer says, "it's very much like a short circuit when you touch two wires with a current. The energy flowing in the current turns into heat or light. "The sudden sparks shoot down along the magnetic field and slam into the Sun's surface, setting off a powerful flare.

The strongest of the Sun's arching magnetic fields can trap billions of tons of gas beneath them, setting the stage for coronal mass ejections. When a magnetic re-connection suddenly releases all that tension, the gas lifts off into space with the solar wind. "It's like cutting the string on a helium balloon," Scherrer says.

By studying many such events, Scherrer thinks he and his colleagues can devise a system that ranks the odds of the Sun aiming an eruption at Earth--a scale that might run from "all clear" to "take precautions." Such guidelines would not be predictions, he admits, and he acknowledges, too, that solar forecasting may never rival earthly weather reports. Solar predicting requires the team to compare recent activity on the Sun with computer models. But the models are so involved that by the time the computer spits out an answer, the Sun may already have popped off or stayed quiet.

ONE OF THE BIGGEST SOLAR SURPRISES in the past 50 years wasn't something the Sun did but something it didn't do: it didn't produce many sunspots for most of 2008 and 2009. "We'd go 60, 70, 80, 90 days without a single sunspot," says NASA science editor Tony Phillips, who independently publishes Space Weather.com. "In the lifetime of solar physicists, no one had seen this. It surprised the entire community."

No one knows what caused the eerie quiet. The deep magnetic field apparently did not twist up in its usual way, perhaps because electrical currents inside the Sun grew weaker. Some scientists speculated that the Sun was powering down, at least temporarily. A panel of solar physicists studied these changes and projected that the Sun's activity might reach just half of its recent levels in its next 11-year sunspot cycle. This could have minor implications for climate change. For the past century human activity far outweighed the Sun's modulations in affecting Earth's climate. If the pattern of reduced solar activity continues through another of the Sun's cycles and beyond, the subtle decrease in energy from the Sun could slightly offset global warming.

The Sun is projected to reach the peak of its current sunspot cycle in late 2013 or early 2014. But there's no reason to think a more sedate Sun will stay that way. "The biggest particle event and geomagnetic storm in recorded history"--the 1859 event observed by Carrington--"occurred during a solar cycle of about the same size as the one we're projecting in the next couple of years," says Phillips. Moreover, a recent study by Suli Ma and colleagues at the Harvard-Smithsonian Center for Astrophysics showed that one-third of the solar storms striking Earth arise without solar flares or other warning signs. These sneak attacks suggest that the Sun can be hazardous even when it appears quiet.

There's no way to shield the Earth from the Sun's eruptions; powerful storms will always disrupt our planet's magnetic field. But advance warning can limit their impact. Precautions include reducing power loads to prevent surges on electrical lines, putting satellites into an electronic safe mode, and--in NASA's case--telling astronauts to take shelter within the most fortified parts of their spacecraft.

Even with those measures, an event as severe as the solar storms of 1859 or 1921 would wreak havoc, says solar and space physicist Daniel Baker of the University of Colorado, lead author of the 2008 National Research Council report. People grow more dependent on communications technology by the year, Baker says, making us ever more vulnerable to electromagnetic chaos. "Those [severe] events probably occur every decade," he says. "It's just a question of time before one of them hits us."

Baker and his colleagues have urged NASA and the National Oceanic and Atmospheric Administration, which runs the Space Weather Prediction Center in Boulder, Colorado, to develop a system of space-weather warning satellites. Today the only instrument that can determine the direction of the magnetic field inside an approaching coronal mass ejection--a critical factor for determining how violently it will interact with Earth--is on a 13-year-old satellite that has no near-term replacement.

"The Sun is a highly variable star," Baker warns. "We live in its outer atmosphere, and the cyber-electric cocoon that surrounds Earth is subject to its whims. We'd better come to terms with that."

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Wolbach Library: CfA in the News ~ Week ending 1 May 2011

1. **Astronomers unveil 'super-exotic' exoplanet**, Indo-Asian News Service, Friday, April 29, 2011
2. **Densest solid planet known 'super-exotic super-Earth' unveiled**, Hindustan Times, Friday, April 29, 2011
3. **New Findings in Physics Described from Harvard-Smithsonian Center for AstroPhysics**, Science Letter, p979, Tuesday, May 3, 2011

Record - 1

DIALOG(R)

Astronomers unveil 'super-exotic' exoplanet,
Indo-Asian News Service,
Friday, April 29, 2011

TEXT:

Washington, April. 29 -- Astronomers have unveiled details of a "super-exotic" exoplanet - described as the densest known solid planet in existence.

An exoplanet is a planet outside the solar system.

The planet, named 55 Cancri e, is 60 percent larger than Earth and eight times as massive. Twice as dense as Earth - almost as dense as lead - it is the densest solid planet known, according to the latest findings.

A team of astronomers from the Massachusetts Institute of Technology (MIT), the University of British Columbia (UBC), the Harvard-Smithsonian Centre for Astrophysics and the University of California at Santa Cruz (UCSC) were involved in research.

The research, based on observations from Canada's Microvariability and Oscillations of Stars (MOST) space telescope, was released online at arXiv.org, scheduled for publication in The Astrophysical Journal Letters.

MOST is a Canadian space agency mission.

Approximately 40 light years from Earth, 55 Cancri e orbits a star called 55 Cancri A so closely that its year is less than 18 hours long.

"You could set dates on this world by your wrist watch, not a calendar," says UBC astronomer Jaymie Matthews, according to an UBC statement.

The temperature on the planet's surface could be as high as 2,700 degrees Celsius.

"Because of the infernal heat, it's unlikely that 55 Cancri e has an atmosphere," says lead author Josh Winn of MIT. "So this is not the type of place where exobiologists would look for life."

While the planet is not visible, even through a telescope, its host star, 55 Cancri A, can be observed with the naked eye for the next two months on a clear dark night. Published by HT Syndication with permission from Indo-Asian News Service. For any query with respect to this article or any other content requirement, please contact Editor at htsyndication@hindustantimes.com

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Record - 2

DIALOG(R)

Densest solid planet known 'super-exotic super-Earth' unveiled,
Hindustan Times,
Friday, April 29, 2011

TEXT:

Washington, April 29 -- An international team of astronomers have revealed details of a "super-exotic" exoplanet, which is the densest solid planet known.

The planet, named 55 Cancri e, is 60 percent larger in diameter than Earth but eight times as massive, and twice as dense as Earth, almost as dense as lead.

The team was led by astronomers from the Massachusetts Institute of Technology (MIT), the University of British Columbia (UBC), the Harvard-Smithsonian Center for Astrophysics and the University of California at Santa Cruz (UCSC).

The research was based on observations from Canada's MOST (Microvariability and Oscillations of STars) space telescope. MOST is a Canadian Space Agency mission.

Approximately 40 light years from Earth, 55 Cancri e orbits a star, called 55 Cancri A, so closely that its year is less than 18 hours long.

"You could set dates on this world by your wrist watch, not a calendar," UBC astronomer Jaymie Matthews said.

The temperature on the planet's surface could be as high as 2,700 degrees Celsius.

"Because of the infernal heat, it's unlikely that 55 Cancri e has an atmosphere. So this is not the type of place where exobiologists would look for life," lead author Josh Winn of MIT said.

However, 55 Cancri e is the type of place exoplanetary scientists will be eager to "visit" with their telescopes, Winn said.

"The brightness of the host star makes many types of sensitive measurements possible, so 55 Cancri e is the perfect laboratory to test theories of planet formation, evolution and survival," he said

While the planet isn't visible, even through a telescope, its host star, 55 Cancri A, can be observed with the naked eye for the next two months on a clear dark night.

"On this world, the densest solid planet found anywhere so far, in the Solar System or beyond, you would weigh three times heavier than you do on Earth," Matthews, MOST Mission Scientist and second author on the paper said.

"By day, the sun would look 60 times bigger and shine 3,600 times brighter in the sky," he explained.

The findings have been released online at arXiv.org and has been submitted for publication in The Astrophysical Journal Letters. Published by HT Syndication with permission from Asian News International. For any query with respect to this article or any other content requirement, please contact Editor at htsyndication@hindustantimes.com

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Record - 3

DIALOG(R)

New Findings in Physics Described from Harvard-Smithsonian Center for

AstroPhysics,
Science Letter, p979,
Tuesday, May 3, 2011

TEXT:

According to recent research from Cambridge, United States, "Antirelaxation coatings in atomic vapor cells allow ground-state coherent spin states to survive many collisions with the cell walls."

"This reduction in the ground-state decoherence rate gives rise to ultranarrow-bandwidth features in electromagnetically induced transparency (EIT) spectra, which can form the basis of, for example, long-time scale slow and stored light, sensitive magnetometers, and precise frequency standards. Here we study, both experimentally and theoretically, how Zeeman EIT contrast and width in paraffin-coated rubidium vapor cells are determined by cell and laser-beam geometry, laser intensity, and atomic density," wrote M. Klein and colleagues, Harvard-Smithsonian Center for Astrophysics.

The researchers concluded: "Using a picture of Ramsey pulse sequences, where atoms alternately spend "bright" and "dark" time intervals inside and outside the laser beam, we explain the behavior of EIT features in coated cells, highlighting their unique characteristics and potential applications."

Klein and colleagues published their study in Physical Review a (Electromagnetically induced transparency in paraffin-coated vapor cells. Physical Review a, 2011;83(1):3826).

For additional information, contact M. Klein, Harvard Smithsonian Center Astrophysics, 60 Garden St., Cambridge, MA 02138, United States.

Publisher contact information for the journal Physical Review a is:
American Physical Society, One Physics Ellipse, College Pk, MD 20740-3844,
USA.

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Wolbach Library: CfA in the News ~ Week ending 8 May 2011

1. **More than oddities, double stars are keys to learning**, Alan M. MacRobert, Boston Globe (MA), p11, Saturday, May 7, 2011
2. **NASA Selects Investigations for Future Key Planetary Mission**, PR Newswire, Thursday, May 5, 2011
3. **Maui telescope spots 19 near-Earth asteroids**, Tsai, Michael, Honolulu Star-Advertiser (Honolulu, HI), pn/a, Friday, February 25, 2011

Record - 1

DIALOG(R)

More than oddities, double stars are keys to learning,
Alan M. MacRobert,
Boston Globe (MA), p11,
Saturday, May 7, 2011

TEXT:

This weekend the crescent moon enlivens the western sky at nightfall. It's advancing day by day across Gemini, the Twins, one of the most engaging constellations in the sky. Two bright stars mark the Twins' heads, as shown here. Their stick figures are holding hands, and they're currently standing upright

Is this how the ancients saw the Gemini twins? We don't know. The connect-the-dots pattern drawn here was invented by the late children's author H.A. Rey, who wrote the Curious George books and lived in Harvard Square. His 1952 book "The Stars: A New Way to See Them," much beloved and still in print, strove to connect constellation dots all over the sky into believable bulls, scorpions, bears, swans and the rest. Often Rey ignored the classical positioning of constellation parts as passed down from the ancient Greeks. But in the case of Gemini, his figures do match the age-old placement of two human forms

In mythology the twins were Castor and Pollux, patrons of sailors, and their names are preserved today in their head stars. The two stars actually have nothing to do with each other. Pollux, slightly the brighter of the two, is an orange-yellow giant 34 light-years away. Castor shines white from a distance of 50 light-years, well in Pollux's background

But an amateur telescope reveals that Castor is a surprising spectacle: a pair of two stars very close together. And there's a faint orange-red glimmer off to one side, making this star a triple. All three have very much to do with each other. They're held together in an orbiting bunch by their mutual gravity. And there's more. Each of the three is itself an even closer pair of stars orbiting each other faster, as revealed by analysis of their light, making Castor a sextuple star in all

Such complex arrangements are common. About half of all stars that are similar to our sun turn out to be orbiting pairs, according to a 2006 study by Charles Lada at the Harvard-Smithsonian Center for Astrophysics in Cambridge. This proportion rises to 80 percent among the most massive, luminous stars and declines to 25 percent among the dim but abundant red dwarfs.

How heavy, how big?

Double stars are more than curiosities. They were keys to learning how all stars work

The big problem in astronomy is that, unlike most sciences, it deals with things that are incredibly far out of reach. We can only look at them from impossibly far away. Even such basic questions as how big stars are, how much they weigh, once seemed beyond all solution

Double stars helped break these barriers. Two centuries ago the English astronomer William Herschel tracked a double star partway around its orbit and showed that the pair were governed by each other's gravitational pull, right in line with the equations of Isaac Newton's laws of gravity. It was the first proof that the universe beyond the solar system works by the same familiar laws as here on Earth. Later measures of binary stars' motions determined exactly how much gravity they exert on each other - and thus their masses

The mass of the sun was already known by then, from the orbits of Earth and other planets around it. Stars more luminous than the sun proved to be more massive; stars that are intrinsically dimmer showed themselves to be less massive - in a mathematical relationship that became key to understanding the nuclear reactions that make stars burn and determine how they evolve through the ages

In addition, some close-orbiting doubles are oriented so that each star passes in front of the other as seen from Earth, once per orbit. Each time this happens, the total brightness of the pair dips. The best-known of these "eclipsing binaries" is Algol in Perseus, now low in the northwest after dusk. If you know where to look, you can glance up and check whether it's in eclipse while getting out your car keys. Study of eclipsing binaries helped reveal not only the masses but the diameters of stars of every type

Much of what science does is figure out ways to learn a lot from a little.
Astronomy pushes this art as far as it can go

Alan M. MacRobert is a senior editor of Sky & Telescope magazine in Cambridge (SkyandTelescope.com). His Star Watch column appears the first Saturday of every month.

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Record - 2

DIALOG(R)

NASA Selects Investigations for Future Key Planetary Mission,

PR Newswire,

Thursday, May 5, 2011

TEXT:

WASHINGTON, May 5, 2011 /PRNewswire-USNewswire/ -- NASA has selected three science investigations for a potential 2016 mission that would look at Mars' interior for the first time; study an extraterrestrial ocean on one of Saturn's moons; and study in unprecedented detail the surface of a comet's nucleus.

(Logo:)

Each investigation team will receive \$3 million to conduct its mission's concept phase or preliminary design studies and analyses. After another detailed review in 2012 of the concept studies, NASA will select one to continue development efforts leading up to launch. The selected mission will be cost-capped at \$425 million, not including launch vehicle funding. NASA's Discovery Program requested proposals for spaceflight investigations in June 2010. A panel of NASA and other scientists and engineers reviewed 28 submissions. The selected investigations could reveal much about the formation of our solar system and its dynamic processes. Three technology developments for possible future planetary missions also were selected.

"NASA continues to do extraordinary science that is re-writing textbooks," said NASA Administrator Charles Bolden. "Missions like these hold great promise to vastly increase our knowledge, extend our reach into the solar system and inspire future generations of explorers."

The planetary missions selected to pursue preliminary design studies are:

-- Geophysical Monitoring Station (GEMS) would study the structure and composition of the interior of Mars and advance understanding of the formation and evolution of terrestrial planets. Bruce Banerdt of NASA's Jet Propulsion Laboratory (JPL) in Pasadena, Calif., is principal investigator. JPL would manage the project.

-- Titan Mare Explorer (TiME) would provide the first direct exploration of an ocean environment beyond Earth by landing in, and floating on, a large methane-ethane sea on Saturn's moon Titan. Ellen Stofan of Proxemy Research Inc. in Gaithersburg, Md., is principal investigator. Johns Hopkins University's Applied Physics Laboratory in Laurel, Md., would manage the project.

-- Comet Hopper would study cometary evolution by landing on a comet multiple times and observing its changes as it interacts with the sun. Jessica Sunshine of the University of Maryland in College Park is principal investigator. NASA's Goddard Space Flight Center in Greenbelt, Md., would manage the project.

"This is high science return at a price that's right," said Jim Green, director of NASA's Planetary Science Division in Washington. "The selected studies clearly demonstrate a new era with missions that all touch their targets to perform unique and exciting science."

The three selected technology development proposals will expand the ability to catalog near-Earth objects, or NEOs; enhance the capability to determine the composition of comet ices; and validate a new method to reveal the population of objects in the poorly understood, far-distant part of our solar system. During the next several years, selected teams will receive funding that is determined through contract negotiations to bring their respective technologies to a higher level of readiness. To be considered for flight, teams must demonstrate progress in a future mission proposal competition.

The proposals selected for technology development are:

-- Primitive Material Explorer (PriME) would develop a mass spectrometer that would provide highly precise measurements of the chemical composition of a comet and explore the objects' role in delivering volatiles to Earth. Anita Cochran of the University of Texas in Austin is principal investigator.

-- Whipple: Reaching into the Outer Solar System would develop and validate a technique called blind occultation that could lead to the discovery of various celestial objects in the outer solar system and revolutionize our understanding of the area's structure. Charles Alcock of the Smithsonian Astrophysical Observatory in Cambridge, Mass., is principal investigator.

-- NEOCam would develop a telescope to study the origin and evolution of NEOs and study the present risk of Earth-impact. It would generate a catalog of objects and accurate infrared measurements to provide a better understanding of small bodies that cross our planet's orbit. Amy Mainzer of JPL is principal investigator.

Created in 1992, the Discovery Program sponsors frequent, cost-capped solar system exploration missions with highly focused scientific goals. The program's 11 missions include MESSENGER, Dawn, Stardust, Deep Impact and Genesis. NASA's Marshall Space Flight Center in Huntsville, Ala., manages the program for the agency's Science Mission Directorate. For more information about the Discovery Program, visit:

SOURCE NASA

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Record - 3

DIALOG(R)

Maui telescope spots 19 near-Earth asteroids,

Tsai, Michael,
Honolulu Star-Advertiser (Honolulu, HI), pn/a,
Friday, February 25, 2011

TEXT:

Scientists at the Pan-STARRS PS1 telescope on Haleakala, Maui, caused a stir among their fellow astronomers when they discovered 19 near-Earth asteroids on the night of Jan. 29, the most asteroids ever discovered in a single night.

According to Nick Kaiser, head of the Pan-STARRS project, the impressive display of the year-old telescope's capabilities was made possible by recent software improvements and refinements in observational techniques.

While the project receives funding from NASA and the U.S. Air Force Research Laboratory for its asteroid-detecting activities, it is also involved in other studies.

"We're not funded exclusively for this, but we thought we'd do it as a demonstration," Kaiser said. "We hope to generate more funding for

(asteroid detection). Ideally, we would be able to build three more telescopes for better observation."

In the past, the telescope had generated false detections that made it difficult to discern real and phantom asteroids. During the Jan. 29 demonstration, the astronomers took four exposures -- "one after the other" -- to ensure accurate observation, Kaiser said.

In particular, the scientists were looking for asteroids "larger than a few hundred meters" whose orbits could potentially put them on a collision course with Earth. Kaiser said there are about 1,000 asteroids larger than a kilometer and tens of thousands of smaller objects. He said the telescope is capable of detecting as many as 50 of these objects per month.

On the night of the observation, Pan-STARRS software engineer Larry Denneau processed and transmitted PS1 data from his office at the University of Hawaii at Manoa. New discoveries were forwarded to the Minor Planet Center in Cambridge, Mass., where the information was made available so other astronomers could re-observe the objects.

As astronomer Richard Wainscoat noted, mainland observatories usually help to confirm discoveries, but widespread snowstorms that weekend forced Pan-STARRS astronomers to confirm many of their own discoveries. Over the next three days, that duty fell to Wainscoat, fellow astronomer David Tholen and graduate student Marco Micheli.

While the likelihood of near-Earth asteroids actually colliding with Earth is remote -- roughly a 1-in-1,000 chance, according to Kaiser -- being able to accurately account for their whereabouts will allow governments to act should the unlikely actually develop into a real threat.

"It's like the risk developing a rare disease," Kaiser said. "The chance that it will actually happen is small, but the risk, whatever it is, is real. You want to find out if it will happen."

Credit: Michael Tsai

IMAGE ILLUSTRATION

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COURTESY ROB RATKOWSKI / HARVARD-SMITHSONIAN Haleakala's Pan-STARRS PS1 telescope puts on a display of its power, finding 19 near-Earth asteroids in a single night.

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Wolbach Library: CfA in the News ~ Week ending 15 May 2011

1. **House Appropriations Subcommittee on Interior, Environment, and Related Agencies Hearing**, Congressional Documents, Thursday, May 12, 2011
2. **Study Results from Harvard-Smithsonian Center for Astrophysics Broaden Understanding of Planetary Science**, Science Letter, p3991, Tuesday, May 17, 2011
3. **Reports Outline Noble Gases Research from Harvard-Smithsonian Center for Astrophysics**, Science Letter, p1757, Tuesday, May 17, 2011
4. **New Findings Reported from Harvard-Smithsonian Center for Astrophysics Describe Advances in Astronomy**, Science Letter, p1023, Tuesday, May 17, 2011
5. **Data on Astronomy Reported by Researchers at Harvard-Smithsonian Center for Astrophysics**, Science Letter, p343, Tuesday, May 17, 2011
6. **NASA'S FERMI SPOTS 'SUPERFLARES' IN THE CRAB NEBULA**, US Federal News, Wednesday, May 11, 2011
7. **GEORGE MITCHELL, MITCHELL FOUNDATION COMMIT \$25 MILLION TO GIANT MAGELLAN TELESCOPE**, US Federal News, Tuesday, May 10, 2011

Record - 1

DIALOG(R)

House Appropriations Subcommittee on Interior, Environment, and Related Agencies Hearing,
Congressional Documents,
Thursday, May 12, 2011

TEXT:

Thank you for the opportunity to testify before the Subcommittee today on the Smithsonian Institution's fiscal year 2012 federal budget.

The Smithsonian has a crucial role to play in the civic, educational, scientific and artistic life of this nation. We are focused on implementing our new strategic plan that centers on four "grand challenges," and is buttressed by four new Consortia to promote interdisciplinary and cross-institutional collaboration. Per the plan, we are leveraging federal funding and becoming more entrepreneurial. Our goal is to revitalize the Smithsonian and make it more relevant to the challenges faced by our nation

and the world.

The new plan calls for exceptional execution so we invest our federal and trust funds responsibly and to this end we have undertaken a major redesign of our organizational structure and our management operations. Over 275 employees representing 55 units have been engaged in this effort using a team work approach. By adopting new technologies, we're following up on our commitment to make our collections, experts and research more available to parents, students, teachers and lifetime learners across the country.

Thanks to help from Congress, the Administration, our various boards, staff and volunteers, the Institution is steadily making progress in improving service to the American public. As the largest museum and research complex in the world, the Smithsonian is supported by authoritative scholarship that connects Americans to their cultural heritage and also makes the Institution an international leader in scientific research and exploration.

Last year, we had more than 30 million visits to our 19 museums and galleries and the National Zoological Park, all of which are open every day of the year but one. Through our digitized offerings, we reached millions more: students, teachers, and lifelong learners of all ages who benefitted from the growing array of educational opportunities that reach all 50 states.

We have improved the conditions of our vast collections, which include 137 million objects, specimens and works of art. As stewards of the national collections, we are balancing the preservation of and access to these collections. We are stepping up efforts to digitize as many of the collections as resources permit.

The Smithsonian has more than 6,000 employees, including approximately 700 scientists and scholars, and more than 6,500 volunteers: curators, researchers, historians, experts in fields from astrophysics to zoology. These dedicated people are passionate about fulfilling the mission of the Smithsonian at the highest level.

We are particularly proud that a survey designed by the Office of Personnel Management resulted in the Smithsonian being named one of the ten best places to work in the federal government, ranking number four among large federal organizations.

We have physical facilities in eight states and the District of Columbia, and operate in nearly 100 countries, at sites ranging from the equator to both poles. The Institution has 166 affiliate museums in 39 states, the District of Columbia, Puerto Rico, and Panama. As part of our outreach programs, the Smithsonian Institution Traveling Exhibition Service, the largest traveling exhibition service in the world, reaches roughly five million people throughout the country each year. The Institution's presence

is further expanded through Smithsonian Networks' Emmy Award-winning Smithsonian HD channel, which now reaches millions of households. Smithsonian magazine has subscribers in every state and several foreign countries, and nearly seven million people read each month's issue.

Increasing numbers of young people are accessing the Smithsonian using new technology and across the Institution, we have more than 400 web and social media accounts, and that number is growing every day. On our main Facebook account, we have more than 85,000 fans; on our main Twitter account, we have nearly 320,000 fans, and our YouTube offerings have been viewed nearly a million times. Our refreshed website has a more modern look and is easier for users to navigate. It just won the 2011 People's Voice Webby Award for best Cultural Institution website. The public can now find customized information about how to visit and engage with the Smithsonian, either in person or virtually. Our free, easy-to-use Smithsonian visitor mobile application will be ready this summer. These interactive tools position the Smithsonian as a leader in mobile applications for museums.

We created more than 100 exhibitions in 2010, hosted several hundred scholarly fellows, more than 1,000 interns, and even welcomed 86 new baby animals at the National Zoo. In art, science, history, culture, education and outreach, there is much to be proud of at "America's museum." As the following examples demonstrate, the Smithsonian's future is bright indeed.

We are collaborating in a number of scientific research areas and leveraging federal and private support with other government organizations and international science agencies. The collections we maintain serve as a resource for scientists from other federal agencies including the Department of Agriculture, the Department of Defense and the United States Geological Survey, to name a few. We work with the Office of Science and Technology Policy to coordinate our efforts with agencies and avoid duplication of activities.

We are a leader in the international initiative devoted to developing DNA bar-coding as a global standard for the identification of biological species. The new technique uses a short DNA sequence from a standardized position in the genome as a molecular diagnostic for species identification.

The National Museum of Natural History (NMNH) is the leading partner in a global effort called the Encyclopedia of Life (EOL), an ambitious project that will become a key repository of scientific information about virtually every form of life on earth. The EOL is a Web-based, online database, which has financial, logistical and research support from numerous partners including the MacArthur and Sloan Foundations. It is expected to encompass the 1.9 million known species of animals, plants and other life forms in

about ten years. Thousands of students and teachers already are using the EOL as a resource. The Biodiversity Heritage Library (BHL), the scientific literature component of EOL, is a consortium of 12 natural history and botanical libraries that now has over 35 million pages available online. The world renowned Smithsonian Tropical Research Institute (STRI) continues to expand and enrich the Smithsonian Institution Global Earth Observatories (SIGEO) which has formed international partnerships involving twenty countries to promote large-scale environmental monitoring of forests around the world and maintain standardized banks of data that provide access to scholars and students around the globe. STRI coordinates the SIGEO programs, which in addition to federal support, is also supported by \$20 million in in-kind and financial support from other government, private and international partners. We are in the process of developing a marine analog to SIGEO, with a global array of assessment sites focusing on coastal marine environments.

We recognize the national need to improve K-12 education in this country and we are, working with teachers and education leaders, developing new approaches to help. Using technology we can reach any corner of our nation. We're nearing completion of an Institution-wide educational plan, and collaborating and partnering with other institutions, and leveraging private support for these efforts.

We have an important role to play in STEAM (Science, Technology, Engineering, Arts and Math) education, because we can offer multidisciplinary experiences that bridge the arts and sciences. Last month, the National Museum of American History (NMAH) was host to the Art of Science Learning conference. It is a National Science Foundation-funded initiative convening scientists, artists, educators, business leaders, researchers and policymakers to explore ways in which the arts can be engaged to strengthen Science, Technology, Engineering, and Mathematics (STEM) skills. This speaks to an issue I have worked on for many years: scientific literacy. I recently outlined how the Smithsonian can be instrumental in addressing that problem in my monograph, *Increasing Scientific Literacy: A Shared Responsibility*.

For 26 years, the National Science Resources Center (NSRC) has leveraged the research and expertise of the Smithsonian and the National Academies of Science to develop science education programs. NSRC was recently awarded a \$25.5 million grant from the Department of Education. NSRC then raised \$8 million in private matching funds for its initiative to transform STEM education in three project areas: two rural, North Carolina and Indiana, and one urban, Houston.

The Smithsonian has conducted three successful interactive online education conferences: on President Lincoln, climate change, and how Smithsonian

experts solve problems. To date, we have more than 33,000 participants from 135 countries, all U.S. states and territories and more than 3,500 cities and six continents. Significantly, more than 500 cities have accessed the conferences since the start of the school year in September 2010, meaning more and more people are taking advantage of our material. More conferences will be offered.

Teachers' Night, which has been generously sponsored for the last three years by Target, offers the opportunity for teachers of all grades and subjects to explore new classroom-ready resources, materials and demonstrations of school programs. This annual free evening event in Washington D.C. attracts 2,000 to 3,000 teachers of science, art, history, social studies, and language arts and provides them with updated information about the use of museum programs, artifacts, and exhibitions to complement school curricula and to meet national education standards.

The Smithsonian American Art Museum, through a partnership with the Department of Defense Education Activity (DoDEA), provides professional development, curriculum resources and videoconferences for teachers and students in schools for children of military personal and civilian employees located on military bases around the world.

The National Museum of American History and the National Museum of African American History and Culture (NMAAHC) commemorated the 50th anniversary of the 1961 Freedom Rides with a series of public programs across the country on February 9 to examine the history and legacy of the rides. Over 1,500 middle and high school students participated here in D.C. and at five Affiliate Regional Youth Town Hall locations across the country, while nearly 20,000 students joined the live conversation on the internet.

In February, our National Museum of Natural History co-hosted, with Coastal America, the 3rd National Student Summit on the Ocean and Coasts. Coastal America is a partnership, begun in 1992, of 16 federal agencies, state and local governments, marine stations, and aquariums around nation. At the symposium, 20 delegations of students from across the country presented their action plans to help the environment.

In partnership with a multi-year commitment from the Pearson Foundation, the Hirshhorn Museum and the National Postal Museum spearheaded pilot programs last summer on mobile learning workshops. Middle-school students created games, blogs and videos that were shared on a social network set up especially for the curriculum.

The Smithsonian launched "Shout," an interactive education program for students on environmental issues, with Microsoft Partners In Learning and Taking It Global. The Bill & Melinda Gates Foundation gave us a transformational gift of \$30 million for an endowment in support of our

goals to broaden access, reach new audiences and invigorate educational activities. The focus is on reaching underserved audiences, particularly ethnic and economically disadvantaged youth audiences. This is in addition to the Foundation's \$10 million gift to NMAAHC and \$10 million in support of our consortia.

These examples are part of our growing role in education, bringing the power of our museums and research centers to America. We offer a variety of experiences for learners of all ages: exhibitions on African, Asian, Latino and Native American art, presidents, painters, astronauts, the history of flight, the story of what it means to be human and the story of what it means to be an American. Currently on view at the National Museum of American History is Abraham Lincoln: An Extraordinary Life.

At the Smithsonian's Cooper-Hewitt, National Design Museum in New York, we recently opened *Set in Style: The Jewelry of Van Cleef & Arpels* and *Color Moves: Art & Fashion of Sonia Delaunay*.

The Smithsonian American Art Museum's exhibition, *The Great American Hall of Wonders*, opening on July 15, examines the 19th-century American belief that the people of the United States shared a special genius for innovation. It includes works of art, mechanical inventions and scientific discoveries and is in collaboration with the United States Patent and Trademark Office.

The Smithsonian's National Portrait Gallery, which houses a national collection of the portraits of America's presidents, will observe the centennial of Ronald Wilson Reagan's birth with a special one-life exhibition, opening on July 1, 2011. The Portrait Gallery's exhibition, which will focus on Reagan's presidential years, will also include images from his boyhood and early career.

Public programs connected to our research and exhibitions provide important touchstones not only for Americans but also visitors from around the world. In our National Museum of American History we regularly schedule citizenship swearing-in ceremonies in front of the Star Spangled Banner. Now, and for future years, we have a number of exhibitions, programs and publications that will focus on the Civil War, and how from its tragedies we grew as a people and as a nation.

The Smithsonian's National Portrait Gallery exhibition, *Hide/Seek: Difference and Desire in American Portraiture*, was the first major museum exhibition that focused on sexual identity and difference in the making of portraiture in America over the past century. I supported the exhibition because it opened a window on the art of the period and illuminated the history of our changing society. *Hide/Seek* was an exhibition the Smithsonian chose to create when others would not. It did generate

controversy. I continue to believe that my decision to remove one controversial video was in the best interest of the exhibition and the Smithsonian. The exhibition remained up for its full duration and served its purpose as an educational resource for the thousands who came to view it. That said, working with the Smithsonian's Board of Regents, I am committed to improving the way we communicate with our many stakeholders, our board leadership, our directors and the curatorial community. In late April, we held a public forum to continue an important dialog about the role and responsibility of publicly supported museums to educate and inform on complex and sometimes sensitive topics. The director of the Freer and Sackler Galleries will serve as our first senior arts advisor, a new position that will rotate among the art museum directors to provide my administration with advice on matters related to art and cultural exhibitions.

In 2010, we continued the aggressive path of collections preservation and improvement that we began in 2005. We have conducted surveys of our collections' conditions, collections spaces across the Institution and the state of our comprehensive digitization efforts. Based on the assessment results, we are strategically targeting specific collections and improving collections care. In addition, recent collections-related audits by the Smithsonian Inspector General, including the recent audit at the National Museum of American History, have identified specific deficiencies in collections management. We are following up on each identified deficiency and have made demonstrable progress. This work is challenging because of limited resources. We recognize there continues to be a need for new resources to accomplish basic collections management activities and correct identified collections deficiencies.

Over the past two years we added \$5 million to our collections budget to address our most critical needs and we have built new state of the art facilities to allow key collections to be moved from inadequate space into state-of-the-art space. Specific accomplishments include the completion of the Pod 5 facility at our Suitland Collections Center for scientific specimens; the opening of the new Pennsy Drive facility for collections in American History, African American History and Culture and Smithsonian Institution Libraries; and the recent opening of the Phase II of the National Air and Space Steven Udvar Hazy Center, which includes a significant new space for conservation, archives and storage. Also, in order to provide a cohesive approach to collections, we have appointed a Deputy Undersecretary for Collections and Interdisciplinary Services who has the prime responsibility for overseeing collections care and coordination at the Institution.

Collections care funding provides the necessary resources for the Smithsonian to implement the Institution-wide collections assessment

program, address the Smithsonian Inspector General's collections-related audit recommendations, and improve the preservation, storage, and accessibility of collections. We will continue to seek additional public and private funding as well as external partnerships to improve Smithsonian collections care.

We have recently developed our first Digitization Strategic Plan to digitize the collections and research of the Institution for the widest possible use by current and future generations, to increase public access and to expedite the work of researchers and educators worldwide. Digital access also reduces the need for physical access and handling of artifacts which can degrade their quality over time.

In 2010, the Smithsonian Institution undertook its first strategic planning effort to develop a focused vision to leverage individual strengths of its organizations and achieve even greater accomplishments through interdisciplinary and collaborative efforts. The plan, Inspiring Generations Through Knowledge and Discovery, focuses on four "Grand Challenges:" 1) Unlocking the Mysteries of the Universe; 2) Understanding and Sustaining a Biodiverse Planet; 3) Valuing World Cultures; and 4) Understanding the American Experience. The plan has created a new organizational structure at the Smithsonian to increase efficiency and encourage entrepreneurship, new goals to focus budget priorities, and four pillars to secure the necessary resources: private philanthropy, government grants and contracts, business revenue, and federal appropriations. We are leveraging federal funds to increase private support.

As part of our strategic plan and in order to support and encourage pan-institution and interdisciplinary collaborations we have formed four Consortia, one around each of the Four Grand Challenges. These are flexible means of bringing our scholars and scientists together around important ideas and enabling them to make progress in tackling those challenges. We have been fortunate to receive a \$10 million grant from the Bill & Melinda Gates Foundation to stimulate the spirit of interdisciplinary collaboration through intellectual exchanges within the Smithsonian and beyond. The Consortia recently funded 31 new internal projects through our Grand Challenge Awards competition for a variety of interdisciplinary projects on such topics as: "Searching for the Building Blocks of the Universe," "Recovering Lost Languages," our "Immigration and Migration Initiative," and much more.

We're looking at the major administrative and financial systems that knit our complex, highly diverse organization together, and taking steps in collaborative fashion to boost efficiencies and free up time for everyone to do their best work. This redesign initiative is of particular importance now as we face budget tightening and are making the case to new and

existing donors that an investment in the Smithsonian is a wise one. We've fielded six teams made up of colleagues from across the Institution; over 275 staff representing 55-plus units are actively involved. These teams are focused on improving our processes in finance, budget development, federal hiring, metrics, procurement, and sponsored projects.

Federal funding remains the backbone of our future. And while federal funding keeps our buildings open and accessible to the public, maintains the invaluable national collections, and funds a large percentage of the Smithsonian's workforce, we know that a vibrant future also depends on private support. The Smithsonian has averaged around \$140 million in private philanthropy in the past few years and last year we raised \$158 million. As noted the Bill & Melinda Gates Foundation made two grants, \$30 million for broadening access to the Institution through a Youth Access Endowment and \$10 million for the four consortia that support the "grand challenges" identified in the Smithsonian's strategic plan. The Boeing Company donated \$4 million to the National Air and Space Museum Steven F. Udvar-Hazy Center's Phase Two construction. Gifts also included support for the National Zoo's new Elephant Trail and the National Museum of African American History and Culture. We plan to build on that entrepreneurial progress in the years ahead.

The complementary nature of public and private funding has enabled the Smithsonian to remain a free resource to the public while at the same time producing programming, outreach, education and research that builds on our vast collections and are accessible to millions. This funding mix is essential to the Smithsonian going forward, as one investment leverages the other and permits us to truly increase and diffuse knowledge - our founding mission.

During fiscal year 2010, the Institution accepted 728 new grant and contract awards totaling \$163 million that funded projects, partnerships and collaborations with agencies and universities. Selected examples of these entrepreneurial sponsored projects include: \$99.2 million from NASA for the SAO X-ray astronomy research; \$25.5 million from the Department of Education for the LASER Model research Project; and \$516,563 from the Department of Defense for a multi-year study to develop predictive models and efficient and cost-effective management strategies used to further migratory bird conservation (in collaboration with Oregon State University, and the U.S. Army Engineer Research and Development Center).

The National Air and Space Museum's Steven F. Udvar-Hazy Center located near Dulles International Airport is now completed with the opening of the new Phase II. While Congress supported the original architectural design and continues to support its operations, the Center was constructed entirely with non-Federal funds. The recently completed areas of the Center

will allow visitors to watch the restoration of museum artifacts in progress. Also, the entire archives of the museum will reside in one facility open to researchers.

The Congressionally supported National Museum of African American History and Culture (NMAAHC) is moving ahead. We have amassed over 10,000 artifacts, including a tool kit that was passed down by three generations of a family of carpenters, a silk shawl given to Harriet Tubman by Queen Victoria in 1897, and a powder horn once used by a black soldier and former slave named Prince Simbo. These artifacts and the tens of thousands more that the Museum intends to collect will tell the rich story of African American art, history and culture. Preconstruction planning for the Museum is proceeding on schedule and construction is on track to begin in 2012 with a scheduled opening in 2015, coinciding with the 150th anniversary of the end of the Civil War. A total of \$100 million has been raised to date, including \$10 million from the Lilly Endowment, \$10 million from the Gates Foundation, and millions more from Boeing, the Ford Foundation, Rockefeller Foundation, Wal-Mart, Target and American Express, to name a few. With the funds provided by Congress in prior years for planning and design, the amount included for fiscal year 2012 to construct the Museum moves the Institution closer to achieving the federal commitment of 50 percent of the building's costs. This amount will also provide a significant incentive for additional private support and contribute to the success of the Institution's private fundraising goals.

We are beginning to make the necessary repairs to the Arts and Industries Building with funds provided by this Subcommittee, the Recovery Act, and the Legacy Fund. We matched the Legacy Fund with private donations as required. Work has begun to replace the roof and windows, as well to restore the building's exterior.

The Smithsonian's fiscal year 2012 request totals \$861.5 million and includes \$636.5 million for Salaries and Expenses, the Institution's operating budget, and \$225 million for Facilities Capital projects. The request includes \$125 million to begin construction of the new National Museum of African American History and Culture building on the National Mall. Otherwise, the Facilities Capital request would be \$100 million or 5 percent below fiscal year 2010.

The Institution's fiscal year 2012 request for Salaries and Expenses was shaped within the Administration's mandate to hold the budget to fiscal year 2010 funding levels. The request of \$636.5 million reflects a minimal increase (\$0.4 million) over the fiscal year 2010 and (\$1.7 million) over current fiscal year 2011 operating levels. We have developed our request and a series of necessary reductions following the guidance provided by our strategic plan so that we maintain our focus and momentum.

The request includes redirecting \$2.3 million of base funds to advance programs within the Four Grand Challenges. An additional \$1.3 million will be redirected to support other priorities within the strategic plan in fiscal year 2012.

The \$2.3 million requested for the Grand Challenges includes \$100,000 for research conducted through the consortium for Unlocking the Mysteries of the Universe; \$350,000 to focus research activities on sustaining a biodiverse earth, changes across geography and through time; \$750,000 for the Smithsonian's Global Earth Observatories network; \$250,000 for efforts in DNA bar-coding and \$300,000 to provide infrastructure for the Encyclopedia of Life initiative. The 2012 plan includes \$500,000 to continue research in the development and diversity of contemporary American culture through the consortium for Understanding the American Experience.

The \$1.3 million for other priorities within the strategic plan includes \$500,000 to broaden access to our collections and research through enhancements to our Digital Asset Management System and expanded use of new media technologies. The request also includes \$500,000 to strengthen collections. These activities include \$250,000 for the National Museum of Natural History's collections program to replace collections storage cabinetry and digitize original handwritten collection ledgers and specimen images and \$250,000 to care for animals at the National Zoo. Under the goal of mission enabling activities the request includes a redirection of \$330,000 to improve internal controls in the Office of Contracting and Personal Property Management.

In addition to supporting the Strategic Plan, the request also addresses uncontrollable increases anticipated in fiscal year 2012 that total \$2.3 million. These increases include \$91,000 for Workers Compensation; \$1.2 million for escalation costs of current rental space; and \$1.4 million for communications costs including increased bandwidth, licenses and IT security. These increases are offset by savings of \$400,000 from reduced utilities consumption and postage costs.

The proposed increases are offset by reductions totaling \$5.5 million, comprised of reductions of \$2 million from administrative activities and \$3.5 million from lower priority program activities. Administrative savings of \$1.2 million result from completion of a new security plan for museums and galleries and an additional \$750,000 from consolidating Information Technology utility type services. The request also includes \$3.5 million in reductions to museums and research center programs that include \$500,000 for Visitor Services at National Museum of the American Indian, which will be supported by volunteers; \$350,000 for instrument development at the Smithsonian Astrophysical Observatory, and savings of \$250,000 resulting from closure of the Kids' Farm at the National Zoological Park. Research

activities at the Tropical Research Institute will be reduced by \$300,000. In addition, the fiscal year 2012 request includes a reduction of \$800,000 to the Repatriation Program and curtailment of temporary exhibits at the National Museum of Natural History; a reduction of \$150,000 to aviation history research at the National Air and Space Museum; and reductions totaling \$1.2 million to central pools that provide cyclical desktop replacements, research equipment, and collections needs throughout the Institution.

Our fiscal year 2012 budget also includes \$72.1 million, toward our target of \$100 million for maintenance and repairs. Through increased attention to preventive maintenance and by addressing deficiencies in a timely manner, the Institution can prolong the usable life of our buildings, some of which are over 100 years old and have experienced the wear and tear of millions of visitors through their doors. Our Maintenance budget also addresses building systems to maintain a safe and healthy physical environment for our staff and visitors.

The Institution's fiscal year 2012 request includes \$225 million for Facilities Capital. The amount includes \$84.8 million for revitalization projects, \$52.8 million of which began in prior fiscal years, \$15.2 million for planning and design of new capital projects, and \$125 million for construction of the National Museum of African American History and Culture.

The fiscal year 2012 request to continue major revitalization projects includes \$7 million for renovation of the Carnegie Mansion at the Cooper-Hewitt, National Design Museum, the Museum has raised over \$30 million in private funds for this effort already. We are requesting \$750,000 for replacement of high-voltage electrical systems at the National Air and Space Museum; \$11 million to continue revitalization of the west wing of the National Museum of American History; and \$8 million to replace windows and HVAC at the one-hundred-year-old National Museum of Natural History building. The request for facilities revitalization funds also includes \$17 million for continued development of the elephant trails and safety improvements and renovations at the National Zoological Park's facilities in Front Royal and Rock Creek Park.

The fiscal year 2012 revitalization request also includes \$21.4 million to continue needed upgrades to scientific research facilities. These upgrades include replacement of temporary trailers and renovations of the Mathias Laboratory at the Smithsonian Environmental Research Center and replacement of unusable space and utilities infrastructure for the Terrestrial Tropical Science laboratory of the Smithsonian Tropical Research Institute at Gamboa. Also included is an additional \$19.7 million for other revitalization projects that are smaller in scale and \$15.2 million for planning and design of future capital projects.

In closing, the Institution is becoming more innovative, disciplined, focused, nimble and self-reliant than in the past. We face a future that holds both exciting opportunities and imposing challenges. Working with the Congress and the Administration, the Smithsonian will aggressively address these challenges and take full advantage of many new opportunities, using the Institution's Strategic Plan as a road map to excellence.

For 165 years, the Smithsonian has served our nation and the world as a source of inspiration, discovery, and learning. With its free museums, distinguished research and scholars, iconic American treasures and remarkable scope of information accessible from its websites, the Smithsonian Institution, despite these economic times, has become an even more valuable resource for the American people.

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Record - 2

DIALOG(R)

Study Results from Harvard-Smithsonian Center for Astrophysics Broaden Understanding of Planetary Science,
Science Letter, p3991,
Tuesday, May 17, 2011

TEXT:

According to a study from Cambridge, United States, "We perform a numerical study of the evolution of a Coronal Mass Ejection (CME) and its interaction with the coronal magnetic field based on the 12 May 1997, CME event using a global MagnetoHydroDynamic (MHD) model for the solar corona. The ambient solar wind steady-state solution is driven by photospheric magnetic field data, while the solar eruption is obtained by superimposing an unstable flux rope onto the steady-state solution."

"During the initial stage of CME expansion, the core flux rope reconnects with the neighboring field, which facilitates lateral expansion of the CME footprint in the low corona. The flux rope field also reconnects with the oppositely orientated overlying magnetic field in the manner of the breakout model. During this stage of the eruption, the simulated CME rotates counter-clockwise to achieve an orientation that is in agreement with the interplanetary flux rope observed at 1 AU. A significant component of the CME that expands into interplanetary space comprises one of the side lobes created mainly as a result of reconnection with the overlying field. Within 3 hours, reconnection effectively modifies the CME connectivity from

the initial condition where both footpoints are rooted in the active region to a situation where one footpoint is displaced into the quiet Sun, at a significant distance (approximate to 1 R-circle dot) from the original source region. The expansion and rotation due to interaction with the overlying magnetic field stops when the CME reaches the outer edge of the helmet streamer belt, where the field is organized on a global scale," wrote O. Cohen and colleagues, Harvard-Smithsonian Center for Astrophysics (see also).

The researchers concluded: "The simulation thus offers a new view of the role reconnection plays in rotating a CME flux rope and transporting its footpoints while preserving its core structure."

Cohen and colleagues published the results of their research in the Journal of Geophysical Research - Space Physics (Numerical simulation of the 12 May 1997 CME Event: The role of magnetic reconnection. Journal of Geophysical Research - Space Physics, 2010;115():10104).

For additional information, contact O. Cohen, Harvard Smithsonian Center Astrophysics, 60 Garden St., Cambridge, MA 02138, United States.

The publisher of the Journal of Geophysical Research - Space Physics can be contacted at: American Geophysical Union, 2000 Florida Avenue NW, Washington, DC 20009, USA.

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Record - 3

DIALOG(R)

Reports Outline Noble Gases Research from Harvard-Smithsonian Center for Astrophysics,

Science Letter, p1757,

Tuesday, May 17, 2011

TEXT:

According to recent research from Cambridge, United States, "The double main sequence identified in the globular cluster Omega Centauri has been interpreted using isochrones to indicate a large variation in the abundance of helium. If true, a helium enhancement carries strong implications for the chemical and stellar evolutionary history of this cluster."

"However, only indirect measures currently support this conjecture. We report the discovery of a variation in the line strength of the near-infrared He I 10830 angstrom transition in 12 similar red giants in

Omega Centauri observed with PHOENIX on Gemini-S. Abundances of these stars derived from Magellan/MIKE spectra taken at the Las Campanas Observatory show that the helium transition is not detected in the most metal-poor population ($[\text{Fe}/\text{H}] < -1.8$), yet is present in the majority of stars with $[\text{Fe}/\text{H}] \geq -1.8$. These observations give the first direct evidence for an enhancement of helium in Omega Centauri," wrote A.K. Dupree and colleagues, Harvard-Smithsonian Center for Astrophysics (see also).

The researchers concluded: "The appearance of helium appears better correlated with increased $[\text{Al}/\text{Fe}]$ and $[\text{Na}/\text{Fe}]$ abundances than as a function of $[\text{Fe}/\text{H}]$, giving observational support to the presence of high-temperature H burning in a prior generation of stars."

Dupree and colleagues published their study in *Astrophysical Journal* (Direct Evidence For An Enhancement Of Helium In Giant Stars In Omega Centauri. *Astrophysical Journal*, 2011;728(2):155).

For additional information, contact A.K. Dupree, Harvard Smithsonian Center Astrophysics, 60 Garden St., Cambridge, MA 02138, United States.

Publisher contact information for the *Astrophysical Journal* is: IOP Publishing Ltd., Dirac House, Temple Back, Bristol BS1 6BE, England.

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Record - 4

DIALOG(R)

New Findings Reported from Harvard-Smithsonian Center for Astrophysics Describe Advances in Astronomy,
Science Letter, p1023,
Tuesday, May 17, 2011

TEXT:

"A deep Chandra observation of the X-ray bright group, NGC 5044, shows that the central region of this group has been strongly perturbed by repeated active galactic nucleus (AGN) outbursts. These recent AGN outbursts have produced many small X-ray cavities, cool filaments, and cold fronts," scientists in Cambridge, United States report (see also).

"We find a correlation between the coolest X-ray emitting gas and the morphology of the H α filaments. The H α filaments are oriented in the direction of the X-ray cavities, suggesting that the warm gas responsible for the H α emission originated near the center of NGC 5044 and was dredged

up behind the buoyant, AGN-inflated X-ray cavities. A detailed spectroscopic analysis shows that the central region of NGC 5044 contains spatially varying amounts of multiphase gas. The regions with the most inhomogeneous gas temperature distribution tend to correlate with the extended 235 MHz and 610 MHz radio emission detected by the Giant Metrewave Radio Telescope. This may result from gas entrainment within the radio emitting plasma or mixing of different temperature gas in the regions surrounding the radio emitting plasma by AGN-induced turbulence. Accounting for the effects of multiphase gas, we find that the abundance of heavy elements is fairly uniform within the central 100 kpc, with abundances of 60%-80% solar for all elements except oxygen, which has a significantly sub-solar abundance. In the absence of continued AGN outbursts, the gas in the center of NGC 5044 should attain a more homogeneous distribution of gas temperature through the dissipation of turbulent kinetic energy and heat conduction in approximately 10^8 yr," wrote L.P. David and colleagues, Harvard-Smithsonian Center for Astrophysics.

The researchers concluded: "The presence of multiphase gas in NGC 5044 indicates that the time between recent AGN outbursts has been less than similar to 10^8 yr."

David and colleagues published their study in *Astrophysical Journal* (Active-galactic-nucleus-driven Weather And Multiphase Gas In The Core Of The Ngc 5044 Galaxy Group. *Astrophysical Journal*, 2011;728(2):162).

For more information, contact L.P. David, Harvard Smithsonian Center Astrophysics, 60 Garden St., Cambridge, MA 02138, United States.

Publisher contact information for the *Astrophysical Journal* is: IOP Publishing Ltd., Dirac House, Temple Back, Bristol BS1 6BE, England.

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DIALOG(R)

Data on Astronomy Reported by Researchers at Harvard-Smithsonian Center for Astrophysics,

Science Letter, p343

Tuesday, May 17, 2011

TEXT:

According to a study from Cambridge, United States, "We report the results of the first transit timing variation analysis of the very hot Jupiter

OGLE-TR-132b, using 10 transits collected over a seven-year period. Our analysis combines three previously published transit light curves with seven new transits, which were observed between 2008 February and 2009 May with the new MagIC-e2V instrument on the Magellan Telescopes in Chile."

"We provide a revised planetary radius of $R_p = 1.23 \pm 0.07 R_J$, which is slightly larger, but consistent within the errors, than that given by previously published results. Analysis of the planet-to-star radius ratio, orbital separation, inclination, and transit duration reveals no apparent variation in any of those parameters during the time span observed. We also find no sign of transit timing variations larger than -108 ± 49 s, with most residuals very close to zero. This allows us to place an upper limit of 5-10 M_{Jup} for a coplanar, low-eccentricity perturber in either the 2:1 or 3:2 mean-motion resonance with OGLE-TR-132b," wrote E.R. Adams and colleagues, Harvard-Smithsonian Center for Astrophysics (see also).

The researchers concluded: "We similarly find that the data are entirely consistent with a constant orbital period and there is no evidence for orbital decay within the limits of precision of our data."

Adams and colleagues published their study in *Astrophysical Journal* (TRANSIT TIMING VARIATION ANALYSIS OF OGLE-TR-132b WITH SEVEN NEW TRANSITS.

Astrophysical Journal, 2011;728(2):125).

For more information, contact E.R. Adams, Harvard Smithsonian Center Astrophysics, 60 Garden St., Cambridge, MA 02138, United States.

Publisher contact information for the *Astrophysical Journal* is: IOP Publishing Ltd., Dirac House, Temple Back, Bristol BS1 6BE, England.

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Record - 6

DIALOG(R)

NASA'S FERMI SPOTS 'SUPERFLARES' IN THE CRAB NEBULA,

US Federal News,

Wednesday, May 11, 2011

TEXT:

WASHINGTON, May 11 -- NASA issued the following press release:

The famous Crab Nebula supernova remnant has erupted in an enormous flare

five times more powerful than any flare previously seen from the object. On April 12, NASA's Fermi Gamma-ray Space Telescope first detected the outburst, which lasted six days.

The nebula is the wreckage of an exploded star that emitted light which reached Earth in the year 1054. It is located 6,500 light-years away in the constellation Taurus. At the heart of an expanding gas cloud lies what is left of the original star's core, a superdense neutron star that spins 30 times a second. With each rotation, the star swings intense beams of radiation toward Earth, creating the pulsed emission characteristic of spinning neutron stars (also known as pulsars).

Apart from these pulses, astrophysicists believed the Crab Nebula was a virtually constant source of high-energy radiation. But in January, scientists associated with several orbiting observatories, including NASA's Fermi, Swift and Rossi X-ray Timing Explorer, reported long-term brightness changes at X-ray energies.

"The Crab Nebula hosts high-energy variability that we're only now fully appreciating," said Rolf Buehler, a member of the Fermi Large Area Telescope (LAT) team at the Kavli Institute for Particle Astrophysics and Cosmology, a facility jointly located at the Department of Energy's SLAC National Accelerator Laboratory and Stanford University.

Since 2009, Fermi and the Italian Space Agency's AGILE satellite have detected several short-lived gamma-ray flares at energies greater than 100 million electron volts (eV) - hundreds of times higher than the nebula's observed X-ray variations. For comparison, visible light has energies between 2 and 3 eV.

On April 12, Fermi's LAT, and later AGILE, detected a flare that grew about 30 times more energetic than the nebula's normal gamma-ray output and about five times more powerful than previous outbursts. On April 16, an even brighter flare erupted, but within a couple of days, the unusual activity completely faded out.

"These superflares are the most intense outbursts we've seen to date, and they are all extremely puzzling events," said Alice Harding at NASA's Goddard Space Flight Center in Greenbelt, Md. "We think they are caused by sudden rearrangements of the magnetic field not far from the neutron star, but exactly where that's happening remains a mystery."

The Crab's high-energy emissions are thought to be the result of physical processes that tap into the neutron star's rapid spin. Theorists generally agree the flares must arise within about one-third of a light-year from the neutron star, but efforts to locate them more precisely have proven unsuccessful so far.

Since September 2010, NASA's Chandra X-ray Observatory routinely has monitored the nebula in an effort to identify X-ray emission associated with the outbursts. When Fermi scientists alerted astronomers to the onset of a new flare, Martin Weisskopf and Allyn Tennant at NASA's Marshall Space Flight Center in Huntsville, Ala., triggered a set of pre-planned observations using Chandra.

"Thanks to the Fermi alert, we were fortunate that our planned observations actually occurred when the flares were brightest in gamma rays," Weisskopf said. "Despite Chandra's excellent resolution, we detected no obvious changes in the X-ray structures in the nebula and surrounding the pulsar that could be clearly associated with the flare."

Scientists think the flares occur as the intense magnetic field near the pulsar undergoes sudden restructuring. Such changes can accelerate particles like electrons to velocities near the speed of light. As these high-speed electrons interact with the magnetic field, they emit gamma rays.

To account for the observed emission, scientists say the electrons must have energies 100 times greater than can be achieved in any particle accelerator on Earth. This makes them the highest-energy electrons known to be associated with any galactic source. Based on the rise and fall of gamma rays during the April outbursts, scientists estimate that the size of the emitting region must be comparable in size to the solar system.

NASA's Fermi is an astrophysics and particle physics partnership managed by NASA's Goddard Space Flight Center in Greenbelt, Md., and developed in collaboration with the U.S. Department of Energy, with important contributions from academic institutions and partners in France, Germany, Italy, Japan, Sweden and the United States.

The Marshall Space Flight Center manages the Chandra program for NASA's Science Mission Directorate in Washington. The Smithsonian Astrophysical Observatory controls Chandra's science and flight operations from Cambridge, Mass.

For more information, images and video, visit:

<http://www.nasa.gov/fermi> For any query with respect to this article or any other content requirement, please contact Editor at htsyndication@hindustantimes.com

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DIALOG(R)

**GEORGE MITCHELL, MITCHELL FOUNDATION COMMIT \$25 MILLION TO GIANT
MAGELLAN
TELESCOPE,**

US Federal News,

Tuesday, May 10, 2011

TEXT:

COLLEGE STATION, Texas, May 10 -- Texas A&M University issued the following news release:

Houston businessman George P. Mitchell has taken another pioneering step in his personal quest to position Texas A&M University as an international leader in fundamental physics and astronomy.

Mitchell, a 1940 Texas A&M distinguished petroleum engineering graduate and founder of Mitchell Energy & Development Corp., and The Cynthia and George Mitchell Foundation have agreed to a landmark \$25 million gift to the Giant Magellan Telescope Organization (GMTO) Corporation toward construction of the \$700 million Giant Magellan Telescope, a next-generation, ground-based wonder poised to open a new window on the Universe for the 21st century. Mitchell's gift is being made through the Carnegie Institution for Science, home of Carnegie Observatories and headquarters of the GMTO, which manages the telescope project. Half of the gift, or \$12.5 million, will be credited to Texas A&M, bringing Mitchell's total commitments to the GMT on behalf of Texas A&M to more than \$21 million.

Mitchell's previous pledges to the GMT include a five-year, \$5 million gift to Texas A&M last fall as well as the original \$3.25 million contribution he and his wife, Cynthia Woods Mitchell, made in 2004 to establish his alma mater as a founding partner in the world's largest telescope and heir apparent to NASA's Hubble Space Telescope - one with the power to solve many of the Universe's most intriguing scientific puzzles.

"This gift not only brings the dream of the Giant Magellan Telescope much closer to becoming reality, but also helps propel Texas A&M and the entire State of Texas to the forefront in the important fields of physics and astronomy," said Texas A&M President R. Bowen Loftin. "We are extremely grateful to Mr. Mitchell for his profound vision and his significant investment in our shared future."

Dr. Nicholas B. Suntzeff, director of Texas A&M's astronomy program and holder of the Mitchell-Heep-Munnerlyn Endowed Chair in Observational Astronomy in the Department of Physics and Astronomy, lauded Mitchell's continued financial support for Texas A&M's burgeoning astronomy program,

singling out his GMT gifts as being particularly vital to its overall success.

"We are approximately one-third of the way funded, and as such, I'm very optimistic this will get built," Suntzeff said. "We greatly appreciate Mr. Mitchell's visionary support of the GMT and of Texas A&M Astronomy."

To date \$255.5 million has been raised in support of the GMT, viewed as one of the most viable successors to the Hubble Telescope that has served as scientists' premier source for the most important astronomical discoveries for decades. Towering above a Chilean mountaintop at a colossal perch of 200 feet and equipped with seven 8.4-meter primary mirror segments weighing in at 20 tons apiece that together will provide the power of a single 25-meter mirror, the GMT will rank as the world's largest and most powerful telescope, capable of collecting 70 times more light - thereby enabling images up to 10 times sharper - than the Hubble.

The GMT is set to begin science operations at the Las Campanas Observatory site in the Atacama Desert in northern Chile in 2018, about the same time the orbiting Hubble is expected to deteriorate beyond the point of functionality. Thanks to Texas A&M's Munneryn Astronomical Laboratory and the expertise of its director, Dr. Darren L. DePoy, holder of the Rachal-Mitchell-Heep Endowed Professorship in Physics, Texas A&M will be leading the development of its state-of-the-art instruments that will enable major breakthroughs, such as direct visual images of planets around other stars and the first galaxies in the Universe. The GMT is expected to unlock the secrets of the very early Universe - the first stars, galaxies and black holes that formed - and to give perhaps the first definitive answer as to whether or not there is life beyond Earth.

"The gift from Mr. Mitchell and The Cynthia and George Mitchell Foundation comes at an extremely important time to help fund the final design of the telescope, which will put the GMT well ahead of the other giant telescope project funded out of California," Suntzeff said. "Our design is significantly less expensive and technologically less challenging than the California project. We will be on the sky first, and I hope we will therefore be first to make the major discoveries in the next decade here in Texas. It is our intent to partner with the outstanding high-tech industry we have in Texas to design and construct major parts of the telescope."

Armed with the GMT's unparalleled insights into optical and infrared astronomy not possible using current technology, scientists hope to unravel new details about the mysteries of dark matter and dark energy. They also hope to use the GMT as a "time machine" to peer back into the cosmos to detect the origins of the very first stars and galaxies.

"We will be able to point this telescope anywhere in the southern skies and see farther than anyone else on Earth, even very close to the edge of the Universe, with a telescope of this size and quality," Suntzeff said.

Back in 2004, it was Mitchell's initial gift to the GMT on behalf of Texas A&M that not only launched the university's astronomy program but also spurred the University of Texas at Austin to provide matching funds that established the two flagship universities as original partners in the GMT project. They, along with eight other major international research organizations - the Carnegie Institution for Science, Harvard University, the Smithsonian Astrophysical Observatory, the University of Arizona, the University of Chicago, the Australian National University, Astronomy Australia Limited and the Korea Astronomy and Space Science Institute - are collaborating to construct and operate the mammoth 25-meter telescope.

Mitchell said he felt compelled to make yet another generous gift to help ensure that Texas A&M's team of world-class astronomers had adequate time to use the GMT upon its completion - all but guaranteeing that Texas A&M will be at the helm of the highly anticipated new discoveries the gigantic telescope is expected to uncover.

"The GMT is one of the reasons these researchers came to Texas A&M in the first place," Mitchell said. "Hubble will be out of commission in the next five or six years. More money means more observation time, and it's important our researchers get that time with the GMT."

Thanks to Mitchell's contributions to the GMT, the possibilities for Texas A&M's future as a premier astronomy research institution are seemingly endless, according to Suntzeff.

"This will cement Texas A&M as one of the top schools in astronomy and astronomical instrumentation," he said. "With the GMT, Texas A&M will be the leader in many tremendous new discoveries with our outstanding faculty. The hardest thing to do is to get a project like this off the ground, and Mr. Mitchell's gifts have made that possible."

Throughout a successful career in the petroleum industry, Mitchell retained a lifelong interest in physics and astronomy, an interest he shared with his late wife, Cynthia. Their visionary support of the Texas A&M Department of Physics and Astronomy has played a leading role in its skyrocketing rise to national prominence. In addition to a \$35 million gift in 2005 toward the construction of the \$82.5 million George P. and Cynthia Woods Mitchell Institute for Fundamental Physics and Astronomy and the George P. Mitchell '40 Physics Buildings, the couple has funded nine academic chairs and professorships, a post-doctoral fellowship in astronomy and a related lecture series. The Mitchell family's generous support of Texas A&M's programs in fundamental physics and astronomy totals more than \$68 million

since 2002.

For decades, the Mitchells have been major benefactors of Texas A&M's marine-oriented branch campus in Galveston. Among other gifts for Texas A&M University at Galveston, Mitchell donated the 135 acres where its main campus is located and which carries his father's name. They also provided major funding for Texas A&M's statistics and petroleum engineering departments and the George P. Mitchell '40 Outdoor Tennis Center.

For additional information on the GMT as well as the science it will perform, visit <http://www.gmto.org>.

To learn more about Texas A&M astronomy, visit <http://astronomy.tamu.edu/>. For any query with respect to this article or any other content requirement, please contact Editor at htsyndication@hindustantimes.com

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Wolbach Library: CfA in the News ~ Week ending 22 May 2011

1. **Space art can bring life to mystery of science**, Dan Vergano, USA TODAY, Gannett News Service, pARC, Wednesday, May 18, 2011
2. **End of the world May 21st? About a billion years too soon, astronomers say.**, Pete Spotts - Staff writer, Christian Science Monitor (USA), ALL ed, Friday, May 20, 2011
3. **Research on Astronomy Described by Scientists at Harvard-Smithsonian Center for Astrophysics**, Science Letter, p3012, Tuesday, May 24, 2011
4. **Investigators at Harvard-Smithsonian Center for Astrophysics Have Published New Data on Astronomy**, Science Letter, p758, Tuesday, May 24, 2011
5. **Astronomers claim planets have no orbits**, MALCOLM RITTER, Charleston Daily Mail (WV), pP4C, Thursday, May 19, 2011
6. **Mysterious objects may aid science**, Virginia Pilot and Ledger-Star (Norfolk, VA), VP - The Virginian-Pilot ed, , p12, Thursday, May 19, 2011
7. **Decouverte de possibles planetes sans orbite, selon une etude--**par Malcolm Ritter-- AP French, Thursday, May 19, 2011
8. **Possible wandering planets found associated press**, Boston Globe (MA), p2, Thursday, May 19, 2011
9. **Descubren "alucinantes" planetas, masivos y sin orbita**, MALCOLM RITTER, El Nuevo Herald, Wednesday, May 18, 2011
10. **'Exciting' find: Possible planets without orbits**, MALCOLM RITTER, AP DataStream, Wednesday, May 18, 2011
11. **Descubrimiento "alucinante": Posibles planetas sin orbita**, Por MALCOLM RITTER, AP Online Regional - Latin America/Caribbean, Wednesday, May 18, 2011

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DIALOG(R)

Space art can bring life to mystery of science,
Dan Vergano USA TODAY,
Gannett News Service, pARC,
Wednesday, May 18, 2011

TEXT:

By Dan Vergano USA TODAY

NOTE: THIS STORY IS BEING PLANNED FOR THE WEEKEND NATION/WORLD PAGE
x

Astronomers on the hunt for another Earth have a not-so-secret weapon to bring their discoveries to the public -- space art.

Artistic depictions of alien worlds have blossomed into their own genre of space art in the last decade, even as planet hunting has emerged as one of astronomy's hottest pursuits. A 2010 National Academies of Science report named planet detection one of the field's top priorities for the next decade.

More than 500 planets orbiting nearby stars have been reported by astronomers since 1995. And aside from astronomers fond of data points, most of us know these worlds from artists' imaginations.

" Art really is the only way to get a sense of the mystery around these discoveries," says Lynette Cook, author of *Infinite Worlds: An Illustrated Voyage to Planets beyond Our Sun*. "Scientists love their squiggles and charts. I think most of us want a picture."

The National Science Foundation, for example, unveiled Cook's latest vision in news last week about jumbo-sized planets orbiting opposite the direction of their star's spin. Once thought impossible by astronomers, the planet news came complete with Cook's depiction of just such a world.

"Space artists are playing a very important role in bringing the latest to the public," says planet-hunting astronomer Sara Seager of MIT. "We are not going to see some of these discoveries any other way for hundreds of years."

At least since astronomer Percival Lowell sketched canals on Mars more than a century ago, inflaming the public mind with thoughts of a nearby extraterrestrial civilization, art has played a public relations role in popularizing alien worlds. "Even today, we owe many of our ideas about the 'look' of space travel to 1950s artists," says space historian Matthew Hersch of the University of Pennsylvania. Just like Cook and her colleagues today, space-race era artists such as Chesley Bonestell then worked with scientists "to image a universe of spaceships more romantic than anything we've created since," Hersch says.

"We want to be as scientifically accurate as possible," says David Aguilar, author of *13 Planets: The Latest View of the Solar System*, who has done

many planet discovery illustrations for the Harvard-Smithsonian Center for Astrophysics, where he works. "At the same time, we are a visual society. People want to see what these planets look like."

Telescopes can't do that. In 1995, European astronomers reported the first nearby star, 51 Pegasus, shown to have a planet. The planet was detected by jumps in the spectrum of starlight that indirectly revealed the gravitational wobbles that the world exerted on its star. Until recently, all astronomers could show was such spectrum data from stars to prove planets existed. The first faint photos of planets orbiting stars taken in 2008 look like blips of light.

Even NASA's 2009 Kepler mission, which in February reported 50 planets circling in the ocean-friendly "habitable zone" orbits surrounding nearby stars, relies on an indirect method to make its discoveries. Kepler looks for blinks from stars caused by planets eclipsing them. The data from these observations look like straight lines interrupted by the occasional divot.

"In the era of the Hubble telescope, it has sometimes seemed that photographic images of deep space all but made artistic representations obsolete," says Megan Prelinger, author of *Another Science Fiction: Advertising the Space Race 1957-1962*. Alien planet images, however, she says, "reinvigorate the tradition of space art."

On the other hand, alien planet art has led to new science, Seager says. Earlier in the decade, astronomers discovered planets gravitationally "locked" to always present one hot face to their star, and one cool side always in darkness. Artists asked whether a habitable ocean could exist on the perpetually twilight part of the planet between the hot and cold side. "It was a good question," Seager says. "The answer is no, but we had to really do a lot of analysis to figure that out."

"We always start with the facts," Cook says. How big, how hot, how cloudy or not, drives what sort of planet she depicts. A decade ago, she painted with a brush, but now everything is done with computers. "I worry that computer art means the planets are starting to look alike," Cook says.

Just like astronomers, artists can be too influenced by our own solar system, Seager says. "It's ironic, but sometimes the images are just not imaginative enough," she says.

Astronomers have detected "Hot Jupiters", jumbo planets that nearly graze their stars, and "Super Earths" that might be entirely ocean, worlds like nothing in our solar system, Seager says. "I'm always a little disappointed when they look too much like one of our (solar system's) planets."

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Record - 2

DIALOG(R)

End of the world May 21st? About a billion years too soon, astronomers say.

Pete Spotts - Staff writer,
Christian Science Monitor (USA), ALL ed,
Friday, May 20, 2011

TEXT:

When doomsday comes to planet Earth, it will leave the third rock from the sun a scorched, sterile cinder devoid of living organisms. Virtually everyone can agree on that.

But May 21, 2011, as the start of a five-month period that ends with an October 2011 doomsday? That's off by at least a billion years, give or take 50 million, according to a recent study by a pair of astronomers in Mexico and Britain. ("Recent" on time scales that astronomers work with, anyway.)

And the cause they cite is considerably different than the one invoked by a California minister for an October end of the world.

RECOMMENDED: Judgment Day? Five failed end-of-the-world predictions
The scenario the two astronomers' calculations spin out a(euro)" in a paper in the Monthly Notices of the Royal Astronomical Society in Britain in 2008 a(euro)" is based on what they say is an improved understanding of how stars like the sun evolve over their history. In addition, they examine the effect those changes would have on the sun's so-called habitable zone a(euro)" a Goldilocks region where temperatures are "just right" to allow liquid water to pool and remain on the surface of a planet.

Over the years, the typical one-sentence version of Earth's demise has tended to read something like this: In about 5 billion years, the sun will expand into a red-giant star, engulfing Mercury, Venus, and Earth as it grows.

Poof, Earth is toast.

But if the calculations of Klaus-Peter Schroeder and Robert Smith are in the ballpark, the end of life on Earth would come much sooner a(euro)" but with the potential for a haven on the fourth rock from the sun, Mars.

The story begins some 4.57 billion years ago, when the young sun's nuclear furnace ignited and stabilized. Back then, solar physicists estimate, the

sun was 30 percent dimmer than it is today. As it has matured, it has brightened at a pace of about 1 percent every 110 million years. Over that period, the two explain, Earth's climate system has adjusted to the increase in the sun's output, keeping the planet's average temperature within a livable range and with plenty of water on hand. Orbiting 93 million miles from the sun, Earth finds itself nicely placed in the sun's habitable zone.

But over the next billion years, the duo says, the sun's output will rise by another 10 percent.

As the sun continues to warm, it will in effect push the inner edge of the habitable zone out beyond Earth's orbit. So when, some 5 billion years from now, the sun enters its red-giant phase, the habitable zone will have long since left Earth behind to embrace Mars.

Thus, roughly 4 billion years before Earth is overrun by a swelling sun, the planet will already have warmed enough to drive water from rivers, lakes, and oceans into the atmosphere as water vapor, according to Dr. Schroeder, from Universidad de Guanajuato, in Mexico, and Dr. Smith of the University of Sussex, in England.

Water vapor is the atmosphere's most abundant greenhouse gas, so the buildup of water vapor, as well as increased releases of carbon dioxide from soils and from dying, decaying vegetation, would amplify the heating that the sun delivers.

The researchers add that some of the water vapor will work its way into the stratosphere, where ultraviolet radiation from the sun will break up water molecules into their constituents, oxygen and hydrogen. Hydrogen is such a light element that the liberated hydrogen atoms will be lost to space. That process will remove much of the water vapor from the atmosphere, leaving an intensifying sun to bake Earth's surface under an increasingly cloudless sky.

How much warmer will Earth get? Others have estimated that when the sun begins its shift to red-gianthood, it will be twice as bright as it is now, meaning Earth will be at least 20 percent hotter than today, says Scott Kenyon, a senior scientist at the Harvard-Smithsonian Center for Astrophysics in Cambridge, Mass.

"The ultimate fate of Earth, if it survived at all as a separate body, would be to become a molten remnant," Schroeder and Smith write.

Initially, their calculations suggested that as the sun loses mass in its red-giant phase, the orbits of remaining planets a(euro)" including any remnant Earth a(euro)"actually would grow more distant, since the strength

of gravity depends not just on the distance between two objects, but also on their masses as well.

But as the work proceeded, and the duo accounted for the sun finally ceasing to rotate, they found that tidal interactions between Earth and the sun would increase the drag Earth experiences, gradually guiding it on an inward spiral. The "molten, remnant" planet becomes an asterisk in the cosmic history book some 7.6 billion years from now, they estimate.

Assuming that the human race a(euro)" or whatever it evolves into a(euro)" lasts close to a billion years, there may be a couple of outs, Schroeder and Smith say. One is Mars, which under the new regime is squarely in the sun's relocated habitable zone, at least for a while.

The other is conceptually, if not technologically, more daring a(euro)" divert an object the size of a large asteroid, perhaps an object from the Kuiper Belt, into a relatively close encounter with Earth every 6,000 years. The goal is to alter Earth's orbit, to move it farther from the sun.

As far back as 2001, a team of researchers estimated that by using gravity assists from Jupiter and Saturn, the amount of energy needed to divert the object would be enormous, but significantly less than the energy needed to travel between stars.

The aim would have to be perfect to place the object into the right orbit, or the asteroid itself could plow into the planet or destabilize Earth's orbit.

But humans have a couple of billion years to figure it out.

Of course, the end of the world as astronomers foresee it is so far down on the list of astronomical events humans could worry about that it all vanishes, Dr. Kenyon notes.

As for possible safe havens, he adds, "If all we learn in a few billion years from now is how to go from here to Mars, we'll be in a sorry state."

RECOMMENDED: Judgment Day? Five failed end-of-the-world predictions

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Record - 3

DIALOG(R)

Research on Astronomy Described by Scientists at Harvard-Smithsonian Center for Astrophysics,

Science Letter, p3012,
Tuesday, May 24, 2011

TEXT:

According to a study from Cambridge, United States, "59 quasars in the background of the Magellanic Clouds had brightness records monitored by the MACHO project during the years 1992-99. Because the circumpolar fields of these quasars had no seasonal sampling defects, their observation produced data sets well suited to further careful analysis."

"Following a preliminary report wherein we showed the existence of reverberation in the data for one of the radio-quiet quasars in this group, we now show that similar reverberations have been seen in all of the 55 radio-quiet quasars with adequate data, making possible the determination of the quasar inclination to the observer's line of sight. The reverberation signatures indicate the presence of large-scale elliptical outflow structures similar to that predicted by the Elvis and 'dusty torus' models of quasars, whose characteristic sizes vary within a surprisingly narrow range of scales," wrote J. Lovegrove and colleagues, Harvard-Smithsonian Center for Astrophysics (see also).

The researchers concluded: "More importantly, the observed opening angle relative to the polar axis of the universal elliptical outflow structure present was consistently found to be on the order of 78 degrees."

Lovegrove and colleagues published the results of their research in Monthly Notices of the Royal Astronomical Society (Discovery of universal outflow structures above and below the accretion disc plane in radio-quiet quasars. Monthly Notices of the Royal Astronomical Society, 2011;412(4):2631-2640).

For additional information, contact J. Lovegrove, Harvard Smithsonian Center Astrophysics, 60 Garden St., Cambridge, MA 02138, United States.

The publisher of the journal Monthly Notices of the Royal Astronomical Society can be contacted at: Wiley-Blackwell, Commerce Place, 350 Main St., Malden 02148, MA, USA.

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Record - 4

DIALOG(R)

Investigators at Harvard-Smithsonian Center for Astrophysics Have Published New Data on Astronomy,
Science Letter, p758,

Tuesday, May 24, 2011

TEXT:

"We report on the imaging analysis of similar to 200 ks sub-arcsecond resolution Chandra Advanced CCD Imaging Spectrometer (ACIS-S) observations of the nearby Seyfert 1 galaxy NGC 4151. Bright, structured soft X-ray emission is observed to extend from 30 pc to 1.3 kpc in the southwest from the nucleus, much farther than seen in earlier X-ray studies," scientists in Cambridge, United States report (see also).

"The terminus of the northeastern X-ray emission is spatially coincident with a CO gas lane, where the outflow likely encounters dense gas in the host galactic disk. X-ray emission is also detected outside the boundaries of the ionization cone, which indicates that the gas there is not completely shielded from the nuclear continuum, as would be the case for a molecular torus collimating the bicone. In the central $r < 200$ pc region, the subpixel processing of the ACIS data recovers the morphological details on scales of < 30 pc ($< 0.5''$) first discovered in Chandra High Resolution Camera images. The X-ray emission is more absorbed toward the boundaries of the ionization cone, as well as perpendicular to the bicone along the direction of a putative torus in NGC 4151. The innermost region where X-ray emission shows the highest hardness ratio is spatially coincident with the near-infrared-resolved H-2 emission and dusty spirals we find in an Hubble Space Telescope V-H color image. The agreement between the observed H-2 line flux and the value predicted from X-ray-irradiated molecular cloud models supports photo-excitation by X-rays from the active nucleus as the origin of the H-2 line, although contribution from UV fluorescence or collisional excitation cannot be ruled out with current data. The discrepancy between the mass of cold molecular gas inferred from recent CO and near-infrared H-2 observations may be explained by the anomalous CO abundance in this X-ray-dominated region," wrote J.F. Wang and colleagues, Harvard-Smithsonian Center for Astrophysics.

The researchers concluded: "The total H-2 mass derived from the X-ray observation agrees with the recent measurement by Storchi-Bergmann et al."

Wang and colleagues published their study in *Astrophysical Journal* (A DEEP CHANDRA ACIS STUDY OF NGC 4151. I. THE X-RAY MORPHOLOGY OF THE 3 kpc DIAMETER CIRCUM-NUCLEAR REGION AND RELATION TO THE COLD INTERSTELLAR MEDIUM. *Astrophysical Journal*, 2011;729(1):75).

For additional information, contact J.F. Wang, Harvard Smithsonian Center Astrophysics, 60 Garden St., Cambridge, MA 02138, United States.

The publisher's contact information for the *Astrophysical Journal* is: IOP Publishing Ltd., Dirac House, Temple Back, Bristol BS1 6BE, England.

Record - 5

DIALOG(R)

Astronomers claim planets have no orbits,

MALCOLM RITTER,

Charleston Daily Mail (WV), pP4C,

Thursday, May 19, 2011

TEXT:

NEW YORK - Are these planets without orbits? Astronomers have found 10 potential planets as massive as Jupiter wandering through a slice of the Milky Way galaxy, following either very wide orbits or no orbit at all. And scientists think they are more common than the stars.

These mysterious bodies, apparently gaseous balls like the largest planets in our solar system, may help scientists understand how planets form.

"They're finding evidence for a lot of pretty big planets," said Alan Boss of the Carnegie Institution of Washington, who wasn't involved in the research.

If they orbit stars, their sheer number suggests every star in the galaxy has one or two of them, "which is astounding" because that's five or 10 times the number of stars scientists had thought harbored such gas-giant planets, he said.

And if instead they are wandering free, that "would be really stunning" because it's hard to explain how they formed, he said.

If that's the case, it would give a boost to some theories that say planets can be thrown out of orbit during formation, said Lisa Kaltenegger of the Harvard-Smithsonian Center for Astrophysics, another outside expert.

Other scientists have reported free-wandering objects in star-forming regions of the cosmos, but the newfound objects appear to be different, said one author of the new study, physicist David Bennett of the University of Notre Dame.

Bennett and colleagues from Japan, New Zealand and elsewhere report the finding in Thursday's issue of the journal Nature. They didn't observe the objects directly. Instead, they used the fact that massive objects bend the light of distant stars with their gravity, just as a lens does. So they

looked extensively for such "microlensing" events.

They found 10, each caused by one of the newfound objects. They calculated each object has about the mass of Jupiter, and estimated how common such objects are. They also found no sign of a star near these bodies, at least not within 10 times the distance from Earth to the sun. (For comparison, within our solar system that would basically rule out an orbit closer than Saturn's.)

So the newfound objects either orbit a star more distant than that, or they don't orbit a star at all, the researchers concluded. They drew on other data to determine most of the objects don't orbit a star.

Scientists believe planets are formed when disks of dust that orbit stars form clumps, so that these clumps - the planets - remain in orbit. Maybe the newfound objects started out that way, but then got tossed out of orbit or into distant orbits by the gravitational tugs of larger planets, the researchers suggest.

The work suggests that such a tossing-out process is quite common, Bennett said.

Boss said maybe the bodies formed around a pair of stars instead, one of which supplied the gravitational tug. But even that would take some explaining to produce an object without an orbit, he said. Or maybe they somehow formed outside of any orbit. So the theoretical challenge in explaining the existence of such bodies is "exciting," he said. Boss said he suspects most of these are in a distant orbit, and that maybe they even formed at that great distance rather than being tossed outward from a closer orbit.

Kaltenegger also said the new results can't rule out the possibility that these possible planets are in orbit, and that they may only have the mass of Saturn, about a third of Jupiter's.

But if they aren't orbiting a star, she noted, they don't fit the official definition of a planet - at least not the definition applied to objects in our own solar system.

All in all, Boss said, the new work is "pretty exciting in telling what is out there in the night sky... Lots of theories will grow in this environment."

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Record - 6

DIALOG(R)

Mysterious objects may aid science,

Virginia Pilot and Ledger-Star (Norfolk, VA),

VP - The Virginian-Pilot ed, , p12,

Thursday, May 19, 2011

TEXT:

By Malcolm Ritter

The Associated Press

NEW YORK

Are there planets without orbits? Astronomers have found 10 potential planets as massive as Jupiter wandering through a slice of the Milky Way galaxy, following either very wide orbits or no orbit at all. And scientists think they are more common than the stars.

These mysterious bodies, apparently gaseous balls like the largest planets in our solar system, may help scientists understand how planets form. "They're finding evidence for a lot of pretty big planets," said Alan Boss of the Carnegie Institution of Washington, who wasn't involved in the research.

If they orbit stars, their sheer number suggests every star in the galaxy has one or two of them, "which is astounding," because that's five or 10 times the number of stars scientists had thought harbored such gas-giant planets, he said.

And if instead they are wandering free, that "would be really stunning" because it's hard to explain how they formed, he said.

If that's the case, it would give a boost to some theories that say planets can be thrown out of orbit during formation, said Lisa Kaltenegger of the Harvard-Smithsonian Center for Astrophysics, another outside expert.

Other scientists have reported free-wandering objects in star-forming regions of the cosmos, but the newfound objects appear to be different, said one author of the new study, physicist David Bennett of the University of Notre Dame.

Bennett and colleagues from Japan, New Zealand and elsewhere report the finding in today's issue of the journal Nature. They didn't observe the objects directly. Instead, they used the fact that massive objects bend the

light of distant stars with their gravity, just as a lens does. So they looked extensively for such "micro-lensing" events.

They found 10, each caused by one of the newfound objects. They calculated each object has about the mass of Jupiter, and estimated how common such objects are. They also found no sign of a star near these bodies, at least not within 10 times the distance from Earth to the sun.

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Record - 7

DIALOG(R)

Decouverte de possibles planetes sans orbite, selon une etude,

--par Malcolm Ritter--

AP French,

Thursday, May 19, 2011

TEXT:

NEW YORK_ Les planetes sans orbite existent-elles? Une equipe internationale d'astronomes a decouvert dans une region de la Voie lactee dix planetes potentielles qui pourraient ne pas avoir d'orbite, rapporte une nouvelle etude publiee jeudi dans la revue "Nature".

Ces corps mysterieux seraient des boules de gaz aussi massives que Jupiter, selon les chercheurs.

Les astronomes n'ont pas observe les objets directement. Ils ont recherche la distorsion de la lumiere d'etoiles lointaines provoquee par la force d'attraction d'objets massifs, et ont decouvert dix cas, causes chacun par l'un des corps decouverts. Ils ont calcule que ces objets avaient a peu pres la masse de Jupiter et n'ont pas trouve de signe de la presence d'une etoile a proximite.

Les astronomes ont conclu que ces objets devaient soit decrire une large orbite autour d'une etoile dont ils seraient separes par une distance superieure a dix fois celle separant la terre du soleil, soit ne pas avoir d'orbite du tout. En utilisant d'autres donnees, ils ont estime que la plupart des objets ne tournaient pas autour d'une etoile.

Selon les experts, les planetes se forment lorsque des disques de poussieres en orbite autour d'etoiles s'agglutinent. Les corps decouverts pourraient s'etre formes de cette maniere, puis avoir ete arraches a leur orbite ou expulses sur une orbite plus lointaine par la force d'attraction de grandes planetes, selon les chercheurs.

L'etude suggere que ce processus d'expulsion est assez frequent, note le physicien David Bennett, de l'universite Notre Dame, l'un des auteurs de l'etude, a laquelle ont egalement participe des chercheurs du Japon, de Nouvelle-Zelande et d'autres pays.

Alan Boss, de la Carnegie Institution, qui n'a pas participe a l'etude, pense que la plupart des corps decouverts tournent autour d'etoiles, mais en suivant une orbite eloignee, et qu'ils ont pu se former a cette distance plutot que d'avoir ete chasses d'une orbite plus proche.

Lisa Kaltenegger, du Centre d'astrophysique Harvard-Smithsonian, qui n'a pas non plus participe a l'etude, estime egalement qu'on ne peut exclure la possibilite que ces possibles planetes aient une orbite. AP

Ima/v583

Sur Internet:

Nature: <http://www.nature.com>

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Record - 8

DIALOG(R)

Possible wandering planets found,

associated press,

Boston Globe (MA), p2,

Thursday, May 19, 2011

TEXT:

NEW YORK - Are these planets without orbits? Astronomers have found 10 possible planets as massive as Jupiter wandering through a slice of the Milky Way galaxy, following either very wide orbits or no orbit at all. And scientists think such entities are more common than stars

These mysterious bodies, apparently gaseous balls like the largest planets in our solar system, may help scientists understand how planets form

"They're finding evidence for a lot of pretty big planets," said Alan Boss of the Carnegie Institution of Washington, who was not involved in the research.

If they orbit stars, their sheer number suggests every star in the galaxy

has one or two of them, "which is astounding" because that's five or 10 times the number of stars scientists had thought harbored such gas-giant planets, he said.

And if instead they are wandering free, that "would be really stunning" because it's hard to explain how they formed, he said.

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Instead, they used the fact that massive objects bend the light of distant stars with their gravity, just as a lens does. So they looked extensively for such "microlensing" events.

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Record - 9

DIALOG(R)

Descubren "alucinantes" planetas, masivos y sin orbita,

MALCOLM RITTER,

El Nuevo Herald,

Wednesday, May 18, 2011

TEXT:

?Existen planetas sin orbitas? Los astrónomos han descubierto 10 posibles planetas tan masivos como Jupiter que erran por un sector de la Via Lactea siguiendo orbitas muy amplias o posiblemente ninguna.

Estos cuerpos misteriosos, que parecen ser bolas de gases como los planetas mas grandes de nuestro sistema solar, ayudarian a comprender como se forman los planetas.

"Estan encontrando pruebas de una gran cantidad de planetas muy grandes", dijo Alan Boss , del Carnegie Institution en Washington, quien no participo de la investigacion.

Si giran en torno de estrellas, su solo numero indica que cada estrella de la galaxia tiene uno o dos, "lo cual es asombroso", porque es cinco o 10 veces el numero de estrellas que, segun los cientificos, albergaban planetas gaseosos gigantescos, dijo Boss.

Y si erran libremente, eso "si que seria alucinante" porque seria dificil explicar como se formaron, prosiguió.

De ser cierto, esto confirmaria ciertas teorias de que los planetas en formacion pueden ser expulsados de sus orbitas, dijo Lisa Kaltenegger, del Centro de Astrofisica Harvard-Smithsonian.

Otros cientificos han reportado objetos errabundos en las regiones del cosmos donde se forman las estrellas, pero estos parecen ser otra cosa, dijo el fisico David Bennett , de la Universidad de Notre Dame, uno de los autores del estudio.

Bennett y colegas de Japon, Nueva Zelanda y otros paises reportaron sus hallazgos en la revista Nature. No observaron los objetos directamente, sino que aprovecharon el fenomeno de que los objetos de gran masa tuercen la luz de estrellas distantes con su fuerza de gravedad, tal como hacen los lentes. Por eso se concentraron en buscar esos eventos "microlenticulares".

Hallaron 10, causados cada uno de ellos por uno de los objetos recientemente descubiertos. Calcularon que cada cuerpo tiene una masa similar a la de Jupiter. No hallaron la menor senal de una estrella cercana, al menos a una distancia menor a 10 veces la que existe entre la Tierra y el sol. (A efectos de comparacion, dentro de nuestro sistema solar eso excluiria una orbita mas cercana que la de Saturno.)

La conclusion, segun los autores, es que cada objeto gira en torno de una estrella aun mas lejana o bien no gira en torno de una estrella. Los datos indican que la mayoria de estos objetos no giran en torno de una estrella.

Los cientificos creen que los planetas se forman cuando los discos de polvo en torno de las estrellas forman terrones y estos quedan atrapados en orbita. Tal vez los objetos recientemente descubiertos empezaron asi, pero se vieron expulsados a orbitas mas lejanas o totalmente fuera de orbita por la atraccion gravitatoria de planetas mas grandes, sugieren los investigadores.

Segun Bennett, el estudio senala que ese proceso de expulsion es bastante comun.

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Record - 10

DIALOG(R)

'Exciting' find: Possible planets without orbits,

MALCOLM RITTER,

AP DataStream,

Wednesday, May 18, 2011

TEXT:

NEW YORK_Are these planets without orbits? Astronomers have found 10 potential planets as massive as Jupiter wandering through a slice of the Milky Way galaxy, following either very wide orbits or no orbit at all. And scientists think they are more common than the stars.

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All in all, Boss said, the new work is "pretty exciting in telling what is out there in the night sky... Lots of theories will grow in this environment."

Nature: <http://www.nature.com>

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Record - 11

DIALOG(R)

Descubrimiento "alucinante": Posibles planetas sin orbita,

Por MALCOLM RITTER,

AP Online Regional - Latin America/Caribbean

Wednesday, May 18, 2011

TEXT:

NUEVA YORK_ Estos cuerpos misteriosos, que parecen ser bolas de gases como los planetas mas grandes de nuestro sistema solar, ayudarian a comprender como se forman los planetas.

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Wolbach Library: CfA in the News ~ Week ending 29 May 2011

1. **Galactic 'train wrecks' atlas created to know how galaxies form and evolve**, Hindustan Times, Thursday, May 26, 2011
2. **Judging a star's true age**, Indo-Asian News Service, Wednesday, May 25, 2011
3. **Astronomers Unveil Most Complete 3-D Map of Local Universe**, Fars News Agency (Iran) Saturday, May 28, 2011
4. **How to Learn Stars' True Age**, Fars News Agency (Iran) Wednesday, May 25, 2011
5. **THE SPITZER PHOTO ATLAS OF GALACTIC 'TRAIN WRECKS'**, US Federal News, Thursday, May 26, 2011
6. **KEPLER'S ASTOUNDING HAUL OF MULTIPLE-PLANET SYSTEMS**, US Federal News, Thursday, May 26, 2011
7. **BROWN BAG BY THE BAY**, Press-Register (Mobile, AL), Press-Register 01 ed, p15, Thursday, May 26, 2011
8. **Scientists unveil most complete ever map of the universe that extends to 380 million lightyears away**, Korea Times, Thursday, May 26, 2011
9. **Research Conducted at Harvard-Smithsonian Center for Astrophysics Has Provided New Information about Astronomy**, Science Letter, p2020, Tuesday, May 31, 2011
10. **NEARBY SUPERNOVAS MAY AID IN UNDERSTANDING OF STAR LIFECYCLES**, US Federal News, Tuesday, May 24, 2011
11. **The other effect**, Vivek Deshpande, Indian Express, Sunday, May 22, 2011
12. **Surprise find in Kepler planet hunt: lots of multi-planet systems**, Pete Spotts Staff writer, Christian Science Monitor (USA), ALL ed, Monday, May 23, 2011
13. **Astronomers discover possibility of planets without orbits**, Malcolm Ritter, Daily Star, The (Lebanon) Monday, May 23, 2011

Record - 1

DIALOG(R)

Galactic 'train wrecks' atlas created to know how galaxies form and evolve,

Hindustan Times,

Thursday, May 26, 2011

TEXT:

Washington, May 26 -- Researchers have predicted that five billion years from now, our Milky Way galaxy will collide with the Andromeda galaxy.

This will mark a moment of both destruction and creation. The galaxies will lose their separate identities as they merge into one. At the same time, cosmic clouds of gas and dust will smash together, triggering the birth of new stars.

To understand our past and imagine our future, we must understand what happens when galaxies collide. But since galaxy collisions take place over millions to billions of years, we can't watch a single collision from start to finish. Instead, we must study a variety of colliding galaxies at different stages. By combining recent data from two space telescopes, astronomers are gaining fresh insights into the collision process.

"We've assembled an atlas of galactic 'train wrecks' from start to finish. This atlas is the first step in reading the story of how galaxies form, grow, and evolve," said lead author Luranne Lanz of the Harvard-Smithsonian Center for Astrophysics (CfA).

The new images combine observations from NASA's Spitzer Space Telescope, which observes infrared light, and NASA's Galaxy Evolution Explorer (GALEX) spacecraft, which observes ultraviolet light. By analyzing information from different parts of the light spectrum, scientists can learn much more than from a single wavelength alone, because different components of a galaxy are highlighted.

"We're working with the theorists to give our understanding a reality check," said Lanz.

"Our understanding will really be tested in five billion years, when the Milky Way experiences its own collision," added Lanz.

The findings have been presented in a press conference at the 218th meeting of the American Astronomical Society. Published by HT Syndication with permission from Asian News International. For any query with respect to this article or any other content requirement, please contact Editor at

Record - 2

DIALOG(R)

Judging a star's true age,
Indo-Asian News Service,
Wednesday, May 25, 2011

TEXT:

Washington, May. 25 -- For many movie stars, their age is a well-kept secret. The same is true of the actual stars in space.

Like our sun, most stars look almost the same for most of their lives. So how can we tell if a star is one billion or 10 billion years old? Astronomers may have found a solution - by measuring the star's spin.

"A star's rotation slows down steadily with time, like a top spinning on a table, and can be used as a clock to determine its age," says astronomer Soren Meibom of the Harvard-Smithsonian Centre for Astrophysics.

Knowing a star's age is important for many astronomical studies and in particular for planet hunters. With the bountiful harvest from NASA's Kepler spacecraft (launched in 2009) adding to previous discoveries, astronomers have found nearly 2,000 planets orbiting distant stars.

Now, they want to use this new zoo of planets to understand how planetary systems form and evolve and why they are so different from each other. The study is scheduled for publication in The Astrophysical Journal Letters.

"Ultimately, we need to know the ages of the stars and their planets to assess whether alien life might have evolved on these distant worlds," says Meibom, according to a Harvard statement.

"The older the planet, the more time life has had to get started. Since stars and planets form together at the same time, if we know a star's age, we know the age of its planets too."

Learning a star's age is relatively easy when it's in a cluster of hundreds of stars that all formed at the same time. Astronomers have known for decades that if they plot the colours and brightness of the stars in a cluster, the pattern they see can be used to tell the cluster's age.

But this technique only works on clusters. For stars not in clusters (including all stars known to have planets), determining the age is much more difficult. Using the unique capabilities of the Kepler space telescope, Meibom and his collaborators measured the rotation rates for stars in a one-billion-year-old cluster called NGC 6811.

These findings were presented at the 218th meeting of the American Astronomical Society. Published by HT Syndication with permission from Indo-Asian News Service. For any query with respect to this article or any other content requirement, please contact Editor at htsyndication@hindustantimes.com

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Record - 3

DIALOG(R)

Astronomers Unveil Most Complete 3-D Map of Local Universe,

Fars News Agency (Iran),
Saturday, May 28, 2011

TEXT:

Taking more than 10 years to complete, the 2MASS Redshift Survey (2MRS) also is notable for extending closer to the Galactic plane than previous surveys - a region that's generally obscured by dust.

Karen Masters (University of Portsmouth, UK) presented the new map May 25, 2011 in a press conference at the 218th meeting of the American Astronomical Society.

"The 2MASS Redshift Survey is a wonderfully complete new look at the local universe -- particularly near the Galactic plane," Masters said. "We're also honoring the legacy of the late John Huchra, an astronomer at the Harvard-Smithsonian Center for Astrophysics, who was a guiding force behind this and earlier galaxy redshift surveys."

A galaxy's light is redshifted, or stretched to longer wavelengths, by the expansion of the universe. The farther the galaxy, the greater its redshift, so redshift measurements yield galaxy distances -- the vital third dimension in a 3-D map.

2MRS chose galaxies to map from images made by the Two-Micron All-Sky Survey (2MASS). This survey scanned the entire sky in three near-infrared wavelength bands. Near-infrared light penetrates intervening dust better than visible light, allowing astronomers to see more of the sky. But without adding redshifts, 2MASS makes only a 2-D image. Some of the

galaxies mapped had previously-measured redshifts, and Huchra started painstakingly measuring redshifts for the others in the late 1990s using mainly two telescopes: one at the Fred Lawrence Whipple Observatory on Mt. Hopkins, AZ, and one at the Cerro Tololo Inter-American Observatory in Chile. The last observations were completed by 2MRS observers on these telescopes shortly after Huchra's death in October 2010.

Robert Kirshner, Huchra's colleague at the Center for Astrophysics (CfA), said, "John loved doing redshift surveys and he loved the infrared. He had the insight to tell when infrared technology, formerly the province of the experts, was ripe for routine use in a big project."

"John was instrumental in setting up the 2MASS telescope at Mount Hopkins, seeing the infrared side of the project through, and making a much more complete survey of the local universe. It's a wonderful tribute to John that his colleagues have finished the infrared-selected galaxy redshift survey that John started," he added.

The 2MRS mapped in detail areas previously hidden behind our Milky Way to better understand the impact they have on our motion. The motion of the Milky Way with respect to the rest of the universe has been a puzzle ever since astronomers were first able to measure it and found it couldn't be explained by the gravitational attraction from any visible matter. Massive local structures, like the Hydra-Centaurus region (the "Great Attractor") were previously hidden almost behind the Milky Way but are now shown in great detail by 2MRS.

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Record - 4

DIALOG(R)

How to Learn Stars' True Age,

Fars News Agency (Iran),

Wednesday, May 25, 2011

TEXT:

"A star's rotation slows down steadily with time, like a top spinning on a table, and can be used as a clock to determine its age," says astronomer Soren Meibom of the Harvard-Smithsonian Center for Astrophysics.

Meibom presented his findings May 24, 2011 in a press conference at the

218th meeting of the American Astronomical Society.

Knowing a star's age is important for many astronomical studies and in particular for planet hunters. With the bountiful harvest from NASA's Kepler spacecraft (launched in 2009) adding to previous discoveries, astronomers have found nearly 2,000 planets orbiting distant stars. Now, they want to use this new zoo of planets to understand how planetary systems form and evolve and why they are so different from each other. "Ultimately, we need to know the ages of the stars and their planets to assess whether alien life might have evolved on these distant worlds," says Meibom. "The older the planet, the more time life has had to get started. Since stars and planets form together at the same time, if we know a star's age, we know the age of its planets too."

Learning a star's age is relatively easy when it's in a cluster of hundreds of stars that all formed at the same time. Astronomers have known for decades that if they plot the colors and brightnesses of the stars in a cluster, the pattern they see can be used to tell the cluster's age. But this technique only works on clusters. For stars not in clusters (including all stars known to have planets), determining the age is much more difficult.

Using the unique capabilities of the Kepler space telescope, Meibom and his collaborators measured the rotation rates for stars in a 1-billion-year-old cluster called NGC 6811. This new work nearly doubles the age covered by previous studies of younger clusters. It also significantly adds to our knowledge of how a star's spin rate and age are related.

If a relationship between stellar rotation and age can be established by studying stars in clusters, then measuring the rotation period of any star can be used to derive its age -- a technique called gyrochronology (pronounced ji-ro-kron-o-lo-gee). For gyrochronology to work, astronomers first must calibrate their new "clock."

They begin with stars in clusters with known ages. By measuring the spins of cluster stars, they can learn what spin rate to expect for that age. Measuring the rotation of stars in clusters with different ages tells them exactly how spin and age are related. Then by extension, they can measure the spin of a single isolated star and calculate its age.

To measure a star's spin, astronomers look for changes in its brightness caused by dark spots on its surface -- the stellar equivalent of sunspots. Any time a spot crosses the star's face, it dims slightly. Once the spot rotates out of view, the star's light brightens again. By watching how long it takes for a spot to rotate into view, across the star and out of view again, we learn how fast the star is spinning.

The changes in a star's brightness due to spots are very small, typically a few percent or less, and become smaller the older the star. Therefore, the rotation periods of stars older than about half a billion years can't be measured from the ground where Earth's atmosphere interferes. Fortunately, this is not a problem for the Kepler spacecraft. Kepler was designed specifically to measure stellar brightnesses very precisely in order to detect planets (which block a star's light ever so slightly if they cross the star's face from our point of view).

To extend the age-rotation relationship to NGC 6811, Meibom and his colleagues faced a herculean task. They spent four years painstakingly sorting out stars in the cluster from unrelated stars that just happened to be seen in the same direction. This preparatory work was done using a specially designed instrument (Hectochelle) mounted on the MMT telescope on Mt. Hopkins in southern Arizona. Hectochelle can observe 240 stars at the same time, allowing them to observe nearly 7000 stars over four years. Once they knew which stars were the real cluster stars, they used Kepler data to determine how fast those stars were spinning.

They found rotation periods ranging from 1 to 11 days (with hotter, more massive stars spinning faster), compared to the 30-day spin rate of our Sun. More importantly, they found a strong relationship between stellar mass and rotation rate, with little scatter. This result confirms that gyrochronology is a promising new method to learn the ages of isolated stars.

The team now plans to study other, older star clusters to continue calibrating their stellar "clocks." Those measurements will be more challenging because older stars spin slower and have fewer and smaller spots, meaning that the brightness changes will be even smaller and more drawn out. Nevertheless, they feel up to the challenge.

"This work is a leap in our understanding of how stars like our Sun work. It also may have an important impact on our understanding of planets found outside our solar system," said Meibom.

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Record - 5

DIALOG(R)
THE SPITZER PHOTO ATLAS OF GALACTIC 'TRAIN WRECKS',

US Federal News,
Thursday, May 26, 2011

TEXT:

WASHINGTON, May 26 -- The Smithsonian Institution issued the following press release:

Five billion years from now, our Milky Way galaxy will collide with the Andromeda galaxy. This will mark a moment of both destruction and creation. The galaxies will lose their separate identities as they merge into one. At the same time, cosmic clouds of gas and dust will smash together, triggering the birth of new stars.

To understand our past and imagine our future, we must understand what happens when galaxies collide. But since galaxy collisions take place over millions to billions of years, we can't watch a single collision from start to finish. Instead, we must study a variety of colliding galaxies at different stages. By combining recent data from two space telescopes, astronomers are gaining fresh insights into the collision process.

"We've assembled an atlas of galactic 'train wrecks' from start to finish. This atlas is the first step in reading the story of how galaxies form, grow, and evolve," said lead author Lorraine Lanz of the Harvard-Smithsonian Center for Astrophysics (CfA).

Lanz presented her findings today in a press conference at the 218th meeting of the American Astronomical Society.

The new images combine observations from NASA's Spitzer Space Telescope, which observes infrared light, and NASA's Galaxy Evolution Explorer (GALEX) spacecraft, which observes ultraviolet light. By analyzing information from different parts of the light spectrum, scientists can learn much more than from a single wavelength alone, because different components of a galaxy are highlighted.

GALEX's ultraviolet data captures the emission from hot young stars. Spitzer sees the infrared emission from warm dust heated by those stars, as well as from stellar surfaces. Therefore, GALEX's ultraviolet data and Spitzer's infrared data highlight areas where stars are forming most rapidly, and together permit a more complete census of the new stars.

In general, galaxy collisions spark star formation. However, some interacting galaxies produce fewer new stars than others. Lanz and her colleagues want to figure out what differences in physical processes cause these varying outcomes. Their findings will also help guide computer simulations of galaxy collisions.

"We're working with the theorists to give our understanding a reality check," said Lanz. "Our understanding will really be tested in five billion years, when the Milky Way experiences its own collision."

Lanz's co-authors are Nicola Brassington (Univ. of Hertfordshire, UK); Andreas Zezas (Univ. of Crete, Greece); Howard Smith and Matt Ashby (CfA); Christopher Klein (UC Berkeley); and Patrik Jonsson, Lars Hernquist, and Giovanni Fazio (CfA). For any query with respect to this article or any other content requirement, please contact Editor at htsyndication@hindustantimes.com

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Record - 6

DIALOG(R)

KEPLER'S ASTOUNDING HAUL OF MULTIPLE-PLANET SYSTEMS,

US Federal News,

Thursday, May 26, 2011

TEXT:

WASHINGTON, May 26 -- The Smithsonian Institution issued the following press release:

NASA's Kepler spacecraft is proving itself to be a prolific planet hunter. Within just the first four months of data, astronomers have found evidence for more than 1,200 planetary candidates. Of those, 408 reside in systems containing two or more planets, and most of those look very different than our solar system.

In particular, the Kepler systems with multiple planets are much flatter than our solar system. They have to be for Kepler to spot them. Kepler watches for a planet to cross in front of its star, blocking a tiny fraction of the star's light. By measuring how much the star dims during such a transit, astronomers can calculate the planet's size, and by observing the time between successive events they can derive the orbital period - how long it takes the planet to revolve around its star.

To see a transit, the planet's orbit must be edge-on to our line of sight. To see multiple transiting planets, they all must be edge-on (or nearly so).

"We didn't anticipate that we would find so many multiple-transit systems.

We thought we might see two or three. Instead, we found more than 100," said Smithsonian astronomer David Latham (Harvard-Smithsonian Center for Astrophysics).

Latham presented the findings today in a press conference at the 218th meeting of the American Astronomical Society.

In our solar system, some planet orbits are tilted by up to 7 degrees, meaning that an alien astronomer looking for transits wouldn't be able to detect all eight planets. (In particular, they would miss Mercury and Venus.) The systems spotted by Kepler are much flatter, with orbits tilted less than 1 degree.

Why are they so flat? One clue comes from the planets themselves. The multiplanet systems found by Kepler are dominated by planets smaller than Neptune. They lack Jupiter-sized gas giants. Scientists believe that a gas giant's powerful gravity tends to disrupt planetary systems, tilting the orbits of neighboring worlds.

"Jupiters are the 800-pound gorillas stirring things up during the early history of these systems," explained Latham. "Other studies have found plenty of systems with big planets, but they're not flat."

Multiple-planet systems may offer a chance for confirming the densities of small, rocky worlds. The more massive a planet, the easier it is to detect using radial velocity measurements (essentially the star's wobble as a planet's gravity tugs it). Earth-sized worlds in Earth-sized orbits aren't massive enough to make a radial velocity signal that's detectable with present technology.

In systems with more than one transiting planet, astronomers have another option: transit timing variations. They can measure how the time between successive transits changes from orbit to orbit due to mutual gravitational interactions between the planets. The size of the effect depends on the planets' masses.

"These planets are pulling and pushing on each other, and we can measure that," said Smithsonian astronomer Matthew Holman. "Dozens of the systems Kepler found show signs of transit timing variations."

As Kepler continues to gather data, it will be able to spot planets with wider orbits, including some in the habitable zones of their stars. Transit timing variations may play a key role in confirming the first rocky planets with the right temperature for water to be liquid on their surfaces. For any query with respect to this article or any other content requirement, please contact Editor at htsyndication@hindustantimes.com

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Record - 7

DIALOG(R)

BROWN BAG BY THE BAY,
Press-Register (Mobile, AL), Press-Register 01 ed, p15,
Thursday, May 26, 2011

TEXT:

By vrandle

From June 4 through Aug. 28, the Exploreum will feature the exhibition "Black Holes: Space Warps & Time Twists" from the Harvard-Smithsonian Center for Astrophysics. Also featured: the exhibit "From Earth to the Universe," an astronomy display in the science center's digital theater, and lab programs about what astronauts eat in space and how rockets work. From May 28 through Sept 30, the J.L. Bedsole IMAX Dome Theater will show "Hubble," a film based on Space Shuttle film footage and Hubble telescope images. For more information, visit www.exploreum.com or call 251-208-6873 or toll-free 877-625-4386.

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Record - 8

DIALOG(R)

Scientists unveil most complete ever map of the universe that extends to 380 million lightyears away,
Korea Times,
Thursday, May 26, 2011

TEXT:

The most complete 3D map of the local universe has been unveiled by British astronomers, dailymail.co.uk reported Wednesday.

The 2MASS Redshift Survey (2MRS) from the University of Portsmouth extends to a distance of 380 million light years and has taken 10 years to complete, the report said.

It extends closer than previous surveys to the galactic plane a region that is generally obscured by dust.

The survey has mapped in detail areas previously hidden behind the Milky Way to better understand the impact they have on its motion in relation to the rest of the universe, it said.

Karen Masters from the University of Portsmouth presented the map in a press conference at the 218th meeting of the American Astronomical Society in the Harvard-Smithsonian Center for Astrophysics (CfA) in Cambridge, Massachusetts, the Daily Mail said.

She said: The 2MASS Redshift Survey is a wonderfully complete new look at the local universe particularly near the galactic plane.

A galaxy's light is 'redshifted' or stretched to longer wavelengths by the expansion of the universe. The farther the galaxy, the greater its redshift, so redshift measurements yield galaxy distances.

It's the vital third dimension in a 3D map and will enable cosmologists to study the area in much more detail.

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Record - 9

DIALOG(R)

Research Conducted at Harvard-Smithsonian Center for Astrophysics Has Provided New Information about Astronomy,

Science Letter, p2020,
Tuesday, May 31, 2011

TEXT:

"Pulsar timing arrays (PTAs) measure nHz frequency gravitational waves (GWs) generated by orbiting massive black hole binaries (MBHBs) with periods between 0.1 and 10 yr. Previous studies on the nHz GW background assumed that the inspiral is purely driven by GWs," scientists in Cambridge, United States report (see also).

"However, torques generated by a gaseous disc can shrink the binary much more efficiently than GW emission, reducing the number of binaries at these separations. We use simple disc models for the circumbinary gas and for the binary-disc interaction to follow the orbital decay of MBHBs through physically distinct regions of the disc, until GWs take over their

evolution. We extract MBHB cosmological merger rates from the Millennium simulation, generate Monte Carlo realizations of a population of gas-driven binaries and calculate the corresponding GW amplitudes of the most luminous individual binaries and the stochastic GW background. For steady state alpha-discs with $\alpha > 0.1$, we find that the nHz GW background can be significantly modified. The number of resolvable binaries is however not changed by the presence of gas; we predict 1-10 individually resolvable sources to stand above the noise for a 1-50 ns timing precision. Gas-driven migration reduces predominantly the number of small total mass or unequal mass ratio binaries, which leads to the attenuation of the mean stochastic GW background, but increases the detection significance of individually resolvable binaries. The results are sensitive to the model of binary-disc interaction," wrote B. Kocsis and colleagues, Harvard-Smithsonian Center for Astrophysics.

The researchers concluded: "The GW background is not attenuated significantly for time-dependent models of Ivanov, Papaloizou & Polnarev."

Kocsis and colleagues published their study in Monthly Notices of the Royal Astronomical Society (Gas-driven massive black hole binaries: signatures in the nHz gravitational wave background. Monthly Notices of the Royal Astronomical Society, 2011;411(3):1467-1479).

For additional information, contact B. Kocsis, Harvard Smithsonian Center Astrophysics, 60 Garden St., Cambridge, MA 02138, United States. The publisher's contact information for the journal Monthly Notices of the Royal Astronomical Society is: Wiley-Blackwell, Commerce Place, 350 Main St., Malden 02148, MA, USA.

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JOURNAL SUBJECT: Science & Engineering

Record - 10

DIALOG(R)

NEARBY SUPERNOVAS MAY AID IN UNDERSTANDING OF STAR LIFECYCLES,

US Federal News,

Tuesday, May 24, 2011

TEXT:

UNIVERSITY PARK, Pa., May 24 -- Pennsylvania State University issued the following news release:

According to a wealth of new data from NASA's X-ray Observatory, what scientists are calling a "supernova factory" has come to life in the Carina Nebula, located a mere 7,500 light years from Earth. This discovery may help astronomers to better understand how some of the Milky Way Galaxy's heaviest and youngest stars race through their lives and release newly-forged elements into their surroundings.

"The Carina Nebula is one of the best places we know about to study how young massive stars live and die," said Leisa Townsley of Penn State, who led the large Chandra campaign to observe Carina. "Now, we have a compelling case that a supernova show in Carina has already begun." For example, it appears that some of the massive stars in Trumpler 15, a star cluster in Carina, already have been destroyed in supernova explosions. These explosions would explain the deficit of bright X-ray sources in Trumpler 15, one of the ten star clusters that make up the Carina complex. The discovery is being presented today at the 218th American Astronomical Society meeting in Boston, and it will be published in a special *Astrophysical Journal Supplement* issue devoted to the new Chandra observations of Carina.

Another outcome from the new Chandra survey of Carina is a new population of young massive stars. These stars had not been seen before because of obscuration, or because they are located outside well-studied clusters.

"We may have doubled the number of known young and massive stars in Carina by looking this long with Chandra," said Matthew Povich of Penn State, first author of a paper on this new population. "Nearly all of these stars are destined to self-destruct in supernova explosions."

Carina Nebula lies in the Sagittarius-Carina arm of the Milky Way. Long studied by telescopes in many wavelengths, this new view of Carina in X-rays from Chandra shows the massive star-forming region like never before. Chandra's extraordinarily sharp vision has pinpointed over 14,000 young stars in this region, and a diffuse X-ray glow.

"There are fewer of the heaviest stars in Trumpler 15 than we would expect," said Junfeng Wang of the Harvard-Smithsonian Center for Astrophysics in Cambridge, Mass., first author of a paper on this cluster. "These stars were likely between 20 and 40 times the mass of the Sun and would have exploded in the last few million years, which is very recent in cosmic terms."

The detection of six possible neutron stars, the dense cores often left behind after stars explode in supernovas, is another clue indicating a supernova bonanza in Carina. One neutron star in Carina previously had been confirmed using XMM-Newton, Chandra, and other X-ray data. Neutron stars in star-forming regions are very difficult to spot because they are

characterized by low-energy X-rays, which are easily absorbed by dust and gas. Therefore, any true neutron stars probably represent only a small fraction of the complete population. The diffuse emission observed by Chandra also supports the idea that supernovas already have erupted in Carina. Some of the diffuse X-ray emission almost certainly comes from the winds of massive stars, but some also may come from the remains of supernova explosions.

Undoubtedly the most famous constituent of the Carina Nebula is Eta Carinae, a massive, unstable star that may be on the verge of exploding as a supernova. When it does explode, it likely will be a spectacular -- yet still safe -- light in the Earth's sky. These latest results suggest Eta Carinae is not alone in its volatility. "Supernovas aren't just eye-catching events, but they release newly-forged elements like carbon, oxygen, and iron into their surroundings so they can join in the formation of new objects, like stars and planets," said Townsley.

The Chandra survey has a large field of 1.4 square degrees, made of a mosaic of 22 individual Chandra pointings. A great deal of multiwavelength data have been used in this campaign including infrared observations from the Spitzer Space Telescope and the Very Large Telescope (VLT).

NASA's Marshall Space Flight Center in Huntsville, Ala., manages the Chandra program for NASA's Science Mission Directorate in Washington. The Smithsonian Astrophysical Observatory controls Chandra's science and flight operations from Cambridge, Mass.

More information, including images and other multimedia, is available at <http://chandra.si.edu> <http://www.nasa.gov/chandra> online. For any query with respect to this article or any other content requirement, please contact Editor at htsyndication@hindustantimes.com

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Record - 11

DIALOG(R)

The other effect,

Vivek Deshpande,

Indian Express,

Sunday, May 22, 2011

TEXT:

The Nobel Prize-winning Raman Effect in physics is one of the most

significant scientific achievements by any Indian scientist till date. But not many, particularly those outside the domain of regular science, know about another effect in physics discovered by an Indian chemist that has remained largely unexplored. Dating back to 1939, it is called the Joshi Effect, attributed to Banaras Hindu University (BHU) chemistry professor Shridhar Sarvottam Joshi (1898-1984).

A subject for over 300 PhDs across the world, the Joshi Effect hadn't been properly theorised until two scientists from Nagpur, Sanjay Wagh and Dilip Deshpande, decided to revisit it. After an arduous pursuit, they have come out with what they claim is the first proper theory explaining the effect. The two are awaiting the outcome of the submission of their paper to Current Science, but experts are already excited about their effort.

Says Chintamani Mande, former head of the Department of Physics, Nagpur and Goa universities, and a Fellow of Indian Academy of Sciences, "Their paper sounds good and the effort is laudable. After about five long decades, they have revived interest in the subject."

What is the Joshi Effect? Simply put, while the Raman Effect deals with the scattering of light passing through matter, the Joshi Effect demonstrates the effect of light on current generated in gas ionised by the application of voltage. A glow is formed due to current generated in a low-density gas ionised by application of voltage and when white light is thrown on the glow, the current, and, hence, the glow, get suppressed.

While the "light-extinguishing-light" effect is the negative Joshi Effect in so far as it is a suppression of current in low-voltage condition, there is also a positive Joshi Effect which is seen as current increase when high voltage is applied to concentric electrode plates coated with mercuric chloride, sodium hydroxide or potassium chloride.

Says Prof R M Singru, former professor of physics at IIT, Kanpur, and vice-president of the Maharashtra Academy of Sciences: "The work done by the two scientists is encouraging. The rekindling of interest in the Joshi Effect could open up new vistas of exciting applications hitherto unexplored."

Say Wagh and Deshpande: "The Joshi Effect had stopped evoking interest among scientists, especially after the discovery of the Opto-Galvanic Effect (OGE) (1976-78) by scientists from the National Bureau of Standards in the US that showed that apart from current, there are voltage changes too, unlike the Joshi Effect that dealt exclusively with current changes. What we have basically done is mathematically explain how the Joshi Effect happens."

Wagh, who has a doctorate in physics, has done his post-doctoral research at the Tata Institute of Fundamental Research and the Harvard-Smithsonian Centre for Astrophysics, Cambridge. With research in theoretical astrophysics, image processing in astronomy, category theory and universal relativity under his belt, he is now the director of the Central India Research Institute (CIRI) in Nagpur. Deshpande, Director of P C D Institute for Computer Studies and Research here, has 40 research papers published in international journals on ferroelectric and thermal analysis. He has also authored many text books published by Oxford-IBH and Tata McGraw Hill.

Explaining the advantage of studying current changes, the scientists say that a current is formed due to electrons and ions generated in the gas ionised by voltage application. "When light is thrown on the gas, atomic electrons absorb the photons (light particles) forming a variety of meta-stable atomic states, thereby suppressing the current. Current and voltage change with each other but not in a linear fashion. So, information given by voltage changes will be different from that given by current changes. While voltage change gives information about the state of gas molecules excited by the throwing of a light beam, current change gives information about electrons and ions. This information is relevant since it shows how light affects the production of ions."

Wagh and Deshpande claim that they have, for the first time, mathematically explained that the Joshi Effect can also be obtained in a cylindrical metallic container with a transparent opening to pass the light through. Many scientists believe the Joshi Effect and OGE are similar. Among those who stress the similarities are Herb Broida of California University and H J Arnikar, former head of chemistry, Pune University. With OGE leading to a new application called opto-galvanic spectroscopy, interest in the Joshi Effect also got vastly reduced. Wagh and Deshpande say: "With current changes being explained and characterised as per our theory, we could also have Joshi Effect spectroscopy in future." The scientists are now devising an apparatus to demonstrate the effect all over again.

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Record - 12

DIALOG(R)

Surprise find in Kepler planet hunt: lots of multi-planet systems,

Pete Spotts: Staff writer,

Christian Science Monitor (USA), ALL ed,

Monday, May 23, 2011

TEXT:

So many planets, so little time.

Two years into a 3-1/2-year mission, NASA's Kepler spacecraft, hunting for planets orbiting some 165,000 stars in the constellation Cygnus, is uncovering planet candidates by the hundreds.

Many of these inhabit multi-planet systems that are unexpectedly flat (the inclination of the planets' orbits within each of these systems are essentially the same, a feature that may hold clues about how these systems formed and evolved.

Not only is the team uncovering many more multi-planet systems than it had anticipated. But the systems hold the promise of allowing researchers to gain valuable information that can lead to an initial estimation of each planet's density and hence its bulk composition (is it rocky, a water world, or something else? And they potentially can estimate these traits more quickly than previously thought.

IN PICTURES: Space photos of the day: Exoplanets

These multi-planet-system discoveries "are very important to the success of the mission," said David Latham, a researcher at the Harvard-Smithsonian Center for Astrophysics in Cambridge, Mass., and a member of the Kepler team. He spoke at a briefing May 23 at the American Astronomical Society's spring meeting underway in Boston.

Kepler's ultimate goal is to gather a census of Earth-mass planets orbiting in the habitable zones of sun-like stars (orbits at distances where the star warms a planet just enough to allow liquid water to remain stable on the surface.

So far, the planets Kepler is finding are well inside that zone, where hot is the order of the day.

Spitzer telescope helps confirm find One of these is Kepler 10c, a new planet orbiting a 10-billion-year-old sun-like star some 564 light years from Earth. The team announced the discovery of its sibling, Kepler 10b, in January. This earlier discovery was striking because at 1.4 times Earth's mass, 10b was the smallest rocky planet found to date.

Evidence for 10c turned out to be buried in 10b's discovery data (the fluctuations in the host star's light as the planet briefly eclipsed, or transited, the star with each orbit.

But 10c didn't emerge as a strong planet candidate until the team used a second space telescope a(euro)" NASA's Spitzer Space Telescope, an infrared observatory that is orbiting Earth a(euro)" to track the dip the planet imposed on the star's light.

The case for 10c's candidacy resulted from this dual observation, in which the dip in light the two spacecraft recorded was able to rule out the possibility that 10c had been another, perhaps dimmer, star.

Comparing the data with what one might expect to see with a binary-star system rather than a planetary system, the team is 99.9998 percent certain they have a planet, according to Francois Fressin, another researcher at the Center for Astrophysics.

Many multi-planet systems foundThe most striking multi-planet system so far is a system dubbed Kepler 11, whose discovery the team announced in February. Its six planets are orbiting a yellow dwarf star some 2,000 light years from Earth. These planets have been confirmed as such, and they seem to be made mostly of rock by mass, although gas appears to take up most of their volume.

But Kepler's cosmic census-takers have found far more of these than anticipated. Of 1,235 planet candidates reported so far, 408 are divvied up among 107 multi-planet systems.

"We didn't anticipate that we would find so many a(euro)]. We thought we might see two or three," Dr. Latham says.

Given the candidates found so far, it looks as though the number of planets of Neptune's mass or less are the most common, while planets with Jupiter's heft or greater are less common, although they are easier to find, Latham says.

As the team gathers more data, it's becoming clear that it is discovering new tools for turning observations into results.

Up to now, for instance, the team has relied on ground-based telescopes to use a second planet-detection method to confirm that a transit that Kepler spots is indeed the result of a planet eclipsing its host star.

With ground-based telescopes, it takes time to carry out the observations needed for those confirmations. Kepler is observing its patch of the sky in Cygnus 24/7/365. But the big telescopes needed to confirm Kepler's observations tend to be in the Northern Hemisphere, whose night sky Cygnus vacates for part of the year. Telescopes such as Spitzer can conduct follow-up transit observations more quickly.

In other cases, Kepler data themselves are opening the possibility for new tools a(euro)" "Kepler helping itself," as astrophysicist Soren Meibom describes it.

Dr. Meibom, another researcher at the Center for Astrophysics and a Kepler team member, is working with Kepler data to develop a more-precise way of telling how old stars are in Kepler's field of view. Essentially, his team is using a star's rotation rate as a clock.

Star's age impacts chance for lifeThe issue bears directly on the chance that an Earth-like planet in the habitable zone of another star could harbor life. If a star is a billion years old, don't bet on much more than microbes. At 3 billion years, far more complex life could be present, but not so developed that it could phone home. At 4.6 billion years, however, life could evolve into technologically advanced civilizations, if Earth is any indication.

But "determining the age of a star is one of the most difficult tasks in astronomy; stars don't have birth certificates," Meibom says.

The problem: After a sun-like star's first 500 million years or so, its mass, brightness, and temperature don't change much until billions of years later, when it teeters on the brink of its self-destruction, explains Dr. Meibom,

But a star's rotation rate does slow with time as its stellar wind carries off material, in effect acting like the spinning ice skater who extends his or her arms to slow the spin.

Astronomers can track a star's rotation by patterns in the periodic dimming that occurs with the coming and going of dark patches on stars a(euro)" essentially their equivalents of sunspots. Younger stars tend to have larger spots and rotate faster than older stars, so their dimming is deeper and more frequent than that in older stars.

Kepler scientists are using stars in star clusters of known ages to build a temporal yardstick for determining the ages of the stars that host planets.

IN PICTURES: Space photos of the day: Exoplanets

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DIALOG(R)

Astronomers discover possibility of planets without orbits,

Malcolm Ritter,
Daily Star, The (Lebanon),
Monday, May 23, 2011

TEXT:

NEW YORK: Are these planets without orbits? Astronomers have found 10 potential planets as massive as Jupiter wandering through a slice of the Milky Way, following either very wide orbits or no orbit at all.

And scientists think they are more common than the stars. These mysterious bodies, apparently gaseous balls like the largest planets in our solar system, may help scientists understand how planets form.

"They're finding evidence for a lot of pretty big planets," said Alan Boss of the Carnegie Institution of Washington, who wasn't involved in the research.

If they orbit stars, their sheer number suggests every star in the galaxy has one or two of them, "which is astounding" because that's five or 10 times the number of stars scientists had thought harbored such gas-giant planets, he said.

And if instead they are wandering free, that "would be really stunning" as it's hard to explain how they formed, he said. If that's the case, it would give a boost to some theories that say planets can be thrown out of orbit during formation, said Lisa Kaltenegger of the Harvard-Smithsonian Center for Astrophysics, another outside expert.

Other scientists have reported free-wandering objects in star-forming regions of the cosmos, but the newfound objects appear to be different, said one author of the new study, physicist David Bennett of the University of Notre Dame.

Bennett and colleagues from Japan, New Zealand and elsewhere report the finding in Thursday's issue of the journal Nature. They didn't observe the objects directly. Instead, they used the fact that massive objects bend the light of distant stars with their gravity, just as a lens does. So they looked extensively for such "microlensing" events.

They found 10, each caused by one of the newfound objects.

They calculated each object has about the mass of Jupiter, and estimated how common such objects are. They also found no sign of a star near these

bodies, at least not within 10 times the distance from Earth to the sun. So the newfound objects either orbit a star more distant than that, or they don't orbit a star at all. They drew on other data to determine most of the objects don't orbit a star.

Scientists believe planets are formed when disks of dust that orbit stars form clumps, so that these clumps - the planets - remain in orbit. Maybe the newfound objects started out that way, but then got tossed out of orbit or into distant orbits by the gravitational tugs of larger planets, the researchers suggest.

The work suggests that such a process is quite common, Bennett said.

Boss said maybe they formed around a pair of stars instead, one of which supplied the gravitational tug. But even that would take some explaining to produce an object without an orbit, he said. Or maybe they somehow formed outside of any orbit. So the theoretical challenge in explaining the existence of such bodies is "exciting," he said.

Boss said he suspects most of these are in a distant orbit, and that maybe they even formed at that great distance rather than being tossed outward from a closer orbit.

Kaltenegger also said the new results can't rule out the possibility that these possible planets are in orbit, and that they may only have the mass of Saturn, about a third of Jupiter's.

But if they aren't orbiting a star, she noted, they don't fit the official definition of a planet.

All in all, Boss said, the new work is "pretty exciting in telling what is out there in the night sky ... Lots of theories will grow in this environment."

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Wolbach Library: CfA in the News ~ Week ending 5 June 2011

1. **Charting the Local Universe**, NPR Talk of the Nation, Friday, June 3, 2011
2. **Ill-starred quest to test Einstein finally pays off: Gravity Probe B measures effect predicted by relativity.** Powell, Devin, Science News, v179, n11, p5(2), Saturday, May 21, 2011
3. **Die "Gang of Four" erhalt Gruber Cosmology-Preisgeld in Hohe von 500.000 USD fur Nachstellung der Ausbreitung des Universums.** PR Newswire Europe (German), Thursday, June 2, 2011
4. **GRUBER COSMOLOGY PRIZE HONORS**, US Federal News, Wednesday, June 1, 2011
5. **Private worlds.**, Metz, Steve, Science Teacher, v78, n4, p6 Friday, April 1, 2011
6. **Active learning strategies: the top 10: 10 strategies to help students overcome their naive conceptions of science.**, Khourey-Bowers, Claudia Science Teacher, v78, n4, p38, Friday, April 1, 2011
7. **"Gang of Four" Receives \$500,000 Gruber Cosmology Prize for Reconstructing How the Universe Grew**, PR Newswire Europe (inc. UK Disclose) Wednesday, June 1, 2011
8. **Gang of 4, cosmology, 06 01**, AP Alert - Business Wednesday, June 1, 2011
9. **Astronomers unveil historic 3-D map of the universe**, Kenyon Wallace, Guelph Mercury, v2011060116497433, First ed, pB10, Wednesday, June 1, 2011
10. **TEXAS A&M ASTRONOMER PART OF 3-D MAPPING MASTERPIECE**, US Federal News, Tuesday, May 31, 2011
11. **NASA grad speaker, 05 31**, AP Alert - Business, Tuesday, May 31, 2011
12. **NASA Langley Scientist is Brooklyn College Commencement Speaker**, PR Newswire, Tuesday, May 31, 2011

Record - 1

DIALOG(R)

Charting the Local Universe,

NPR Talk of the Nation,

Friday, June 3, 2011

TEXT:

IRA FLATOW, host:

This is SCIENCE FRIDAY. I'm Ira Flatow.

Astronomers are mapping the universe, and they've created what they call the most complete map of the local universe. And while it won't download yet on to your GPS, it does include data on countless galaxies up to 380 million light- years away.

Now, why is this so important? The map was released this week at the meeting of the American Astronomical Society in Boston.

And joining me now to talk about is Karen Masters, an astronomer at the Institute of Cosmology and Gravitation at the University of Portsmouth in the U.K. She joins us by phone from there. Good evening.

Dr. KAREN MASTERS (Astronomy Researcher, Institute of Cosmology and Gravitation, University of Portsmouth): Yeah, good evening. Good afternoon for you.

FLATOW: Thank you very much. Well, tell us how much of the universe this is.

Dr. MASTERS: Well, to be honest, this is a tiny, tiny fraction of the universe on astronomical scale. That's why we call it the local universe. On astronomical scale, it's relatively nearby. Even though, on human scale, 380 million light-years sounds like a long, long away - and is a long way.

FLATOW: Mm-hmm.

Dr. MASTERS: But if we use redshift, which is sort of the astronomer's way of thinking about distances, this is the speed of which galaxies appear to be moving away from us because of the expansion of the universe. That's actually how we estimated the distance or how the measure distances of this map. And the maximum redshift in this map is much smaller than some other maps that we have of the sky, so they are much more structure of the sky. Why this map is unique is that it covers 95 percent of the sky to a uniform depth. Unlike other much deeper sound wave maps, which just cover smaller

areas of the sky.

FLATOW: So you sort of done a 360 on the sky, but not gone out so far.

Dr. MASTERS: That's right. It's always going to be a payoff between how much of the sky you covered, how deep you can go, just because we have only so many telescopes and we only so much - so many resources available for mapping the universe.

FLATOW: Is it possible to estimate how many galaxies, stars, things like that you have actually mapped?

Dr. MASTERS: With this map, the catalog on these distances to about 43,000 galaxies.

FLATOW: 43,000.

Dr. MASTERS: 43,000, so it's definitely a countable number. Those are - that's the number of galaxies we have distances for in this map.

FLATOW: And this project took some 10 years to complete. What was involved in this?

Dr. MASTERS: Well, this is a project that was initiated by John Huchra, who is the - an astronomer at the Harvard-Smithsonian Center for Astrophysics. And 10 years is probably actually an underestimate of how long this project took. I think John had in mind to do this project as long ago as the mid - the late '80s, when proposals were put in to do an all-sky imaging survey in the near- infrared.

Now, the reason you would want to go in the near-infrared instead of using sort of optical vibrant, the kinds of light that we see with our eyes, is that we live in a galaxy. And the galaxy blocks out big chunks of the sky. There's a lot of stuff, stars, dust and other materials in the galaxy. And if we want to see things that are behind that, you know, that are much farther away, other galaxies, which we can through it somehow.

In optical light, the galaxy blocks, you know, as much as 20 percent of the sky. But if you're using the near-infrared, it's a longer red or wavelength, you can see much more of the sky. And something that's called the two-micron all sky survey, was envisaged by John and by other astronomers in the late '80s and was sort of developed during the '90s and actually was completed in about 2000, I believe.

FLATOW: In fact, Dr. Huchra was on our program several times.

Dr. MASTERS: Yes.

FLATOW: And I'm going to play a little bit of a discussion, or clip, that he talked about, oh, about 10 years ago.

Dr. MASTERS: I would love to hear that.

(Soundbite of archived news)

Dr. JOHN HUCHRA (Astronomer, Harvard-Smithsonian Center for Astrophysics):

One of the keys, we think we're getting a better handle - astronomers, overall, think we have better handle on cosmological model right now. In fact, you probably won't find very many people at all, working in the field trying to understand the origin of things and the state of things, who will say that there's anything wrong with the Big Bang model. It works pretty well, a hot Big Bang with a little bit of inflation and a variety of other things. That's just everything that we need. However, there are still a whole host of really unanswered questions. For example, we know that the universe seems to be made of, in large part, the stuff called dark matter. We don't know what it is. We don't really know where it is. And we think we know how much there is, but we're not even sure about that.

I think one of the real key puzzles for the next decade in astronomy is to - and physics for that matter, is to try to understand what the heck dark matter is.

FLATOW: Well, Dr. Masters, here it is 10 years later. Do we know any more what the heck dark matter is?

Dr. MASTERS: I would say we're getting closer, actually. Very, I mean, I don't think you'd find a single astronomer who, well, hardly a single astronomer who would disagree with - that most of the matter, most of the gravitating matter in the universe is dark matter.

And we're getting tantalizingly close in particle accelerators and - in particle physics experiments to detecting dark matter particles or particles that are sort of predicted that could explain dark matter. So I actually think we're significantly closer to knowing what dark matter is than 10 years ago. We're not quite there yet, but I think, you know, it's kind of - it's really teething now. It really seems to be close on the horizon.

FLATOW: And as you say, this map you're making is just a small part of the universe. What would you learn from it? I mean, know that when we have maps, we use them to drive distances or fly or take a boat or something. What does an astronomer do with a map once it gets finished?

Dr. MASTERS: Well, this is a small part of the universe, but this is our

part of the universe, and that's why we want to see everything (unintelligible) whole sky. Because the things that are near us in the universe has an impact on Earth, on our galaxy, on the, sort of, the region of the universe we live in. And we know that the universe has structure on various scales. And these clusters, and supercluster galaxies are extremely massive because of the huge amount of dark matter in them.

And they pull - they have gravity, right, so they're pulling on our galaxy, on the galaxies near us. We know that our galaxy and the galaxy near us are moving through the universe and are being pulled on by this gravity, and sort of accounting for where that pull is coming from. Just - in order to do that, you need a complete all sky map of the local universe, and that's what we've provided. And hopefully, this will help with those kinds of studies. And I know there are actually already some researchers who are using this data to look at that exact question.

FLATOW: I know that we put a copy on our website at sciencefriday.com of the image from the map, and you can see that the galaxies are not completely evenly distributed. You see sorts of bands of color. Do you know why that is, or is that the dark matter that we don't see in between those bands?

Dr. MASTERS: Well, no, the dark matter - so we believe the galaxy - we have evidence that shows the galaxies are tracing where the dark matter is. So you can - if you look at those lines and those structures, those are the superclusters. And actually, I mean, it was John - going back to John - it was him in 1980s who you first showed that galaxies in our universe are not uniformly distributed.

Have you ever heard of the famous (unintelligible) Stick man. It was the first kind of elementary structure that we're seeing in a map, which was just a tiny fraction of what we should be seeing here. It looked kind of like a little stick man, so people gave it that name. But those are real structures that we see in the universe, elementary structures and the black spaces between them - not the big black holes across the middle - well, that's the part of the sky we can't see because of the - because of our galaxy.

But the black spaces between the colored dots in the rest of the map are real gaps, real voids and holes, whether it's no dark matter or (unintelligible) dark matter and few galaxies.

FLATOW: Will this get any closer to understanding what the great majority of the universe is made out of, the dark energy?

Dr. MASTERS: I don't believe so, actually - I think what you need to do for

dark energy studies are these much deeper, smaller area surveys, and the reason that is, is that dark energy doesn't have a lot of an impact on the clustering of galaxies.

It doesn't - because we think it's smooth, it doesn't have any variation in its gravity, what it does is it affects overall evolution of the universe.

And so in order to look for dark energy and to try to understand about dark energy, you have to see how the universe changes as you look very far back because, you know, as we're looking back at galaxies that are very far away, we're looking back in the history of the universe. So we need very, very deep (unintelligible) surveys in order to understand dark energy. So this map is not going to have a lot to say about dark energy.

FLATOW: And what would you like to know if - what would be the big answer you'd like - the question you'd like to answer out of this study. What would you like this work to answer for you?

Dr. MASTERS: I think if we can truly account for the motion of the Milky Way, the motion of our galaxy in the universe, by the structures in this map, I think if we can show without a doubt that that's true, that will be a very powerful statement to make. I think that would be probably the most powerful statement that will come out of this map.

FLATOW: You mean because it's - there's a lot of dark matter in there.

Dr. MASTERS: Yeah. So I mean, there has been a little bit of a debate whether or not we're moving too fast for the cosmology model, for the standard cosmological model. But if we can show that there's enough matter in that, in a single direction or in the direction that keeps pulling on us that accounts for that, then that sort of removes that question about the cosmological model.

It's one little niggling - you know, the model works very well, as John explained 10 years ago. The model works so well, and it passes so many tests. You can always find a few little tests where people are, like, well, look, this isn't quite right, and this isn't quite right. And one of them has been this motion, our motion in the universe.

FLATOW: You mean the rotary spiral sort of motion of our galaxy?

Dr. MASTERS: Yeah, no actually the motion of the entire galaxy. So the rotation of our galaxy is one of the big pieces of evidence for dark matter, but our actual motion - and the cleanest way you see this, actually, is in looking at maps of the cosmic microwave background.

So this is the sort of - this is the first light that was emitted in the

universe when the universe first became transparent, and we see it everywhere. It's sort of this blast of radiation that we live in. And when you look at that, you see that it's hotter in one direction and colder in the other direction. And it has lots of other structures, as well, but that's the biggest structure in it.

And we explain that by saying we're moving toward - in a direction through this (unintelligible) of radiation, and that's what creates this dipole, this structure (unintelligible).

And so that you can measure our motion with respects to C and B extremely accurately, and some researchers claim that it's too high for the standard cosmological model.

But if the two (unintelligible), that group we've just released can account for that motion, that kind of removes one of these doubts about the standard model.

FLATOW: Thank you, Dr. Masters. Good luck to you. Thanks for staying up for us. Have a good weekend.

Dr. MASTER: Okay, thanks.

FLATOW: Karen Masters, astronomy researcher at the Institute of Cosmology and Gravitation, University of Portsmouth in the U.K.

When we come back, we're going to talk about telling and reading stories about health. Can it make for better health care? Stay with us.

(Soundbite of music)

FLATOW: I'm Ira Flatow. This is SCIENCE FRIDAY from NPR.

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Record - 2

DIALOG(R)

Ill-starred quest to test Einstein finally pays off: Gravity Probe B measures effect predicted by relativity.

Powell, Devin,

Science News, v179, n11, p5(2)

Saturday, May 21, 2011

TEXT:

The longest-running project in NASA's history has completed its mission.

Gravity Probe B has finally confirmed that the Earth drags spacetime around as it rotates, like a spoon twisting in a jar of honey.

Other experiments had already confirmed this "frame-dragging" effect, predicted by Einstein's theory of general relativity. The new results, marred by technical difficulties, won't set any records for precision.

But for those who have supported the beleaguered project, which was defunded by NASA three years ago, the end of its saga is a triumph in itself.

"We're proud that our dream wasn't completely lost," says Stanford University physicist Francis Everitt, who has worked on the project for 49 years. "The science is complete."

In 1959 and 1960, the era of Sputnik, MIT physicist George Pugh and Stanford physicist Leonard Schiff independently proposed launching a gyroscope into orbit to put Einstein to the test. In Einstein's universe, where gravity distorts spacetime, the spinning Earth should deflect the tilt of an orbiting gyroscope over time. Everitt arrived at Stanford in 1962 to help build the world's best gyroscope. This effort, Gravity Probe B, would ultimately cost NASA at least \$750 million. By Everitt's count, the project was nearly canceled seven times.

[ILLUSTRATION OMITTED]

But on April 20, 2004, a spacecraft carried four quartz spheres into a polar orbit. The size of Ping-Pong balls and coated with the superconductor niobium, the spheres were the roundest objects ever created by human beings. A puff of gas started the gyros spinning, an onboard telescope lined them up neatly with the star IM Pegasi and the probe collected data until August of 2005.

The first analysis of this data revealed unexpected anomalies. The gyroscopes had behaved badly- wandering around and pointing in strange orientations.

Irregular patches on the surfaces of the spheres were to blame. Everitt knew about these patches and expected interactions with the gyroscope housings that would create small forces, or torques. But unanticipated patches on the housings themselves amplified these electrostatic interactions.

"The torques were 100 times larger than we were expecting," says Everitt. "It was a horrible shock."

Despite this setback, in 2007 the Gravity Probe B team confirmed one prediction of general relativity. According to Einstein, the Earth's gravity warps spacetime like a bowling ball on a trampoline. This "geodetic" effect was measured with an error of about 1 percent (SN: 4/28/07, p. 270).

The much smaller frame-dragging effect from the Earth's rotation, though, remained hidden in the noisy data. Theory predicted frame-dragging should change the orientation of the craft's spinning spheres by only 39 milliarcseconds per year, about the width of a human hair seen from 400 meters.

[ILLUSTRATION OMITTED]

After NASA pulled the plug in 2008, private funding arranged by an executive at Capital One Financial and the royal family of Saudi Arabia bought some extra time to clean up the data. By comparing the overall wobble of each sphere with the tiny magnetic fluctuations on its surface, the team worked out how the patches were interacting. The researchers also discovered that the motion of the revolving spacecraft could occasionally kick the gyros into new orientations.

"What the Gravity Probe B team did to understand this problem, sort it out and get a credible answer was nothing short of heroic," says Clifford Will, a theoretical physicist at Washington University in St. Louis who serves on the mission's science advisory board.

The results of this painstaking analysis, announced at a NASA press briefing May 4 and scheduled for publication in an upcoming Physical Review Letters, reconfirm the geodetic effect with an error of about 0.2 percent. Gravity Probe B puts the frame-dragging effect at 37 milliarcseconds, with an error of about 19 percent, far from the original goal of 1 percent precision.

"This project has been a victim of time," says physicist Kenneth Nordtvedt of Montana State University in Bozeman, who points out that other experiments have already measured these effects.

Ignazio Ciufolini, a physicist at the University of Salento in Lecce, Italy, and Erricos Pavlis of the University of Maryland, Baltimore County confirmed frame-dragging by analyzing the orbits of the two laser-ranged LAGEOS satellites (SN: 11/27/04, p. 348). Publishing in Nature in 2004, the team reported an error of 10 percent. Two other groups of scientists in Germany and the United States have since checked the analysis, and a third satellite scheduled for launch this year could help Ciufolini and Pavlis improve their precision.

[ILLUSTRATION OMITTED]

"We should be able to reach a test of frame-dragging with an uncertainty of almost 1 percent," Ciufolini says.

Proponents of Gravity Probe B say that general relativity, which is currently incompatible with quantum mechanics, should be tested in as many ways as possible.

But the project's ultimate legacy may lie in its contributions to technology, not science. GPS systems developed for the spacecraft, for instance, now help farmers plant perfectly straight rows of corn.

"The technology needed to do this test didn't exist when the project started," says John Mester, a 19-year veteran of the Gravity Probe B team at Stanford.

Mester hopes to help the team publish a series of papers detailing the equipment they developed. But otherwise their mission is complete.

"We're basically done," Mester says. "None of us have a job anymore."

RELATED ARTICLE: Back story: Gravity Probe A.

Of the many curious effects predicted by Einstein's general theory of relativity, the slowing of time by gravity is (by comparison) relatively simple to grasp.

When gravity is stronger, time moves more slowly. This effect is often called the "gravitational redshift" because it can be detected by its influence on the color of light emitted from the surface of a massive body. (Slowing of time reduces the frequency of emitted light, shifting its color toward the red end of the spectrum.) The gravitational redshift also affects other sorts of radiation, such as radio waves.

[ILLUSTRATION OMITTED]

In 1976, scientists from the Smithsonian Astrophysical Observatory and NASA's Marshall Space Flight Center tested this gravity-time effect with an experiment called Gravity Probe A. Launched to an altitude of 10,000 kilometers, the probe (payload shown, left) contained a hydrogen maser clock that emitted precisely timed microwave signals until it crashed into the Atlantic Ocean. By comparing signals from the probe with an identical maser clock on the ground, the scientists could determine whether Einstein's expectations were fulfilled. And in fact, the effect on the probe's signals matched relativity's predictions to within 7 parts in 100,000.

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Record - 3

DIALOG(R)

Die "Gang of Four" erhalt Gruber Cosmology-Preisgeld in Hohe von 500.000 USD fur Nachstellung der Ausbreitung des Universums,

PR Newswire Europe (German)

Thursday, June 2, 2011

TEXT:

NEW YORK June 2, 2011 - NEW YORK, June 2, 2011 /PRNewswire/ --

Vier Astronomen, die einen Weg gefunden haben, die Entstehung des Universums nachzuahmen, sind die Gewinner des Cosmology-Preises 2011 der Peter and Patricia Gruber Foundation. Marc Davis, Professor fur Astronomie und Physik an der University of California in Berkeley; George Efstathiou, Direktor des Kavli Institute for Cosmology in Cambridge; Carlos Frenk, Direktor des Institute for Computational Cosmology der Durham University und Simon White, einer der Direktoren Max Planck-Instituts fur Astrophysik in Garching (Deutschland) teilen sich das Preisgeld in Hohe von 500.000 USD.

The Peter and Patricia Gruber Foundation

In der offiziellen Erwahnung werden die Astronomen -- von ihren Kollegen auch freundschaftlich als "Gang of Four" ("Vierergruppe") bezeichnet und oft als DEFW abgekürzt -- fur ihre "wegweisende Nutzung numerischer Simulation zur Nachstellung und Interpretation der grossflachigen Ausbreitung von Materie im Universum" geehrt. Der Gruber-Preis zeichnet sowohl die Entdeckungsmethode, die DEFW entworfen haben, als auch die daraus folgenden Entdeckungen des Teams aus.

Davis, Efstathiou, Frenk und White erhalten anlässlich einer Zeremonie in diesem Herbst jeder einen gleichen Anteil des Preisgelds sowie eine goldene Medaille. Ausserdem werden sie einen Vortrag halten.

Astronomen haben uns von jeher gesagt, wie das Universum aufgebaut ist. Theoretiker haben sich von jeher den darüber Kopf zerbrochen, wie es wohl dazu gekommen sein konnte. Doch erst im Zeitalter des Computers konnten Wissenschaftler, die die Evolution des gesamten Universums erforschten, die einzelnen Gedanken der Gelehrten und die offensichtlichen Spuren zusammenfugen.

Der besondere Beweis, der die Forscher zur Schaffung des DEFW-Teams motivierte, war eine Studie des Harvard-Smithsonian Center for Astrophysics von 2400 Galaxien in unterschiedlicher Distanz zur Erde 1981 -- für die damalige Zeit eine ungewöhnliche Studie dazu, wie die grossen Dimensionen des Himmels aussehen. (Davis leitete das Projekt.) Die CfA-Studie ergab einen ersten Hinweis auf das heute sogenannte "kosmische Netz" -- Galaxien, die wie lange Fäden, oder so genannte Superhaufen, welche von riesigen Hohlräumen getrennt sind, angeordnet sind.

Es kursierten zwei konkurrierende Theorien darüber, wie sich Materie in dieser Weise hatte zusammenfügen können. Beide Theorien zogen die Existenz dunkler Materie in Betracht, einer rätselhaften Substanz, die Astronomen bereits in den 1970er Jahren als unbestreitbares Element im kosmischen Puzzle akzeptiert hatten, wodurch die Bewegungen der Galaxien erklärt werden konnten, die andernfalls mit den Gesetzen der Physik nicht vereinbar gewesen waren. Bei einer Theorie handelte es sich um "heisse dunkle Materie" - "heiss", da sich die Partikel zu Beginn mit einer Geschwindigkeit fortbewegten, die der Lichtgeschwindigkeit nahe kommt. Solche schnellen Partikel liessen die "reguläre" Materie hinter sich, aus der sich Galaxien bildeten, und die sich so nicht um sie herum verklumpen konnte. Die andere Theorie lautete "kalte dunkle Materie". Hierbei handelte es sich um relativ schwerfallige Partikel, die sich zu Galaxienhalos zusammengeschlossen hatten und so die reguläre Materie mit sich zogen.

Die Studie des Center for Astrophysics gab Astronomen die Möglichkeit, beide Theorien zu testen -- jedoch nur dann, wenn sie herausfinden konnten, wie die Bildung des Universums im Laufe von Milliarden von Jahren nachgebildet werden kann.

Hier kommt die Gang of Four ins Spiel. Obwohl bereits andere Astronomen mit Mehrkörpersimulation gearbeitet hatten (im Englischen N-Body-Simulation genannt, da sie eine Anzahl von Punkten, N, verfolgt, von denen jeder eine Massenkonzentration darstellt), konnte ihr Code keinen N darstellen, der gross genug war, um die Dimensionen des Universums zu simulieren. Efstathiou jedoch ging davon aus, dass ein Code zur Simulation ionischer Mikrokristalle verwendet werden könne. So übernahm er diese für die Kosmologie, und Davis, Frenk und White verwendeten diesen Code, um darzustellen, dass ein simuliertes Universum auf der Basis der Theorie der heissen dunklen Materie nicht im Entferntesten mit den CfA-Beobachtungen übereinstimmten.

Dann zeigten Davis, Efstathiou, Frenk und White anhand von fünf bedeutenden Papers zwischen 1985 und 1988, dass die Beobachtungen der Galaxien, Materienhaufen, Fäden und Locher mit einem simulierten Universum übereinstimmten, das sich durch den Einfluss der kalten, dunklen Materie entwickelt hatte.

"Die Papers von DEFW lauteten eine neue Ara ein, in der numerische Simulationen zum Standard bei kosmologischen Studien wurden", erklarte Wendy Freedman, Crawford H. Greenewalt, Vorsitzender und Leiter der Observatories der Carnegie Institution in Washington und Vorsitzender des Auswahlgremiums fur den Gruber Cosmology-Preis 2011. Kalte, dunkle Materie (oder CDM) ist heute eine der beiden Schlussselkomponenten des kosmologischen Standardmodells. Die andere Komponente ist die Beschleunigung der Entwicklung des Universums, eine Entdeckung, die in den spaten 1990er Jahren gemacht wurde und die durch die Simulationen von DEFW absehbar war. Wissenschaftler bezeichnen die Quelle fur die Beschleunigung mit dem mathematischen Symbol Lambda, doch sie ist in Anlehnung an den Begriff dunkle Materie besser bekannt als "Dunkle Energie".

Noch weiss niemand, was dunkle Materie oder dunkle Energie wirklich ist. Doch je umfangreicher und detaillierter die Beobachtungen des Universums werden, desto mehr wird Lambda-CDM zu einem Standardmodell in der Kosmologie. Die Kombination heutiger Forschung und Theorien weist darauf hin, dass das Universum aus 4,6 Prozent "normaler" Materie, 23,3 Prozent dunkler Materie und 72,1 Prozent dunkler Energie besteht. Numerische Simulationen dieser Art, die DEFW als erste lieferten, zeigen, dass ein Universum mit dieser erstaunlich prazisen und dennoch seltsamen Zusammensetzung doch Strukturen entwickelt, die uns so fremd nicht sind.

Zusatzliche Informationen

Die offizielle lobende Erwahnung lautet folgendermassen:

Die Peter and Patricia Gruber Foundation freut sich, den Cosmology-Preis 2011 an Marc Davis, George Efstathiou, Carlos Frenk und Simon White fur deren bahnbrechende Verwendung numerischer Simulationen zur Nachbildung und Interpretation der grossflachigen Anordnung von Materie im Universum zu ubergeben.

Kosmologische Simulationen erlauben eine direkte Konfrontation zwischen Beobachtung und Theorie, und sie haben die Art und Weise, wie wir das Wachstum der Struktur im Universum wahrnehmen und darstellen, verandert.

Die Arbeit der Professoren Davis, Efstathiou, Frenk und White verleiht der Theorie zur "kalten dunklen Materie" als die dominante Form von Materie in unserem Universum einen grossen Schub und ist daher fur die Darstellung unseres aktuellen Bilds des Kosmos von hochster Bedeutung.

Das internationale Auszeichnungsprogramm von Gruber ehrt zeitgenossische Individuen in den Bereichen Kosmologie, Genetik, Neurowissenschaft, Recht und Frauenrechte, deren bahnbrechende Forschung neue Modelle bietet, die

bedeutende Fortschritte für Wissen und Kultur bedeuten. Das Auswahlgremium wählte Individuen aus, deren Beiträge in ihren jeweiligen Bereichen unseren Wissensbereich erweitern und einen tiefgreifenden Einfluss auf unser Leben haben, und die, so wie im Falle der Preise für recht und Frauenrechte, Mut und Einsatz hinsichtlich grosser Hürden zeigen.

Die Peter and Patricia Gruber Foundation ehrt und unterstützt herausragende Leistungen, soziale Gerechtigkeit und wissenschaftliche Leistungen, die das Leben der Menschen verbessern. Weitere Informationen zu den Vorgaben und Prioritäten der Stiftung finden Sie unter <http://www.gruberprizes.org>.

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Record - 4

DIALOG(R)
GRUBER COSMOLOGY PRIZE HONORS,
US Federal News,
Wednesday, June 1, 2011

TEXT:
BERKELEY, Calif., June 1 -- The University of California issued the following press release:

University of California, Berkeley, astronomer Marc Davis will share with three other astronomers the 2011 Cosmology Prize of The Peter and Patricia Gruber Foundation, the foundation announced today (June 1).

The astronomers were honored for their computer simulations more than 20 years ago that convinced the world of the existence of "dark matter" and set off a so-far fruitless search to find out what it is.

Davis, a UC Berkeley professor of astronomy and physics who led the project, will share the \$500,000 prize with George Efstathiou, the director of the Kavli Institute for Cosmology in Cambridge, England; Carlos Frenk,

the director of the Institute for Computational Cosmology at Durham University in England; and Simon White, a director of the Max Planck Institute for Astrophysics in Garching, Germany.

The foundation cited the four scientists "for their pioneering use of numerical simulations to model and interpret the large-scale distribution of matter in the Universe." The work by Davis, Efstathiou, Frenk and White, most of which was conducted at UC Berkeley, "galvanized support for 'cold dark matter' as the dominant form of matter in the universe and has thus been instrumental in the crafting of our current cosmological paradigm," the foundation said in a statement. The Gruber Prize recognizes both the discovery method that the team introduced as well as the collaboration's subsequent discoveries.

Davis and his three colleagues will receive a gold medal at a ceremony this fall, where they each will deliver a lecture.

The team's work was conducted in the 1980s, when astronomers recognized that some invisible matter permeated the Milky Way and other galaxies, but models of the Big Bang and the subsequent evolution of the universe were not sophisticated enough to distinguish between different theories.

The three reigning proposals were hot dark matter, composed of relativistic particles traveling at close to the speed of light; cold dark matter, comprising slow moving particles; and warm dark matter, midway between the two.

In 1981, while a young professor of astronomy at Harvard University in the Harvard-Smithsonian Center for Astrophysics (CfA), Davis surveyed 2,400 galaxies at various distances - an extraordinary census of how the heavens look on the largest scales - and made a discovery that astounded the astronomical community. The universe wasn't just a uniform scattering of galaxies, but a "cosmic web" of galaxies grouped into filaments separated by vast voids.

"At the time, nobody had any idea what the large scale distribution of matter was, and mostly we didn't think about it," Davis said. "I soon saw that the best mathematical model of the Big Bang we had was wrong, there was a complete disconnect between our CfA observations and the theory."

"At that point," he said, "I became convinced that the only alternative was simulations," that is, computer calculations of how thousands of galaxies move under the influence of gravity, with dark matter thrown into the mix.

Davis teamed up with White, who was a researcher at UC Berkeley's Space Sciences Laboratory, recruited Frenk as a postdoctoral fellow, and

collaborated with Efstathiou, who was then at Cambridge University's Institute of Astronomy and had developed a clever way to simulate billions of years of galaxy evolution. Together, they were referred to as the DEFW collaboration, or the Gang of Four. Working mostly at UC Berkeley, the team in the late 1980s produced simulations that ruled out hot and warm dark matter, but showed that cold dark matter could produce the clumps, filaments and voids observed in space.

"That was the clincher," Davis said. "We said that the universe looks like it is dominated by cold dark matter, and everybody was convinced after that."

"The DEFW papers were instrumental in ushering in a new era where numerical simulations became a standard tool of cosmological studies," according to Wendy Freedman, Crawford H. Greenewalt Chair and director of the Observatories of the Carnegie Institution of Washington, and chair of the 2011 Selection Advisory Board to the Gruber Cosmology Prize.

"Boy, that was just a fun thing to do, we really had a great time, we loved it," Davis said. "And it really got a name for UC Berkeley, which became the center of all this work."

Interestingly, the simulations also hinted at another "energy" in the universe aside from normal matter and cold dark matter. But like Einstein before them, the astronomers balked at including a cosmological constant in their calculations. A mere 10 years later, a mysterious "dark energy" was discovered to permeate the universe. Today, cosmologists estimate that ordinary matter - stars and stuff composed of stardust, including life - comprises only 4.6 percent of the universe. About 23.3 percent is dark matter, and the remainder, 72.1 percent, is dark energy.

Though simulations like those of the DEFW team can now precisely model the behavior of dark matter, the identity of this exotic matter is still unknown. Since their work's culmination in 1989, many experiments looking for unusual elementary particles or dim substances between the stars have proved fruitless.

"Because of some wonderful experiments, we're driving dark matter to real extremes, and we're not sure what the hell to do now," Davis said, referring to experiments like the Cryogenic Dark Matter Search that have set limits on what dark matter can be, but have yet to specify what it is. "The next best hope is the Large Hadron Collider (at CERN), but if that doesn't tell us anything, we're never going to know what dark matter is."

Since his work on dark matter, Davis has been involved in several surveys, including an unprecedented survey of all galaxies at a redshift distance of

one, performed with the Keck Telescope in Hawaii. The DEEP2 survey has proved the starting point for many subsequent observations and astronomy missions in space, he said.

"What got us engaged from the beginning was an interest in how galaxies are arranged in three dimensions and the question: Does it tell us anything about the nature of the universe?" Davis said. "The answer is, yes, it does, very clearly."

The Gruber International Prize Program honors contemporary individuals in the fields of cosmology, genetics, neuroscience, justice and women's rights, whose groundbreaking work provides new models that inspire and enable fundamental shifts in knowledge and culture. The foundation's Selection Advisory Boards choose individuals whose contributions in their respective fields advance our knowledge, potentially have a profound impact on our lives, and, in the case of the justice and women's rights prizes, demonstrate courage and commitment in the face of significant obstacles. For any query with respect to this article or any other content requirement, please contact Editor at htsyndication@hindustantimes.com

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Record - 5

DIALOG(R)

Private worlds.

Metz, Steve,

Science Teacher, v78, n4, p6,

Friday, April 1, 2011

TEXT:

The classic video documentary A Private Universe has not lost its relevance in the 24 years since its release (Sadler, Schneps, and Woll 1987). The first part of the video, filmed on graduation day at Harvard University, reveals the scientific misconceptions of newly minted Harvard graduates, still in their caps and gowns. Even after years of education--in some cases including university-level physical science or astronomy courses--21 of 23 randomly chosen graduates, professors, and alumni reveal misconceptions when asked to explain the reasons for the seasons or the phases of the Moon.

The documentary becomes even more interesting as it follows Heather, a bright ninth-grade science student, as she attempts to reconcile her misconceptions about Earth's orbit. Interviews both before and after classroom instruction reveal that she retains many of her prior

misconceptions, even as she desperately tries to incorporate her old naive ideas into a new scientific framework.

The success of A Private Universe inspired the Harvard-Smithsonian Center for Astrophysics to create the Private Universe Project (see "On the web"). One part of this project, the Minds of Their Own video, roughly follows the format of A Private Universe, with additional commentary for teachers. Although Massachusetts Institute of Technology graduates are now interviewed along with their neighbors at Harvard, both groups of new graduates display equally egregious misconceptions about basic science. Topics investigated include photosynthesis (where does the weight of a tree come from?), electricity (can you light a bulb with a battery and a wire?), chemistry (what is air made of?), and vision and light (what happens to the size of your reflection when you walk backward from a mirror?). It is a fascinating collection.

The persistence of preconceptions should come as no surprise to anyone who has tried, in teaching or in everyday life, to convince someone to change his or her mind. This is especially true when the beliefs have been deeply rooted over time. Teaching is easy; by comparison, unteaching is extremely difficult. The collected videos of the Private Universe Project add solid evidence to the growing body of research showing that students' prior ideas and beliefs create critical obstacles to learning science. Every time we teach, new concepts compete with the misconceptions of our students. It is only by identifying and examining these naive ideas that we can hope to bring about conceptual change and free our students from their unexamined private worlds.

On the web

The private universe project: www.learner.org/resources/series29.html

Reference

Sadler, P.M., M.H. Schneps, and S. Woll. 1987. A private universe. Santa Monica, CA: Pyramid Film and Video.

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Record - 6

DIALOG(R)

Active learning strategies: the top 10: 10 strategies to help students overcome their naive conceptions of science.

Khourey-Bowers, Claudia,
Science Teacher, v78, n4, p38,
Friday, April 1, 2011

TEXT:

[ILLUSTRATION OMITTED]

Conceptual change instruction recognizes that students bring personal, or naive, conceptions to the classroom, which they use to explain their world, interpret situations, and create meaning (Driver et al. 2007). But what happens when students' personal conceptions are inconsistent with experts' views of scientific knowledge? Even after direct instruction, many students are held captive by their naive conceptions.

The persistence of these conceptions, as documented in The Private Universe Teacher Workshop Guide (Harvard-Smithsonian Center for Astrophysics 1995), provides compelling evidence that traditional instructional strategies are often ineffective at displacing naive conceptions. Conceptual change instruction, however, creates opportunities to replace students' naive conceptions with scientific concepts.

This article describes the conceptual change cycle and provides 10 active learning strategies to help students overcome their naive conceptions of science. I have found these strategies to be effective in teaching for conceptual change.

Conceptual change

Conceptual change theory (Posner et al. 1982) asserts that learners must first become dissatisfied with their existing conceptions, and then be provided new concepts they find to be intelligible, plausible, and fruitful:

* Dissatisfaction arises when learners realize that their preexisting ideas are no longer able to provide answers or solve problems.

* A new concept is intelligible when it can be used to represent a situation or solve a problem and it can be internalized by the learner; representations may take the form of analogies, metaphors, or images.

* For a new concept to be plausible, the learner must find it potentially

believable and consistent with his or her experiences and worldview.

- * For a concept to be fruitful, the learner must be aware of, generate, or understand novel practical applications or experiments that the new conception supports or explains.

A conceptual change lesson cycle, which incorporates the phases of dissatisfaction, intelligibility, plausibility, and fruitfulness, can be designed to address any of the National Science Education Standards (NRC 1996). The cycle begins and ends with students' understanding. In this kind of lesson cycle, teachers do the following (Figure 1 provides a more detailed outline):

- * Reveal students' prior knowledge and establish instructional goals.
- * Design a bridging lesson that will create dissatisfaction.
- * Present the "experts'" perspective on the concept.
- * Provide an opportunity for students to apply the scientific concept, to test its fruitfulness and plausibility.
- * Ask students to reflect on their new understanding.

FIGURE 1

A conceptual change lesson cycle.

1. Reveal students' prior knowledge and establish instructional goals.

- * What are the recurring naive conceptions of students?

How do you know?

- * What is the fundamental scientific concept you want students to understand?

2. Design a bridging lesson that creates dissatisfaction.

- * What bridging lesson can you use to challenge naive conceptions?

- * How will this lesson create dissatisfaction by helping students realize that their personal naive conceptions are inadequate to explain phenomena?

- * What active learning strategy will you use to engage your students?

3. Present the "experts'" perspective on the concept.

- * How will you present the experts' scientific perspective to students?

- * What representations (e.g., analogies, images, symbols, models) will you use to make the experts' perspective intelligible to your students?

4. Provide an opportunity for students to apply the scientific concept, to test its fruitfulness and plausibility.

What active learning strategy will students use to apply the experts' perspective to a novel situation?

* Will students find the new concept preferable to their prior understanding and fruitful as a problem-solving strategy?

* What kind of posttest will verify that students have developed new knowledge?

* Will students find the new concept plausible in light of everything else they know about related concepts?

5. Ask students to reflect on their new understanding.

* Have students self-assess their cognitive processes.

What aspect of the lesson cycle caused them to change their thinking? What convinced them that the new concept was preferable to their naive conceptions?

* How can journaling or other reflective strategies encourage students to think about thinking?

Top 10 strategies

As seen in Figure 1 (p. 39), the conceptual change cycle combines teacher-centered and student-centered activities. Student-centered activities should emphasize active learning (Blank and Alas 2009) strategies in which students are expected to manipulate knowledge and eventually construct understandings that are consistent with scientific conceptions.

Active learning strategies transform learning from a private, unexamined event to a public, shared process within the classroom community. By manipulating knowledge and talking about the phenomena with their classmates and teachers, students' naive conceptions are made visible and can be replaced with more scientific understandings.

The "top 10" active learning strategies presented here are suggested for conceptual change instruction. I have used these strategies with middle and high school students and preservice and inservice teachers. These strategies helped my students rethink their prior knowledge about science topics--allowing them to approach key concepts with fresh attitudes--and in the end, develop more scientific ways of thinking. Inservice teachers, eager to try novel strategies with their own students, enjoyed similar successes. These strategies are also supported by educational research, some of which is cited throughout this article.

#10: Watch your language!

Sometimes, multiple definitions of common words--such as work, energy, size, shape, and growth--affect students' understanding of fundamental scientific concepts. For example, you might think of growth as an increase in the size or number of cells, but students might think of it as an increase in height or width--overlooking the concept of cellular structure. Help students distinguish scientific meanings from everyday meanings of words. Word Walls (in which important terms are posted on a wall or bulletin board as the terms are taught), student-illustrated vocabulary cards, and science notebooks can help students create a working vocabulary and develop understanding (Roberson and Lankford 2010).

#9: Go for the long haul

Design longitudinal studies by having students collect data over an extended period of days, weeks, or months. Grow yeast colonies and make daily measurements of population growth and collapse. Raise fast-growing plants such as radishes and have students observe plant height, leaf number, length, and width over a period of several weeks. Have students select an independent variable. Make seasonal observations of ecosystems, including pond conditions, ground cover, light levels, and animal tracks. Long-term observations help students see trends and patterns, while minimizing transitory or insignificant changes. Patterns can be a powerful tool for analyzing the logic of students' prior knowledge and assumptions.

#8: Use discrepant events to awaken curiosity and inspire questioning
Dynamic models such as the "drinking bird," gyroscopes, and wind-up cars are surefire ways to get students asking questions about motion. A static model, such as a center-of-mass demonstration, can be placed in a corner of the classroom for students to discover. Students will eventually ask what it is and how it works. Predictions and hypothesis generation follow, as intrigued students are challenged to apply scientific knowledge to explain the "unexpected."

#7: Use novel associations to explore concepts

Rather than using textbook examples in the study of important concepts, use unique examples. Does every food web consist of grass, a rabbit, and a fox? Consider instead the food web on a rotting log. Why not use bacteria to convey concepts of population and abiotic factors? Study the physics of motion by observing the family pet. Encourage students to construct their own ecosystems or food webs by observing the school grounds or their backyards. Have students apply content knowledge and methods of scientific inquiry to investigate product claims, such as ultraviolet (UV) light-sterilizing toothbrushes and fat-free potato chips.

#6: Demystify diagrams

The most familiar diagrams--of food webs, the water cycle, and chemical equations, for example--attempt to convey complex relationships simply, using a combination of words, pictures, numbers, and symbols. But how many students really understand what these shorthand images represent? For example, in a food web, arrows point to the higher-order consumer. Why isn't the arrow pointing toward the organism that is consumed? How can we make sure that students understand that matter and energy are both moving from producers to consumers?

Similarly, the water cycle typically pairs specific processes with specific parts of Earth. For example, evaporation is shown over the ocean, and transpiration is shown over plants. Doesn't water both evaporate and transpire from plants? And doesn't water evaporate from roads, parking lots, and puddles, as well as from the ocean?

Chemical equations, symbolic of types and ratios of matter, present further problems. Do arrows in chemical equations mean the same thing as arrows in food webs? Are the products consuming the reactants?

In an effort to simplify, some diagrams can lead to incomplete understanding. Replace stereotypical thinking by presenting students with the opportunity to create their own images, before relying on standard diagrams. Have students make drawings and diagrams that depict their interpretations of the concept. As instruction proceeds, the drawings should become more complete and more consistent with standard representations.

#5: Measure twice, lecture once!

Just like the carpenter's adage of "measure twice, cut once," the suggestion here is to spend time making quantitative observations to develop understanding of fundamental concepts, particularly the conservation of matter. Measurement can be used in the study of physical and chemical changes. Start by measuring matter involved in physical changes, such as mixtures or solutions. When working with chemical changes--especially when gases play a role--use closed-system designs, such as reactions in freezer bags. Measurement can help students realize that matter is conserved in both chemical and physical changes.

By massing matter before and after physical or chemical changes, quantitative data (e.g., measurements) and qualitative data (e.g., observations of changes in state, color, or shape) can help structure classroom discussions. For younger students, discussion can center on how changes in appearance or state of matter are simply rearrangements of the

building blocks of matter. For older students, those building blocks can be identified as specific atoms and molecules. Measurement helps develop the concepts of particulate nature and conservation of matter by guiding students to make and interpret observations and support their interpretations with experimental evidence.

#4: Say it with flowers ...

... and pictures, words, and mathematical symbols! Difficult concepts such as photosynthesis can be represented with concrete examples (flowers), images and diagrams (pictures), words (descriptions), and symbols (the equation for photosynthesis). We expect that high school students are abstract thinkers, but in some domains, they may still think concretely. For example, students tend to think that individual atoms demonstrate the same properties as macro-amounts of substances. Give students time to talk or write about their macroscopic perceptions of matter before presenting theories based in the particulate nature of matter. Then scaffold students' progress through multiple levels of representation by specifically addressing their current understanding. As you and your students discuss different models used to explain the phenomena, they will begin to understand that each model has strengths and limitations.

#3: Use concept maps

Concept maps are versatile learning tools, which can be used as pretests to determine students' prior knowledge or as posttests to assess learning. More important, concept maps can help build knowledge as students actively construct meaning through recognizing associations between concepts. These relationships, or propositions, reveal how students are organizing ideas. Begin the process of concept-mapping with a focus question that serves to guide the organization of concepts, such as "What are the parts of a cell?" "How are parts of the cell adapted for specific functions?" and "How are prokaryotic cells different from eukaryotic cells?" Each of these focus questions results in a unique concept map, using different propositions to organize key terms.

Remember to provide students with key terms and a skeleton template for the concept map (Novak and Canas 2008). The template should provide enough structure that the primary divisions are suggested, but be open enough for students to incorporate their own associations.

#2: Write to learn

Use of structured writing tasks, such as observations, interactive lab reports, and science notebooks, can improve conceptual understanding through metacognition (McDermott 2010; Roberson and Lankford 2010). Meta cognition, or knowing how you learn, is itself a form of learning produced

by writing; at the same time, it is a catalyst for the process of content learning (Wallace, Hand, and Prain 2007).

Writing can be used for knowledge-telling and knowledge transformation (Wallace, Hand, and Prain 2007). Knowledge-telling focuses on the recall of information through observations, reading summaries, vocabulary reviews, and lecture notes. To encourage knowledge transformation, have students interpret and present knowledge in new ways, such as through interactive or reflective lab reports, creative writing (including poetry and rap), and group writing (Jackson, Dickinson, and Horton 2010; McDonald and Dominguez 2009).

Ask students to create a rap about mitosis or a haiku about solutions. In group writing, have students begin by anonymously writing one important idea about a specific topic, such as the rock cycle, on a piece of paper. Then ask students to pass their papers on to one or two other students, who in turn, add a new concept or clarification. This process encourages students to think more deeply about their current knowledge.

#1: Talk the (science) talk

Encourage teacher-student and student-student dialogue in the classroom. Take the time to ask questions that require students to think, use evidence, and listen to others. Discussion, by its very nature, requires that the participants integrate knowledge from others into their own understandings.

Have students work in small groups that are accountable for learning. Groups can share their ideas orally, write brief reports, or include their findings in lab reports or on tests. Just as we learn as we teach, students learn as they talk science. Concept development and language development are interrelated, so the more our students talk about science, the more opportunities they have to refine their understandings of important concepts.

The impact

Each of these 10 strategies combines tangible experiences with focused communication (i.e., discussing, writing, drawing). This combination gives learners an important reason to use language--to find and convey meaning in scientific phenomena. Communication as a transformative learning tool is far different than memorizing lists of vocabulary terms or filling in bubbles on a worksheet. Sensory-rich lessons can arouse curiosity, which leads students to question their own assumptions and, ultimately, creates an intrinsic desire to understand important concepts.

It is important to note that if learners merely assimilate knowledge, rather than accommodate it, naive conceptions may persist. But if learners actively reconsider prior knowledge in light of new knowledge, they can create new and more scientific cognitive models.

Conclusion

What really matters in our classrooms? If we want students to develop deep understanding, we must teach directly to their existing conceptions and help guide them into more scientific ways of thinking. The heart of conceptual change instruction is helping students gain and reconfigure knowledge, which, in turn, enhances their capacities for abstract reasoning. By designing instruction that specifically addresses naive conceptions, we enhance opportunities for the construction of scientific conceptions.

Nonscientific conceptions: Misconceptions, alternative, or naive?

Each of these terms refers to strongly held interpretations of natural phenomena developed by the learner. The differences in these terms depend on the absolute or relative "inaccuracy" perceived by the teacher.

Misconceptions imply that the learner's ideas are simply wrong and should be removed from his or her cognitive framework.

Alternative and naive conceptions recognize that the learner's ideas are "prescientific"--meaning that they do not hold with accepted scientific explanations and have limited usefulness in solving problems or interpreting a pattern of phenomena--when compared to scientific ideas. Both terms imply that the learner's ideas are partially correct, relative to the scientific view.

The term alternative conception recognizes that the context of the learner's knowledge has a strong influence on the usefulness of this knowledge. The term naive conception recognizes the developmental nature of cognitive development. Teachers can actively build on students' naive conceptions to help them become more scientific thinkers.

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Claudia Khourey-Bowers (cmkhoure@kent.edu) is an associate professor in the School of Teaching, Learning, and Curriculum Studies at Kent State University at Stark in North Canton, Ohio.

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Record - 7

DIALOG(R)

"Gang of Four" Receives \$500,000 Gruber Cosmology Prize for Reconstructing How the Universe Grew,

PR Newswire Europe (inc. UK Disclose)

Wednesday, June 1, 2011

TEXT:

NEW YORK June 1, 2011 - NEW YORK, June 1, 2011 /PRNewswire/ --

Four astronomers who found a way to recreate the growth of the universe are the recipients of the 2011 Cosmology Prize of The Peter and Patricia Gruber Foundation. Marc Davis, a professor in the Departments of Astronomy and Physics at the University of California at Berkeley; George Efstathiou, the director of the Kavli Institute for Cosmology in Cambridge; Carlos Frenk, the director of the Institute for Computational Cosmology at Durham University; and Simon White, a director of the Max Planck Institute for Astrophysics in Garching, Germany, will share the \$500,000 award.

The Peter and Patricia Gruber Foundation

The official citation recognizes the astronomers -- nicknamed the "Gang of Four" by their colleagues and often collectively abbreviated as DEFW -- for "their pioneering use of numerical simulations to model and interpret the large-scale distribution of matter in the Universe." The Gruber Prize recognizes both the discovery method that DEFW introduced as well as the collaboration's subsequent discoveries.

Davis, Efstathiou, Frenk, and White will each receive an equal share of the award, along with a gold medal, at a ceremony this fall. They will also deliver a lecture.

Astronomers have always told us what the universe looks like. Theorists have always invented ideas as to how it came to look that way. Not until the computer age, however, could scientists studying the evolution of the entire universe decisively match the gossamer of educated guesswork with the blueprint of observational evidence.

The particular evidence that motivated the creation of the DEFW collaboration came in the form of a 1981 Harvard-Smithsonian Center for Astrophysics survey of 2400 galaxies at various distances -- at the time, an extraordinary census of how the heavens look on the largest scales. (Davis led the project.) What the CfA survey showed was an early hint of what is today called "the cosmic web" -- galaxies grouped into lengthy filaments, or superclusters, separated by vast voids.

Theorists offered two competing ideas that might explain how matter could have coalesced in such a manner. Both theories took into account the presence of dark matter, a mysterious substance that astronomers in the 1970s had come to accept as a necessary piece in the cosmic puzzle in order to explain galaxy motions that otherwise would be violating the laws of physics. One candidate theory was "hot dark matter" -- "hot" because at early times the particles would travel at velocities approaching the speed

of light. Such speeding particles leave behind the "regular" matter which makes up galaxies and so does not clump around them. The other candidate was "cold dark matter," relatively sluggish particles that would fall together to build galaxy halos, dragging the regular matter along for the ride.

The Center for Astrophysics survey would allow astronomers to test these interpretations -- but only if they could figure out how to model the evolution of the universe over billions of years.

Enter the Gang of Four. Although other astronomers had been working with N-body simulations -- so called because they follow a number of points, N, each representing a concentration of mass -- their code couldn't handle a large enough N to represent large scales in the universe. Efstathiou, however, suspected that a code used to simulate ionic microcrystals would work. He succeeded in adapting it for cosmology, and Davis, Frenk, and White then used that code to demonstrate that a simulated universe based on the hot dark matter theory didn't remotely match the CfA observations.

Then, in a series of five landmark papers from 1985 to 1988, Davis, Efstathiou, Frenk, and White showed that observations of galaxies, clusters, filaments, and voids were consistent with a simulated universe that had evolved under the influence of cold dark matter.

"The DEFW papers were instrumental in ushering in a new era where numerical simulations became a standard tool of cosmological studies," says Wendy Freedman, Crawford H. Greenewalt Chair and Director of The Observatories of the Carnegie Institution of Washington, and chair of the 2011 Selection Advisory Board to the Gruber Cosmology Prize.

Cold dark matter -- or CDM -- is today one of the two key components of the standard cosmological model. The other is the acceleration of the expansion of the universe, a discovery observers made in the late 1990s that DEFW's simulations had anticipated. Scientists designate whatever is causing the acceleration with the mathematical symbol λ , but it is more commonly known, in a nod to dark matter, as "dark energy."

Nobody yet knows what dark matter or dark energy are. Yet as more extensive and more detailed observations of the universe have accumulated, λ CDM has become the standard model of cosmology. Today the match between observation and theory indicates that the universe is composed of 4.6 percent "ordinary" matter, 23.3 percent dark matter, and 72.1 percent dark energy. Numerical simulations of the kind pioneered by DEFW show that a universe with this astonishingly precise yet remarkably strange composition does indeed develop structures which are a close match to those we see around us.

Additional Information

The official citation reads:

The Peter and Patricia Gruber Foundation proudly presents the 2011 Cosmology Prize to Marc Davis, George Efstathiou, Carlos Frenk and Simon White for their pioneering use of numerical simulations to model and interpret the large-scale distribution of matter in the Universe.

Cosmological simulations allow direct confrontation between observation and theory, and have transformed the way we conceive and visualize the growth of structure in the Universe.

The work of Professors Davis, Efstathiou, Frenk and White galvanized support for "cold dark matter" as the dominant form of matter in the Universe and has thus been instrumental in the crafting of our current cosmological paradigm.

The Gruber International Prize Program honors contemporary individuals in the fields of Cosmology, Genetics, Neuroscience, Justice and Women's Rights, whose groundbreaking work provides new models that inspire and enable fundamental shifts in knowledge and culture. The Selection Advisory Boards choose individuals whose contributions in their respective fields advance our knowledge, potentially have a profound impact on our lives, and, in the case of the Justice and Women's Rights Prizes, demonstrate courage and commitment in the face of significant obstacles.

The Peter and Patricia Gruber Foundation honors and encourages educational excellence, social justice and scientific achievements that better the human condition. For more information about Foundation guidelines and priorities, please visit <http://www.gruberprizes.org>.

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DIALOG(R)

Gang of 4, cosmology, 06 01,

AP Alert – Business,

Wednesday, June 1, 2011

TEXT:

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TO SCIENCE EDITORS:

"Gang of Four" Receives \$500,000 Gruber Cosmology Prize for

Reconstructing How the Universe Grew

NEW YORK, June 1, 2011 /PRNewswire/ -- Four astronomers who found a way to recreate the growth of the universe are the recipients of the

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The particular evidence that motivated the creation of the DEFW collaboration came in the form of a 1981 Harvard-Smithsonian Center for Astrophysics survey of 2400 galaxies at various distances -- at the time, an extraordinary census of how the heavens look on the largest scales. (Davis led the project.) What the CfA survey showed was an early hint of what is today called "the cosmic web" -- galaxies grouped into lengthy filaments, or superclusters, separated by vast voids.

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travel at velocities approaching the speed of light. Such speeding particles leave behind the "regular" matter which makes up galaxies and so does not clump around them. The other candidate was "cold dark matter," relatively sluggish particles that would fall together to build galaxy halos, dragging the regular matter along for the ride.

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The work of Professors Davis, Efstathiou, Frenk and White galvanized support for "cold dark matter" as the dominant form of matter in the Universe and has thus been instrumental in the crafting of our current cosmological paradigm.

Laureates of the Gruber Cosmology Prize:

-- 2010: Charles Steidel for his groundbreaking studies of the distant Universe.

-- 2009: Wendy Freedman, Robert Kennicutt and Jeremy Mould for the definitive measurement of the rate of expansion of the universe, Hubble's Constant

-- 2008: J. Richard Bond for his pioneering contributions to our understanding of the development of structures in the universe

-- 2007: Saul Perlmutter and Brian Schmidt and their teams: the Supernova Cosmology Project and the High-z Supernova Search Team, for independently discovering that the expansion of the universe is accelerating

-- 2006: John Mather and the Cosmic Background Explorer (COBE) Team for studies confirming that our universe was born in a hot Big Bang

-- 2005: James E. Gunn for leading the design of a silicon-based

camera for the Hubble Space Telescope and developing the original concept for the Sloan Digital Sky Survey

-- 2004: Alan Guth and Andrei Linde for their roles in developing and refining the theory of cosmic inflation

-- 2003: Rashid Alievich Sunyaev for his pioneering work on the nature of the cosmic microwave background and its interaction with intervening matter

-- 2002: Vera Rubin for discovering that much of the universe is unseen black matter, through her studies of the rotation of spiral galaxies

-- 2001: Martin Rees for his extraordinary intuition in unraveling the complexities of the universe

-- 2000: Allan R. Sandage and Phillip J. E. (Jim) Peebles: Sandage for pursuing the true values of the Hubble constant, the deceleration parameter and the age of the universe; Peebles for advancing our understanding of how energy and matter formed the rich patterns of galaxies observed today

The Prize recipients are chosen by the Cosmology Selection Advisory Board. Its members are:

Jacqueline Bergeron, Institut d'Astrophysique-CNRS; Wendy

Freedman, The Observatories of the Carnegie Institution of

Washington; Helge Kraghe, Aarhus University; Ronald Ekers, Australia

Telescope National Facility - CSIRO; Andrei Linde, Stanford University; Julio F. Navarro, University of Victoria; and Roger

Penrose, University of Oxford. Owen Gingerich of the Harvard-Smithsonian Center for Astrophysics and Virginia Trimble of the University of California, Irvine, also serve as special Cosmology advisors to the Foundation.

The Gruber International Prize Program honors contemporary individuals in the fields of Cosmology, Genetics, Neuroscience, Justice and Women's Rights, whose groundbreaking work provides new models that inspire and enable fundamental shifts in knowledge and culture. The Selection Advisory Boards choose individuals whose contributions in their respective fields advance our knowledge, potentially have a profound impact on our lives, and, in the case of the Justice and Women's Rights Prizes, demonstrate courage and commitment in the face of significant obstacles.

The Peter and Patricia Gruber Foundation honors and encourages educational excellence, social justice and scientific achievements that better the human condition. For more information about Foundation guidelines and priorities, please visit <http://www.gruberprizes.org>.

Affiliation with International Astronomical Union

In 2000, The Peter and Patricia Gruber Foundation and the International Astronomical Union (IAU) announced an agreement by which the IAU provides its expertise and contacts with professional astronomers worldwide for the nomination and selection of Cosmology Prize winners. Under the agreement, The Peter and Patricia Gruber Foundation also funds a fellowship program for young astronomers, with

the aim of promoting the continued recruitment of new talent into the field.

The International Astronomical Union, founded in 1919, is an organization of professional astronomers. It serves today a membership of more than 9,000 individual astronomers from 85 countries, worldwide. Information about the activities of the IAU is available from <http://www.iau.org>.

For more information on the Gruber Prizes

e-mail media@gruberprizes.org or contact Bernetia Akin at +1 (340) 775-4430.

Media materials and additional background information on the Gruber Prizes can be found at our online newsroom:

<http://www.gruberprizes.org/Press.php>

By agreement made in the spring of 2011 the Gruber Foundation has now been established at Yale University.

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Record - 9

DIALOG(R)

Astronomers unveil historic 3-D map of the universe,

Kenyon Wallace,

Guelph Mercury, v2011060116497433, First ed, pB10,

Wednesday, June 1, 2011

TEXT:

It's a big universe out there.

Now astronomers are getting a better idea of just how big, thanks to a new 3-D map of the local universe, the most complete ever created.

Covering a distance of 380 million light-years (the Milky Way Galaxy is about 100,000 light-years in diameter), the map, unveiled this month at the Harvard-Smithsonian Center for Astrophysics, took more than 10 years to create and finally assembles in one image the location and distance of more than 43,000 galaxies.

"It's exactly like making a map of the whole Earth and flattening it out," said Dr. Karen Masters, an astronomer at Britain's University of Portsmouth and one of the researchers who helped create the image. "It's nice to finally have a map of the universe . . . it's where we live."

Masters said that the map will help astronomers as they tackle the mystery of why the Milky Way - the galaxy to which the Earth and its solar system belongs - moves in relation to its surroundings.

Scientists have figured out that the Milky Way is moving through space at about 600 kilometres per second due to gravitational forces.

But the source of this gravity has yet to be pinpointed.

"The gravity of all the structures around us is pulling on us and has caused our system to move.

"This map now shows the local structures, and from this information, we hope to find the things that have the strongest gravity," she said.

Work on the map began in the late 1990s by the late John Huchra, an astronomer at the Harvard-Smithsonian Center for Astrophysics, who assembled images made by the Two-Micron All-Sky Survey.

The survey used two telescopes - one at the Fred Lawrence Whipple Observatory on Mt. Hopkins in Arizona and one at the Cerro Tololo Inter-American Observatory in Chile - to scan the entire night sky using near-infrared wavelengths of light, which penetrate opaque clouds of dust better than visible light.

The near-infrared scans also allowed astronomers to map in detail areas previously hidden due to their proximity to the plane of the Milky Way Galaxy - the dark line running through the middle of the map - an area heavily obscured by stars and dust.

Huchra then combined these scans with "redshift" measurements, which indicate how far away galaxies are from Earth.

As the universe expands, it "redshifts" light coming from galaxies into longer wavelengths. By measuring these longer wavelengths or redshifts coming from a galaxy, astronomers can deduce the distance of the object from Earth.

In other words, the higher the redshift, the farther away a galaxy is. It is these measurements that give the map its vital third dimension.

Each dot on the map indicates a single galaxy made up of billions of stars. Red galaxies are the farthest away, while purple galaxies are closest.

Huchra died in October before completing the study, leaving his fellow astronomers, like Masters, to put the finishing touches on the map.

Mike Hudson, a physics and astronomy professor at the University of Waterloo, says the map will aid him in his research into dark matter, a mysterious and unmeasurable substance that scientists believe makes up most of the universe.

Record - 10

DIALOG(R)

TEXAS A&M ASTRONOMER PART OF 3-D MAPPING MASTERPIECE,
US Federal News,
Tuesday, May 31, 2011

TEXT:

BOSTON, Texas, May 31 -- Texas A&M University issued the following news release:

Last week an international group of astronomers unveiled the most complete 3-D map of the local Universe to great worldwide fanfare, not to mention the immense pride of one of the map's creators, Texas A&M astronomer Lucas Macri.

Macri, assistant professor of physics and astronomy and a member of Texas A&M's George P. and Cynthia Woods Mitchell Institute for Fundamental Physics and Astronomy, is one of the leading members of the team that created the map, which contains galaxies as far as a billion light-years. Known as the 2MASS Redshift Survey (2MRS), it is the result of a decade-long effort initiated by an astronomical legend, the late Dr. John Huchra, a longtime astronomer at the Harvard-Smithsonian Center for Astrophysics.

Karen Masters (University of Portsmouth, United Kingdom) presented the new map in a Wednesday (May 26) press conference at the 218th meeting of the American Astronomical Society, crediting Huchra for his masterpiece.

"The 2MASS Redshift Survey is a wonderfully complete new look at the local Universe, particularly near the Galactic plane [a region generally obscured by dust]," Masters said. "We're also honoring the legacy of the late John Huchra, who was the leader and guiding force behind this and earlier galaxy redshift surveys."

A galaxy's light is redshifted, or stretched to longer wavelengths, by the expansion of the Universe. The farther the galaxy, the greater its redshift, so redshift measurements yield galaxy distances - the vital third dimension in a 3-D map.

The 2MRS team chose 45,000 galaxies based on images made by the 2 Micron All-Sky Survey (2MASS). This survey scanned the entire sky in three

near-infrared wavelength bands. Near-infrared light, which Macri notes we feel as heat, penetrates intervening dust better than visible light, allowing astronomers to see more of the sky. The dust can be thought of as cosmic smoke, and observing in the near-infrared allows us to clear away the smoke to see the Universe clearly.

However, without adding redshifts, 2MASS makes only a 2-D image. Many of the galaxies mapped had previously-measured redshifts, but 11,000 new ones were measured by Huchra, Macri and collaborators starting in the late 1990s using mainly two telescopes: one at the Fred Lawrence Whipple Observatory on Mount Hopkins, Ariz., and one at the Cerro Tololo Inter-American Observatory in Chile. The last observations were completed shortly after Huchra's death in October 2010.

Macri, who is the corresponding author in the resulting paper that will soon be published, completed his doctorate in astronomy at Harvard in 2001 under Huchra, who put the CfA on the international astronomical map 25 years ago with one of the first redshift surveys. "The focus of 2MRS is to answer how much dark matter is there in the local Universe - out to about 400 million light years in radius - and to understand why the Milky Way is moving through the Universe at its present speed and direction," Macri said.

The 2MRS mapped in detail areas previously hidden behind our Milky Way. The motion of the Milky Way with respect to the rest of the Universe has been a puzzle ever since astronomers were first able to measure it and found it couldn't be explained by the gravitational attraction from any visible matter. Massive local structures, like the Hydra-Centaurus region (the "Great Attractor") were previously hidden almost behind the Milky Way but are now shown in great detail by 2MRS.

Macri noted that Texas A&M astronomers are involved in another historical mapping project, the Hobby-Eberly Telescope Dark Energy Experiment (HETDEX), an international collaboration led by The University of Texas at Austin to investigate dark energy in the early universe. The \$34 million project will harness the extensive light-gathering power of the world's third-largest telescope, the Hobby-Eberly Telescope, and the world's premier survey spectrograph being assembled and aligned at Texas A&M to produce the largest map of the Universe to date by pinpointing the positions of more than one million far-off galaxies in three dimensions. The goal is to measure how the Universe expands over time, revealing unprecedented information about dark energy, and to measure the "geometry" of our Universe to very high precision to give astronomers direct information about the state of the Universe at a time less than one second after the Big Bang.

"HETDEX will give us a 3-D map of a large volume of the Universe, but it will 'only' cover 1 percent of the surface of the entire sky," Macri said. "For comparison, 2MRS covers 95 percent of the entire sky out to a very shallow depth - astronomically speaking, of course - of 400 million light-years, yielding a volume that is about 1,000 times smaller than the one to be surveyed by HETDEX. If you compare a survey of the Universe to a study of the Earth, HETDEX would be the equivalent of getting very deep geological information for two regions covering an area about 7 times the size of Texas, whereas 2MRS would be akin to mapping the near-surface features of our planet - mountains, coastlines, ocean rifts, etc. - for 95 percent of its surface. Just as both types of geological surveys are useful for answering different questions about the Earth, 2MRS and HETDEX complement each other in our study of the Universe."

Macri, a joint holder of the Mitchell-Heep-Munnerlyn Career Enhancement Professorship in Physics and Astronomy, joined the Texas A&M faculty in 2008 after spending six years as a postdoctoral Hubble Fellow and Goldberg Fellow at the National Optical Astronomy Observatory (NOAO) in Arizona. His research focuses on the extragalactic distance scale, resolved stellar populations and near-field cosmology. He is an expert in Cepheid variables, which he studies using the Hubble Space Telescope, the Gemini North telescope and other observatories. In addition to authoring more than 50 referred publications, he is a member of the SH0ES team, an international collaboration that is using Cepheid variables - specifically, measurements of their luminosity - to help refine the Hubble constant and thereby narrow alternative explanations for dark energy in the Universe.

To learn more about the 2MASS Redshift Survey, visit <https://www.cfa.harvard.edu/~dfabricant/huchra/2mass/>.

For more information about Macri's research and astronomy at Texas A&M, visit <http://astronomy.tamu.edu/>.

News release includes significant contributions from the Harvard-Smithsonian Center for Astrophysics. For any query with respect to this article or any other content requirement, please contact Editor at htsyndication@hindustantimes.com

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Record - 11

DIALOG(R)

NASA, grad speaker, 05 31,

AP Alert – Business,

Tuesday, May 31, 2011

TEXT:
STK

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-- WITH PHOTO -- TO EDUCATION, NATIONAL, AND SCIENCE EDITORS:

NASA Langley Scientist is Brooklyn College Commencement Speaker

HAMPTON, Va., May 31, 2011 /PRNewswire-USNewswire/ -- Joel Levine, a

senior research scientist at NASA Langley Research Center in Hampton, Va., will be honored with a Distinguished Alumnus Award and will be

the keynote speaker at the 2011 commencement at Brooklyn College in

Brooklyn, N.Y., on June 1.

(Logo: <http://photos.prnewswire.com/prnh/20081007/38461LOGO>)

Levine will serve as the keynote speaker for the master's ceremony.

He serves as chief scientist and principal investigator for the

proposed ARES (Aerial Regional-scale Environmental Surveyor) Mars

Airplane, a robotic, rocket-powered aerial vehicle that NASA will use

to search for life on Mars.

In 2010, his unique expertise also led NASA officials to appoint him

to the agency's Trapped Chilean Miners Rescue Team, which assisted in

the successful rescue of 33 miners trapped a half mile below the surface of earth. Levine will also receive a Distinguished Alumni

award.

Levine and Rudolf Schild, of the Harvard-Smithsonian Center for

Astrophysics in Cambridge, Mass., are co-editors of the recently

published book, "The Human Mission to Mars: Colonizing the Red Planet." Levine has also edited four books on planetary atmosphere and global climate change.

From 2007 to 2008, Levine served as Mars Scout program scientist for the Mars Exploration Program, NASA Headquarters, Washington, D.C.

Among many honors and awards, Levine has received the NASA Medal for Exceptional Scientific Achievement, the NASA Outstanding Leadership Medal, the New York Academy of Science Halpern Award in Photochemistry, and was selected as Virginia's Outstanding Scientist.

An image of Levine with the Mars Airplane is at

<http://www.nasa.gov/centers/langley/multimedia/iotw-levine-ares.html>.

After graduation from Brooklyn College, Levine received a Master of Science degree in atmospheric science from New York University and a Master of Science in aeronomy and planetary atmospheres, and a Ph.D. in atmospheric science, both from the University of Michigan.

To see Levine's biography, go to

<http://www.brooklyn.cuny.edu/pub/levine.htm>.

For more information about Langley go to <http://www.nasa.gov/langley>.

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Record - 12

DIALOG(R)

NASA Langley Scientist is Brooklyn College Commencement Speaker,
PR Newswire,
Tuesday, May 31, 2011

TEXT:

HAMPTON, Va., May 31, 2011 /PRNewswire-USNewswire/ -- Joel Levine, a senior research scientist at NASA Langley Research Center in Hampton, Va., will be honored with a Distinguished Alumnus Award and will be the keynote speaker at the 2011 commencement at Brooklyn College in Brooklyn, N.Y., on June 1.

(Logo:)

Levine will serve as the keynote speaker for the master's ceremony.

He serves as chief scientist and principal investigator for the proposed ARES (Aerial Regional-scale Environmental Surveyor) Mars Airplane, a robotic, rocket-powered aerial vehicle that NASA will use to search for life on Mars.

In 2010, his unique expertise also led NASA officials to appoint him to the agency's Trapped Chilean Miners Rescue Team, which assisted in the successful rescue of 33 miners trapped a half mile below the surface of earth. Levine will also receive a Distinguished Alumni award.

Levine and Rudolf Schild, of the Harvard-Smithsonian Center for Astrophysics in Cambridge, Mass., are co-editors of the recently published book, "The Human Mission to Mars: Colonizing the Red Planet." Levine has also edited four books on planetary atmosphere and global climate change.

From 2007 to 2008, Levine served as Mars Scout program scientist for the Mars Exploration Program, NASA Headquarters, Washington, D.C.

Among many honors and awards, Levine has received the NASA Medal for Exceptional Scientific Achievement, the NASA Outstanding Leadership Medal, the New York Academy of Science Halpern Award in Photochemistry, and was selected as Virginia's Outstanding Scientist.

An image of Levine with the Mars Airplane is at .

After graduation from Brooklyn College, Levine received a Master of Science degree in atmospheric science from New York University and a Master of Science in aeronomy and planetary atmospheres, and a Ph.D. in atmospheric science, both from the University of Michigan.

To see Levine's biography, go to .

For more information about Langley go to .

NASA Langley news releases are available automatically by sending an e-mail message to with the word "subscribe" in the subject line. You will receive an e-mail asking you to visit a link to confirm the action. To unsubscribe, send an e-mail message to with the word "unsubscribe" in the subject line.

SOURCE NASA

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Wolbach Library: CfA in the News ~ Week ending 12 June 2011

1. **Nearby Galaxy Boasts Two Monster Black Holes, Both Active**, Fars News Agency (Iran), Sunday, June 12, 2011

2. **IN YOUR SCHOOLS**, Metro, D. Aileen Dodd, Staff, Atlanta Journal and Constitution (GA), Main; The Atlanta Journal-Constitution ed, pB1, Sunday, June 12, 2011

3. **NORTHERN LIGHTS MAY DANCE IN NIGHT SKY IT COULD BE THE FIRST TIME IN YEARS THAT NORTHERN LIGHTS ARE VISIBLE IN THIS REGION**, DAVID TEMPLETON, PITTSBURGH POST-GAZETTE, Pittsburgh Post-Gazette (PA), SOONER ed, pA-1, Thursday, June 9, 2011

4. **EPA SEEKS TO BOLSTER UTILITY MACT WITH STRICT MERCURY RISK ASSESSMENT**, Inside the EPA, v32, n23, Friday, June 10, 2011

Record - 1

DIALOG(R)

Nearby Galaxy Boasts Two Monster Black Holes, Both Active,
Fars News Agency (Iran)
Sunday, June 12, 2011

TEXT:

The galaxy, which is known as Markarian 739 or NGC 3758, lies 425 million light-years away toward the constellation Leo. Only about 11,000 light-years separate the two cores, each of which contains a black hole gorging on infalling gas.

The study will appear in a forthcoming issue of The Astrophysical Journal Letters.

"At the hearts of most large galaxies, including our own Milky Way, lies a supermassive black hole weighing millions of times the sun's mass," said Michael Koss, the study's lead author at NASA's Goddard Space Flight Center in Greenbelt, Md., and the University of Maryland in College Park (UMCP). "Some of them radiate billions of times as much energy as the sun." Astronomers refer to galaxy centers exhibiting such intense emission as active galactic nuclei (AGN). Yet as common as monster black holes are, only about one percent of them are currently powerful AGN. Binary AGN are rarer still: Markarian 739 is only the second identified within half a

billion light-years.

Many scientists think that disruptive events like galaxy collisions trigger AGN to switch on by sending large amounts of gas toward the black hole. As the gas spirals inward, it becomes extremely hot and radiates huge amounts of energy.

Since 2004, the Burst Alert Telescope (BAT) aboard Swift has been mapping high-energy X-ray sources all around the sky. The survey is sensitive to AGN up to 650 million light-years away and has uncovered dozens of previously unrecognized systems. Follow-up studies by Koss and colleagues published in 2010 reveal that about a quarter of the Swift BAT AGN were either interacting or in close pairs, with perhaps 60 percent of them poised to merge in another billion years.

"If two galaxies collide and each possesses a supermassive black hole, there should be times when both black holes switch on as AGN," said coauthor Richard Mushotzky, professor of astronomy at UMCP. "We weren't seeing many double AGN, so we turned to Chandra for help." Swift's BAT instrument is scanning one-tenth of the sky at any given moment, its X-ray survey growing more sensitive every year as its exposure increases. Where Swift's BAT provided a wide-angle view, the X-ray telescope aboard the Chandra X-ray Observatory acted like a zoom lens and resolved details a hundred times smaller.

For decades, astronomers have known that the eastern nucleus of Markarian 739 contains a black hole that is actively accreting matter and generating prodigious energy. The Chandra study shows that its western neighbor is too. This makes the galaxy one of the nearest and clearest cases of a binary AGN.

The distance separating the two black holes is about a third of the distance separating the solar system from the center of our own galaxy. The dual AGN of Markarian 739 is the second-closest known, both in terms of distance from one another and distance from Earth. However, another galaxy known as NGC 6240 holds both records.

How did the second AGN remain hidden for so long? "Markarian 739 West shows no evidence of being an AGN in visible, ultraviolet and radio observations," said coauthor Sylvain Veilleux, a professor of astronomy at UMCP. "This highlights the critical importance of high-resolution observations at high X-ray energies in locating binary AGN." The research team also includes Ezequiel Treister and David Sanders at the University of Hawaii's Institute for Astronomy in Honolulu, Kevin Schawinski at Yale University in New Haven, Conn., and Ranjan Vasudevan, Neal Miller and Margaret Trippe at the University of Maryland, College

Park.

Swift, launched in November 2004, is managed by Goddard. It was built and is being operated in collaboration with Penn State University, the Los Alamos National Laboratory in New Mexico, and General Dynamics in Falls Church, Va.; the University of Leicester and Mullard Space Sciences Laboratory in the United Kingdom; Brera Observatory and the Italian Space Agency in Italy; plus additional partners in Germany and Japan.

The Marshall Space Flight Center manages the Chandra program for NASA's Science Mission Directorate in Washington. The Smithsonian Astrophysical Observatory controls Chandra's science and flight operations from Cambridge, Mass.

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Record - 2

DIALOG(R)

IN YOUR SCHOOLS, Metro,
D. Aileen Dodd, Staff,
Atlanta Journal and Constitution (GA), Main; The Atlanta
Journal-Constitution ed, pB1,
Sunday, June 12, 2011

TEXT:

They could have made excuses and dropped out of school like thousands of other teens facing adversity.

Yet they succeeded, even excelled, despite the odds against them. Poverty. Cultural differences. Stubbornness. The death of a mother.

Nothing could keep them from achieving their goal of earning a high school diploma and a college acceptance letter. Now, with big scholarships in hand, they begin the next leg of their journey.

Surviving loss: A mother's academic wish fulfilled

On the day of Carla Bradley's funeral, teenagers in gray slacks and plaid skirts respectfully filed into a holiness church to mourn the passing of a woman that many of them had never met.

Their support for a new classmate in November 2007 would expand Amanda

Bradley's definition of family at a time when she felt hers was falling apart.

The compassion that the Marist School students showed the family, the way that they carried themselves with quiet dignity -- it was exactly what Bradley's mother wanted for her daughter, who was then just a 15-year-old freshman at a mostly Catholic school.

"I was very delighted about how everyone reached out to me," said Amanda, 18. "It was one of the things that I love about the school and will never forget."

Despite the loss of one of her biggest supporters, Amanda found the courage to move on. Since sixth grade, she had dreamed of going to Harvard.

"She took it day by day," her grandmother Vera Bradley said. "We are a praying family."

Her father Cedric Bradley also was there for her.

Carla Bradley had pushed her daughter to apply to Marist, where 100 percent of students graduate and go to college, because she wanted her to excel. Amanda tested the waters at a summer enrichment program.

Reach for Excellence helped her to apply to Marist for freshman year and secure financial aid to make tuition affordable.

Amanda knew she wasn't the typical Marist student. She had eight brothers and sisters and was raised mostly by her paternal grandmother. (Carla Bradley was diagnosed with kidney failure when Amanda was a first-grader.) She lived modestly in West Atlanta. Many of her classmates, she said, had elite Buckhead and Dunwoody addresses and lakefront vacation villas.

"I am low income, and I was used to going to a 100 percent African-American school. I wanted to experience something new," she said. "There were so many people in my neighborhood that had given up on their dreams. I wanted to inspire people to not just conform."

Despite classes that Amanda says were demanding, she graduated with an A-plus average. A support network helped her to cope with her grief and focus on school. Her grandmother came to her games when she was basketball cheer captain. Her classmates voted her junior class president and co-president of student government senior year. Marist's director of counseling Gordon Stanley personally led her through college applications and reviewed her essays, Amanda said. "I was in his office practically every day."

Amanda received 11 college acceptances, including one from Harvard. She will attend as a Gates Millennium Scholar, an award her sister told her about. The scholarship will pay her tuition, room and board and for graduate school, depending on her major. "I have made my father proud. My mother would be so excited."

Vera Bradley assures her granddaughter that her mother knows: "She's in heaven with her chest stuck out saying, 'That is my child.' "

Bridging the language divide: Student realizes college potential

Karla Cruz would often hear classmates talking about college, but she didn't think she could actually go. Her parents didn't have degrees.

But when the First Generation college club was formed at Dacula High her senior year, it opened her mind to the possibility. Some of her international classmates in the school of 1,960 were too ashamed to admit they would be the first in their immediate families to hope to attend a university, but not Karla.

"We had a lot of kids who didn't know anything about the college application process," said Patty James, a guidance counselor who led the club of 10 teens. "They felt like they were alone. They needed to know that they weren't the only ones who had doubts."

Karla learned about financial aid and toured a college with the group to make applying less intimidating. "My parents never said anything about attending college. I thought I couldn't go because it was expensive."

Juan and Margarita Cruz left Mexico to find jobs and quality schools so they could start a family. The couple relocated from Boston to Dacula when Karla, who was born in the United States, was 5. She learned English at school. But, as she got older, good grades weren't a priority for her.

Karla's grade-point average was 1.6 her freshman year. But by her senior year, she had a 3.1 as she began to focus on college.

She received a \$20,000 Broad Prize scholarship for overcoming academic struggles. She was accepted into Georgia Gwinnett College.

"I still can't believe it," she said. "I cried."

Her sister Karen, a junior, said she is proud. She joined the college club, too. "I learned it's better to start young. Four years pass by really quickly."

Adjusting and thriving: Student learns identity is an asset

It was her mother's idea to attend Holy Innocents' Episcopal School. Rekeyia Sherrell thought she would have been perfectly happy at Grady High.

She didn't like the uniforms. Or the fact that she'd be a new face on a predominantly white campus, building its diversity.

"It was a change. Not only was I going to be a freshman, I was going to be a minority around people who were brought up differently," she said.

Her mother pushed her into Holy Innocents'. A Better Chance placement program helped the family apply and secure financial aid to make it affordable.

"This is what you need," Traci Sherrell, told her daughter. "I wanted her to have options."

Rekeyia thought that her mother would tire of the 30-mile commute from College Park, but it didn't happen. "I found ways to cope," Rekeyia said.

She got active in school and found her classmates friendly and accepting. Rekeyia was the first African-American to lead the junior varsity and varsity cheer squads.

She also pushed herself academically, signing up for honors math sophomore year when an instructor warned against it.

"The teacher actually told me she didn't think I could pass," said Rekeyia, 18, who has three siblings. "I got a B."

She worked harder than ever before, taking her math book everywhere -- even to bed.

Rekeyia was inspired to try more rigorous classes, then took on leadership positions addressing student misconceptions about race. She graduated with an A average as the school's first Gates Millennium Scholar and will attend Howard University. "I came here and did what I was destined to do."

Her father, Richard Sherrell, was thrilled when he heard about the Gates. "I always tell her that she can go anywhere and do anything in life. She has the mental capacity."

Surpassing limited resources: Student ambition opens Ivy League doors

His mother left her job as a security guard, yet she couldn't be happier. His father is smiling wider.

Paul Harris Jr., a kid who used imagination instead of expensive toys, graduated as valedictorian of Carver Early College with offers from 25 universities -- many of them Ivy League.

"He was early accepted to Harvard University, Brown and Columbia," beams his principal Marcene Thornton. "I want to hold him back another year. He is so good for the kids. He is living proof that it's possible."

Paul, another Gates Scholar, has become a school legend.

"Public school was my only option, so I made the best I could out of it," said Joann Harris. "I got involved in my children's education. Every morning before they went to school, I would kiss them, bless them and send them off telling them, 'Great things are going to happen to you today.' "

Summers were spent at the library. Paul became a voracious reader. He found math and science fascinating.

To pass the time, Paul and his sister Angelique Harris, now a pre-med student on full scholarship at Johns Hopkins University, invented things.

"I was 10 when I made a working replica of an air conditioning unit," Paul, 18, said. "I used a bunch of different boxes. I had some wire and fans. I used ice cubes for cooling. It was very rudimentary. Somehow, I used the fan to cool the air from the ice cubes and blew it out the vent that I made."

They also built a model car using motors, Legos and spare Matchbox tires.

Paul followed his sister to Carver Early College. By junior year, he landed a summer research scholarship in California plotting the path of asteroids. "They only accepted 34 people. I was there with [students] from Greece, Turkey and France. Sometimes we stayed up until 3 a.m."

His research was archived at the Harvard-Smithsonian Center for Astrophysics.

He credits his family at home and at school for his success. "They taught me that you can do whatever you put your mind to."

Paul's mother is so excited about where he is going to college she even tells strangers.

"Ever since he brought me the acceptance letter, I have been telling people, 'My son is going to Harvard!' " she said, giddy with excitement. "I told the mailman. I told the people at the bank. I told the people at work

when I had a job. I stood out in the neighborhood. My son is going to Harvard!"

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Record - 3

DIALOG(R)

NORTHERN LIGHTS MAY DANCE IN NIGHT SKY; IT COULD BE THE FIRST TIME IN YEARS THAT NORTHERN LIGHTS ARE VISIBLE IN THIS REGION,

DAVID TEMPLETON, PITTSBURGH POST-GAZETTE,
Pittsburgh Post-Gazette (PA), SOONER ed, pA-1,
Thursday, June 9, 2011

TEXT:

Eruption of a medium-sized solar flare potentially could cause a display of northern lights -- aurora borealis -- this week, although the event generated by a sunspot isn't believed to be large enough to cause problems for communications or air travel.

David Aguilar, director of information for the Harvard-Smithsonian Center for Astrophysics, said the electromagnetic pulse generated by the solar flare could interact with the Earth's electromagnetic field to produce atmospheric lights that could be visible as far south as Washington, D.C.

It could be the first time in years that northern lights are visible in this region.

NASA officials report that the flare peaked early Tuesday on the sun. But once such a flare occurs, it can take a day or more for the electromagnetic pulse to reach Earth. The colliding electromagnetic fields can produce colorful atmospheric fluorescence.

"A cloud of charged particles erupted from the sun's outer atmosphere" with initial expectations that it would pass by Earth late Wednesday or early today, causing a minor disruption to Earth's magnetic field, according to the National Weather Service's Space Weather Prediction Center in Boulder, Colo.

But on Wednesday, the center said the electromagnetic pulse would make "but a glancing blow" on Earth's magnetic field that could begin at 8 a.m. today and continue through Friday.

Some brief interruptions could occur in high-frequency radio communications, especially those closer to the north and south poles.

Global positioning devices also might show tiny errors.

Mr. Aguilar said the solar flare occurred in a position on the sun that's aimed toward Earth, although it won't be a direct hit.

"One seven years ago disrupted airline flights over the poles because of radiation levels equal to 15 to 20 X-rays," he said, adding that communication satellites could be shut down temporarily for protection during the event.

"It's rare to have a solar flare pointed toward Earth," Mr. Aguilar said. "As it moves toward us, we'll likely get spectacular photographs from Scandinavia. It will be a fortunate event to see."

The sun is moving into a more dynamic period of its 11-year cycle after years of low solar activity. The cycle is caused by the orientation of its magnetic field, with the maximum activity expected to occur in 2013.

NASA said "high-latitude sky watchers should be alert for auroras" with the arrival of the solar electromagnetic pulse. Viewing northern lights, Mr. Aguilar said, occurs best in dark, clear skies.

People in this region may see a grayish-green cloud, but reds and blues sometimes are possible. The lights can be photographed, he said, by putting a digital camera on a tripod with the lens wide-open on the infinity setting. The exposure rate must be adjusted manually to last for 5 to 10 seconds.

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Record - 4

DIALOG(R)

EPA SEEKS TO BOLSTER UTILITY MACT WITH STRICT MERCURY RISK ASSESSMENT,
Inside the EPA, v32, n23,
Friday, June 10, 2011

TEXT:

EPA is preparing to defend its controversial proposed rule regulating air toxics emissions from power plants by finalizing a stringent assessment of the risks from mercury (Hg) that the plants emit -- though critics say the assessment raises questions about whether those risks can be linked to power plant emissions specifically.

A special panel of the agency's Science Advisory Board (SAB) is meeting in

Research Triangle Park, NC, June 15-17 to review the assessment, which estimates that domestic electric generating units (EGUs) are expected to contribute up to 18 percent of fish tissue mercury levels by 2016. Relevant documents are available on InsideEPA.com. (Doc ID: 2366317)

One EPA source says the SAB review is intended to bolster the assessment and the agency's related rule that sets strict Maximum Achievable Control Technology (MACT) requirements for utilities. "There are many ways in which people are trying to slow this down," the agency source says. "There will be a full-throated attack, so we are getting SAB review" to enhance the risk assessment's credibility.

That attack has already started with critics of the agency's rule, in a series of recent editorials, questioning the health benefits to be gained by strictly regulating power plants and arguing that other sources of mercury vastly overshadow power plants. "Since our power plants account for less than 0.5% of all the mercury in the air we breathe, eliminating every milligram of it will do nothing about the other 99.5% in our atmosphere," Willie Soon of the Harvard--Smithsonian Center for Astrophysics and Paul Driessen of the Committee For A Constructive Tomorrow argued in recent editorial in the Wall Street Journal.

EPA's proposed rule, published in the Federal Register May 3, has already garnered heated opposition from coal-fired power plants, mine workers and other groups, who charge its requirements, along with other rules facing the sector, are so expensive to meet that coal-fired power plants will simply shut down, causing electricity grid reliability concerns and raising consumer prices. Some labor unions are urging EPA to delay the proposal's compliance date by one year.

But environmentalists and "clean" energy companies are defending EPA's proposed MACT, rejecting utility industry criticisms that the proposal is unachievable, too stringent and will harm reliability.

The rulemaking stems from a Clean Air Act requirement that EPA first determine that it is "appropriate and necessary" to regulate coal- and oil-fired electric utilities under section 112 of the Clean Air Act before crafting a MACT standard. The EPA source, along with an environmentalist involved in the issue, say however that there is little explanation for what "appropriate and necessary" requires.

The assessment is unusual given that the rule is a technology-based measure, rather than a health- or risk-based rule, says an environmentalist who has followed the rule's progress. "They're not making a risk-based decision. They're just bolstering their decision" to list power plants as entities that can be regulated, the environmentalist says. "If you ask me,

it doesn't make sense because EPA had more than enough information to [make the] list decision. It's a low bar and EPA gets a lot of discretion. It's more than obvious that the agency is acting within its discretion."

While outgoing Clinton administration officials made a determination in December 2000, the Bush administration sought to reverse the finding as part of its effort to craft a cap-and-trade system for mercury emissions. The Bush EPA's effort, however, was vacated by a federal court and incoming Obama officials later agreed to a deadline for crafting a final MACT standard under section 112 by November. The agency is working to bolster its decisions in the face of that time line, the environmentalist and an agency source say.

As part of the rulemaking effort, EPA March 17 released a draft version of the mercury risk assessment, which attempts to match a modeled estimate of how much mercury power plants will release with the amounts of mercury observed in fish tissues. One of the largest sources of human exposure to mercury is consuming fish that contain the most toxic species of the metal, methyl mercury (MeHg).

The document focuses on those populations it considers most affected: pregnant women who eat large amounts of fish, subsistence fishers and frequent sport fishers who eat a majority of their catch. These, however, are just a few of the assumptions that make the assessment so stringent, according to an industry consultant who has reviewed EPA's draft.

The assessment was conducted by calculating with a long-range air model the amount of mercury power plants emitted in 2005 and will be emitted in 2016. The lower 2016 value, of 29 tons, is similar to data from 2010, so the assessment places greater weight on that figure. Next, the assessors estimate total mercury deposition on inland water bodies and water sheds and then calculates the fraction of the total that EGUs contribute. The assessment then focuses on the risk that these depositions present to populations that eat high quantities of fish caught in these inland lakes and streams, mostly sport fishers or subsistence fishers.

The assessment then analyzes these calculations with a "three-phase risk characterization framework." This includes considering those watersheds "where total risk is considered to pose a potential public health hazard" and then considering the amount of mercury in these watersheds is from power plants. Next, the assessors identify those watersheds where mercury risk would be considered a health hazard from power plant sources alone. Then they calculate the number of watersheds where populations are at risk from power plant mercury alone.

The authors "estimate that up to 28 percent of the watersheds included in

this risk assessment could have populations potentially at-risk under the 2016 scenario." They explain that the estimate includes both watersheds where power plant mercury alone causes a health hazard and watersheds whose total risk poses a public health hazard where at least five percent of the mercury is attributable to power plants. It is also based on "application of the 99th percentile consumption rate for the high-end female consumer."

The document describes a number of other "key observations," including, "U.S. EGUs can contribute up to 11 percent of total Hg deposition (for the 99th percentile watershed in the 2016 Scenario). U.S. EGUs (for the 2016 scenario) contribute on average, about 2 percent of total Hg deposition across the country."

EPA's assessment calculates that "U.S. EGUs contribute on average, about 2 percent of total Hg deposition for the 2016 Scenario, they contribute about 4 percent of the fish tissue MeHg levels at watersheds included in this analysis . . . U.S. EGUs are estimated to contribute up to 18 percent of fish tissue MeHg levels in the 2016 scenario (for the 99th percentile watershed)." The report explains the discrepancy between total deposition and fish tissue levels because the fish tissue samples referenced in the assessment are largely from sources east of the Mississippi River, in parts of the country with higher mercury deposition levels.

And, the assessors indicate that their analyses could "substantially" underestimate the number of populations at risk. They explain, "while we have some degree of coverage for high U.S. EGU impact areas, this coverage is limited. For this reason, we believe that the actual number of where populations may be at risk from EGU-attributable Hg (i.e., watersheds where U.S. EGUs could contribute to a public health hazard) could be substantially larger than estimated."

But the agency's estimates are bolstering the arguments of those who question the health benefits gained by strictly regulating the power plants. Soon and Driessen, for example, argue in their Wall Street Journal editorial and a second piece in Investor's Business Daily that other sources contribute significantly greater amounts of mercury than power plants."U.S. forest fires emit at least 44 tons per year; cremation of human remains discharges 26 tons; Chinese power plants eject 400 tons; and volcanoes, subsea vents, geysers and other sources spew out 9,000-10,000 additional tons per year," they wrote in the Journal May 25.

And an industry consultant who has reviewed the assessment argues that EPA's document is overly conservative, designed to protect "the top 99th percentile of the population," and also fails to make a linkage between power plant emissions and human health risk due to mercury consumed in fish. The source notes that when public health agencies, like EPA, assess

mercury risk, "they tend to focus on subsistence fishers, which is highly conservative . . . You end up having regulations focused on protecting an extremely small percentage of the population. You're assuming that people are eating fish at a high rate and that they're getting it all from a contaminated place."

The document bases some calculations on people they estimate are eating as much as 373 grams of fish per day. The consultant compares this to the equivalent of one to three fillets of tilapia fish daily. The consultant adds, "For this fish pathway, you have to make assumptions about the waterbody. You have to make assumptions about the land and about the watershed that leads to mercury [entering] the water. Water flow also impacts how [mercury is] taken up by fish. So again, these are areas where the tendency is to make very conservative assumptions, and the combination of conservative assumptions results in

an overestimate for most [power] plants."

But the consultant acknowledges that for EPA's purpose, the way staff have designed the assessment is probably the only way to do it. "[This is] really the only way I can think of to do a national scale risk assessment. But the problem is they tend to pile on the conservative assumptions. It's challenging to reflect reality in an [assessment] like this. The problem is you end up with limits so low its hard to operate in an economically viable way and it doesn't provide an added health [benefit]."

Still, the consultant argues that EPA has not linked the power plant mercury emissions with the risk that methyl mercury in fish pose to the public. "Part of the way to do an appropriate and necessary [finding is to assess] how industry affects public health," the source says. "This report does not do a good job. It fails to make a connection between mercury emissions of power plants and the threat posed by eating fish with mercury [in them]." -- Maria Hegstad

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Wolbach Library: CfA in the News ~ Week ending 19 June 2011

1. **New black hole findings open gates for research Scientists can learn much from discovery**, Amina Khan, Star-Ledger, The (Newark, NJ), State/ROP ed, p005, Sunday, June 19, 2011
2. **Research shows black holes populated cosmos early**, Amina Khan, Edmonton Journal (Canada), Final ed, pA16, Saturday, June 18, 2011
3. **PAN-STARRS TELESCOPE SPOTS NEW DISTANT COMET**, US Federal News, Thursday, June 16, 2011
4. **Synergies**. Clough, G. Wayne, Smithsonian, v42, n2, p27(2), Sunday, May 1, 2011
5. **Arts Calendar**, Press-Register (Mobile, AL), Press-Register 01 ed, p02, Sunday, June 12, 2011
6. **NASA'S CHANDRA FINDS MASSIVE BLACK HOLES COMMON IN EARLY UNIVERSE**, US Federal News, Wednesday, June 15, 2011

Record - 1

DIALOG(R)

New black hole findings open gates for research Scientists can learn much from discovery,

Amina Khan,

Star-Ledger, The (Newark, NJ), State/ROP ed, p005,

Sunday, June 19, 2011

TEXT:

LOS ANGELES - Astronomers have discovered a hidden collection of supermassive, growing black holes dating back to the early Universe -- showing, for the first time, that black holes populated the cosmos far earlier than thought.

The findings, published online Wednesday in Nature, could help scientists understand how these black holes are born, how big they grow and how galaxies develop with them.

"We know the nearest galaxies, like our own Milky Way, all have supermassive black holes in the center," said lead author Ezequiel Treister, an astronomer at the University of Hawaii. "And the question is, how did they form? How did they get there?"

Astrophysicists had theorized that black holes would be found at the center of galaxies very early in the universe. But when astronomers tried to detect them -- by looking for X-ray radiation emitted by dust falling into a black hole -- they came up empty.

X-rays, unlike visible or infrared light, can escape the powerful gravitational pull of a black hole.

And so Treister decided to look for high energy X-rays using NASA's space-based Chandra X-ray Observatory. Because earlier searches had failed, the team combined the signals coming from about 200 galaxies that had existed less than 1 billion years after the Big Bang.

The scientists were surprised to find at least 30 percent, and possibly much more, of the galaxies contained black holes at their centers -- showing that the strong association between black holes and galaxies dates back to the very young Universe. Astronomers had not been able to detect these black holes before because they were surrounded by clouds of gas and dust that obscured all but the most high-energy radiation.

"This paper takes that relationship (between black holes and galaxies) back to when the universe was only a billion year old -- quite further back than we've been able to take it before," said Harvey Tananbaum, director of the Chandra X-ray Center at the Smithsonian Astrophysical Observatory in Cambridge, Mass.

"This is completely new and unexpected -- no one expected this connection to start so early in the universe," Treister said.

Scientists are still not sure how these ancient black holes were formed. One theory is that several smaller black holes eventually merged together. Another suggests that individual black holes sucked in huge amounts of gas and dust and grew to supermassive size.

The reason why black holes and galaxies are connected also remains a mystery, said Mitchell Begelman, an astrophysicist at the University of Colorado who was not involved in the study.

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DIALOG(R)

Research shows black holes populated cosmos early,

Amina Khan,

Edmonton Journal (Canada), Final ed, pA16,

Saturday, June 18, 2011

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The findings, published online Wednesday in Nature, could help scientists understand how these black holes are born, how big they grow and how galaxies develop with them.

"We know the nearest galaxies, like our own Milky Way, all have supermassive black holes in the centre," said lead author Ezequiel Treister, an astronomer at the University of Hawaii. "And the question is, how did they form? How did they get there?"

Astrophysicists had theorized that black holes would be found at the centre of galaxies very early in the universe. But when astronomers tried to detect them -by looking for X-ray radiation emitted by dust falling into a black hole -they came up empty.

X-rays, unlike visible or infrared light, can escape the powerful gravitational pull of a black hole.

And so Treister decided to look for high energy X-rays using NASA's space-based Chandra X-ray Observatory. Because earlier searches had failed, the team combined the signals coming from about 200 galaxies that had existed less than a billion years after the Big Bang.

The scientists were surprised to find that at least 30 per cent, and possibly many more, of the galaxies contained black holes at their centres -showing that the strong association between black holes and galaxies dates back to the very young universe. Astronomers hadn't been able to detect these black holes before because they were surrounded by clouds of gas and dust that obscured all but the most high-energy radiation from view.

"This paper takes that relationship (between black holes and galaxies) back to when the universe was only a billion years old -quite further back than we've been able to take it before," said Harvey Tananbaum, director of the Chandra X-ray Center at the Smithsonian Astrophysical Observatory in Cambridge, Mass.

Record - 3

DIALOG(R)

PAN-STARRS TELESCOPE SPOTS NEW DISTANT COMET,

US Federal News,

Thursday, June 16, 2011

TEXT:

HONOLULU, June 16 -- The University of Hawaii issued the following news release:

Astronomers at the University of Hawaii at Manoa have discovered a new comet that they expect will be visible to the naked eye in early 2013. Originally found by the Pan-STARRS 1 telescope on Haleakala, Maui, on the night of June 5-6, it was confirmed to be a comet by UH Manoa astronomer Richard Wainscoat and graduate student Marco Micheli the following night using the Canada-France-Hawaii Telescope on Mauna Kea. A preliminary orbit computed by the Minor Planet Center in Cambridge, Massachusetts, shows that the comet will come within about 30 million miles (50 million km) of the sun in early 2013, about the same distance as Mercury. The comet will pose no danger to Earth. "The comet has an orbit that is close to parabolic, meaning that this may be the first time it will ever come close to the sun, and that it may never return," said Wainscoat. The comet is now about 700 million miles (1.2 billion km) from the sun, placing it beyond the orbit of Jupiter. It is currently too faint to be seen without a telescope with a sensitive electronic detector. The comet is expected to be brightest in February or March 2013, when it makes its closest approach to the sun. At that time, the comet is expected to be visible low in the western sky after sunset, but the bright twilight sky may make it difficult to view. Over the next few months, astronomers will continue to study the comet, which will allow better predictions of how bright it will eventually get. Wainscoat and UH Manoa astronomer Henry Hsieh cautioned that predicting the brightness of comets is notoriously difficult, with numerous past comets failing to reach their expected brightness. Making brightness predictions for new comets is difficult because astronomers do not know how much ice they contain. Because sublimation of ice (conversion from solid to gas) is the source of cometary activity and a major contributor to a comet's overall eventual brightness, this means that more accurate brightness predictions will not be possible until the comet becomes more active as it approaches the sun and astronomers get a better idea of how icy it is. The comet is named C/2011 L4 (PANSTARRS). Comets are usually named after their discoverers, but in this case, because a large team, including observers,

computer scientists, and astronomers, was involved, the comet is named after the telescope. C/2011 L4 (PANSTARRS) most likely originated in the Oort cloud, a cloud of cometlike objects located in the distant outer solar system. It was probably gravitationally disturbed by a distant passing star, sending it on a long journey toward the sun. Comets like C/2011 L4 (PANSTARRS) offer astronomers a rare opportunity to look at pristine material left over from the early formation of the solar system. The comet was found while searching the sky for potentially hazardous asteroids—ones that may someday hit Earth. Software engineer Larry Denneau, with help from Wainscoat and astronomers Robert Jedicke, Mikael Granvik and Tommy Grav, designed software that searches each image taken by the Pan-STARRS 1 telescope for moving objects. Denneau, Hsieh and UH Manoa astronomer Jan Kleyna also wrote other software that searches the moving objects for comets' tell-tale fuzzy appearance. The comet was identified by this automated software. The Pan-STARRS 1 telescope has a 1.8-meter-diameter mirror and the largest digital camera in the world (1.4 billion pixels). Each image is almost 3 gigabytes in size, and the camera takes an image approximately every 45 seconds. Each night, the telescope images more than 1,000 square degrees of the night sky. The Pan-STARRS Project is being led by the University of Hawaii at Manoa's Institute for Astronomy, and exploits the unique combination of superb observing sites and technical and scientific expertise available in Hawaii. Funding for the development of the observing system has been provided by the United States Air Force Research Laboratory. The PS1 Surveys have been made possible through contributions by the Institute for Astronomy, the University of Hawaii, the Pan-STARRS Project Office, the Max-Planck Society and its participating institutes, the Max Planck Institute for Astronomy, Heidelberg and the Max Planck Institute for Extraterrestrial Physics, Garching, The Johns Hopkins University, Durham University, the University of Edinburgh, the Queen's University Belfast, the Harvard-Smithsonian Center for Astrophysics, the Las Cumbres Observatory Global Telescope Network, Incorporated, the National Central University of Taiwan, and the National Aeronautics and Space Administration under Grant No. NNX08AR22G issued through the Planetary Science Division of the NASA Science Mission Directorate. Any opinions, findings, and conclusions or recommendations expressed in this article are those of the author(s), and do not necessarily reflect the views of the National Aeronautics and Space Administration. For more information, visit:

<http://www.ifa.hawaii.edu/info/press-releases/PS1CometJune2011/> For any query with respect to this article or any other content requirement, please contact Editor at htsyndication@hindustantimes.com

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Record - 4

DIALOG(R)

Synergies.

Clough, G. Wayne,
Smithsonian, v42, n2, p27(2)
Sunday, May 1, 2011

TEXT:

THE GERMAN NATURALIST Alexander von Humboldt (1769-1859) was called the "last universal man"--a person who had a grasp of all the world's knowledge. A stretch then, and impossible today. Our age has seen an explosion of experts in hundreds of disciplines, all creating huge amounts of specialized knowledge, which ricochets instantaneously around the world over the Internet. Not even von Humboldt could make sense of it all.

Which is why the Smithsonian's new strategic plan takes a cross-disciplinary approach to four Grand Challenges: unlocking the mysteries of the universe, understanding and sustaining a biodiverse planet, valuing world cultures, and understanding the American experience. We have established four corresponding Smithsonian Consortia to organize and energize interdisciplinary efforts and to stimulate intellectual exchange within the Institution and beyond. And we have appointed four outstanding scholars as Consortia directors; they now devote half of their time to their consortium, and half to their specialization at the Smithsonian--be it astrophysics, tropical biology, museum archives or photography collections. The Consortia draw from various fields to advance research and provide core content to exhibitions, curricula and public programs. Thanks to a \$10 million grant from the Bill & Melinda Gates Foundation, 31 projects have already been funded. (See si.edu/consortia.)

One such collaborative effort, the Immigration Initiative, will explore the importance of immigration and migration in American history. It will use Smithsonian resources to help Americans contemplate their own experiences--and thereby better appreciate the wider history and culture of our nation. The Immigration Initiative will culminate in a presentation at the 2015 Smithsonian Folklife Festival and an exhibition at the National Museum of American History the following year. Another project, the Marine Global Earth Observatories, will draw on the Institution's marine science resources to establish several coastal sites for long-term monitoring of marine life and to collect data on changes in biodiversity. The Smithsonian Astrophysical Observatory, the National Air and Space Museum, and the Smithsonian Institution Traveling Exhibition Service will create an exhibition--for use by universities and colleges--showcasing discoveries such as black holes and dark energy. A program called Race: A Pan-Institutional Collaboration will explore the themes of race, diversity

and identity

Moving forward, we will seek out like-minded partners at universities, nonprofit organizations and government agencies willing to tackle high-risk/high-return problems. I am confident that collaborations such as these will reinvigorate the Smithsonian and allow us to better serve all those who look to us for knowledge and understanding.

G. WAYNE CLOUGH is Secretary of the Smithsonian Institution.

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Record - 5

DIALOG(R)

Arts Calendar,

Press-Register (Mobile, AL), Press-Register 01 ed, p02,
Sunday, June 12, 2011

ART & SCIENCE

Gulf Coast Exploreum Science

Center - "Spaced Out Summer"

runs through Aug. 28

with "Black Holes: Space
Warps & Time Twists," produced

by Harvard-Smithsonian

Center for Astrophysics.

Exploreum will show the "Hubble

IMAX" movie through Sept.

30 in the J.L. Bedsole IMAX

Dome Theater, and "Stars

Over Alabama" in the Hearin-

Chandler Virtual Journeys Digital

Theater. Admission: \$12 for

adults; \$11 for youth and seniors;

\$10 for children. Combo
admission is \$16, \$15 and \$14

and includes the IMAX movie.

Info, 251-208-6879 or visit the

Web: www.exploreum.com.

Record - 6

DIALOG(R)

NASA'S CHANDRA FINDS MASSIVE BLACK HOLES COMMON IN EARLY UNIVERSE,

US Federal News,

Wednesday, June 15, 2011

TEXT:

WASHINGTON, June 15 -- NASA issued the following press release:

Using the deepest X-ray image ever taken, astronomers found the first direct evidence that massive black holes were common in the early universe. This discovery from NASA's Chandra X-ray Observatory shows that very young black holes grew more aggressively than previously thought, in tandem with the growth of their host galaxies.

By pointing Chandra at a patch of sky for more than six weeks, astronomers obtained what is known as the Chandra Deep Field South (CDFs). When combined with very deep optical and infrared images from NASA's Hubble Space Telescope, the new Chandra data allowed astronomers to search for black holes in 200 distant galaxies, from when the universe was between about 800 million to 950 million years old.

"Until now, we had no idea what the black holes in these early galaxies were doing, or if they even existed," said Ezequiel Treister of the University of Hawaii, lead author of the study appearing in the June 16 issue of the journal Nature. "Now we know they are there, and they are growing like gangbusters."

The super-sized growth means that the black holes in the CDFS are less extreme versions of quasars - very luminous, rare objects powered by material falling onto supermassive black holes. However, the sources in the CDFS are about a hundred times fainter and the black holes are about a thousand times less massive than the ones in quasars.

The observations found that between 30 and 100 percent of the distant galaxies contain growing supermassive black holes. Extrapolating these results from the small observed field to the full sky, there are at least 30 million supermassive black holes in the early universe. This is a factor of 10,000 larger than the estimated number of quasars in the early universe.

"It appears we've found a whole new population of baby black holes," said co-author Kevin Schawinski of Yale University. "We think these babies will grow by a factor of about a hundred or a thousand, eventually becoming like the giant black holes we see today almost 13 billion years later." A population of young black holes in the early universe had been predicted, but not yet observed. Detailed calculations show that the total amount of black hole growth observed by this team is about a hundred times higher than recent estimates.

Because these black holes are nearly all enshrouded in thick clouds of gas and dust, optical telescopes frequently cannot detect them. However, the high energies of X-ray light can penetrate these veils, allowing the black holes inside to be studied.

Physicists studying black holes want to know more how the first supermassive black holes were formed and how they grow. Although evidence for parallel growth of black holes and galaxies has been established at closer distances, the new Chandra results show that this connection starts earlier than previously thought, perhaps right from the origin of both.

"Most astronomers think in the present-day universe, black holes and galaxies are somehow symbiotic in how they grow," said Priya Natarajan, a co-author from Yale University. "We have shown that this codependent relationship has existed from very early times."

It has been suggested that early black holes would play an important role in clearing away the cosmic "fog" of neutral, or uncharged, hydrogen that pervaded the early universe when temperatures cooled down after the Big Bang. However, the Chandra study shows that blankets of dust and gas stop ultraviolet radiation generated by the black holes from traveling outwards to perform this "reionization." Therefore, stars and not growing black holes are likely to have cleared this fog at cosmic dawn.

Chandra is capable of detecting extremely faint objects at vast distances, but these black holes are so obscured that relatively few photons can escape and hence they could not be individually detected. Instead, the team used a technique that relied on Chandra's ability to accurately determine the direction from which the X-rays came to add up all the X-ray counts near the positions of distant galaxies and find a statistically significant signal.

NASA's Marshall Space Flight Center in Huntsville, Ala., manages the Chandra program for the agency's Science Mission Directorate in Washington. The Smithsonian Astrophysical Observatory controls Chandra's science and flight operations from Cambridge, Mass.

More information, including images and other multimedia, can be found at:

<http://www.nasa.gov/chandra>

and

<http://chandra.si.edu> For any query with respect to this article or any other content requirement, please contact Editor at htsyndication@hindustantimes.com

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Wolbach Library: CfA in the News ~ Week ending 26 June 2011

1. **SPACED OUT SUMMER AT THE GULF COAST EXPLOREUM**, Press-Register (Mobile, AL), Press-Register 01 ed, p14, Thursday, June 23, 2011
2. **Galaxy gets an arm extension: new finding suggests Milky Way has a rare symmetry.**, Cowen, Ron, Science News, v179, n13, p14(1), Saturday, June 18, 2011
3. **UA wins \$800M NASA contract**, TOM BEAL; BECKY PALLACK; TOM BEAL AND BECKY PALLACK, ARIZONA DAILY STAR, Arizona Daily Star (AZ), FINAL ed, pA1, Thursday, May 26, 2011
4. **Astronomers Discover That Galaxies Are Either Asleep or Awake**, M2 PressWIRE, Monday, June 20, 2011

Record - 1

DIALOG(R)

BW SPECIAL EVENTS

Press-Register (Mobile, AL), Press-Register 01 ed, p14
Thursday, June 23, 2011

TEXT:

SPACED OUT SUMMER AT THE GULF COAST EXPLOREUM - From June 4 through Aug. 28, the Exploreum will feature the exhibition "Black Holes: Space Warps & Time Twists" from the Harvard-Smithsonian Center for Astrophysics. Also featured: the exhibit "From Earth to the Universe," an astronomy display in the science center's digital theater, and lab programs about what astronauts eat in space and how rockets work. From May 28 through Sept 30, the J.L. Bedsole IMAX Dome Theater will show "Hubble," a film based on Space Shuttle film footage and Hubble telescope images. For more information, visit www.exploreum.com or call 251-208-6873 or toll-free 877-625-4386.

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Record - 2

DIALOG(R)

Galaxy gets an arm extension: new finding suggests Milky Way has a rare symmetry.

Cowen, Ron,

Science News, v179, n13, p14(1),

Saturday, June 18, 2011

TEXT:

A new study suggests the Milky Way doesn't need a makeover: It's already just about perfect.

Astronomers base that assertion on their discovery of a vast section of a spiral, star-forming arm at the Milky Way's outskirts. The finding indicates that the galaxy is a rare beauty with an uncommon symmetry--one half of the Milky Way is essentially the mirror image of the other.

Thomas Dame and Patrick Thaddeus of the Harvard-Smithsonian Center for Astrophysics in Cambridge, Mass., say the structure they've discovered is most likely the outer extension of the Scutum-Centaurus arm from the inner galaxy. It appears that Scutum-Centaurus wraps all the way around the Milky Way, making it a symmetric counterpart to the galaxy's other major star-forming arm, Perseus.

The two arms seem to extend from opposite ends of the galaxy's central, bar-shaped cluster of stars, each winding around the galaxy, the researchers report in the June 10 *Astrophysical Journal Letters*.

Dame found evidence for the new structure while reviewing galactic data on atomic hydrogen gas, which radiates at a radio wavelength of 21 centimeters. After tracing the extension of the arm in the 21-centimeter radio emission, "I was in the unique position of being able to walk up two flights of stairs to the roof of my building [at Harvard] and search for carbon monoxide emissions from molecular clouds using the CfA 1.2-meter radio telescope," says Dame.

What he saw confirmed his initial finding.

"This is a major new discovery," comments Robert Benjamin of the University of Wisconsin-Whitewater. "Dame and Thaddeus have found evidence for a large-scale coherent structure, spanning 60 degrees in the sky ... which contains giant molecular gas clouds very far from the galactic center."

The newfound structure lies about 49,000 light-years from the galaxy's center, and one of the arm's many large molecular clouds contains an amount of molecular hydrogen equivalent to that of 50,000 suns.

Virtually every spiral arm in the Milky Way has been found in sections, Dame notes. When astronomers realized that the Sagittarius arm (found in the northern sky) and the Carina arm (in the south) were part of a single, larger structure, they became known as the Sagittarius-Carina arm. Similarly, since Dame and Thaddeus believe the new arm is an extension of Scutum-Centaurus, "we suggested 'Outer Scutum-Centaurus' as a more logical name," Dame says. The structure is longer than the known parts of the Scutum-Centaurus arm, he adds.

The new feature was previously overlooked because it tilts out of the plane of the galaxy, following the outer galaxy's warp. Most studies that examine spiral arms focus on the galaxy's plane.

The team's "identification of the feature as a discrete structure is new, and the discovery that it contains molecular gas makes a very strong case for this being a spiral arm," Benjamin says.

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Record - 3

DIALOG(R)

UA wins \$800M NASA contract

TOM BEAL; BECKY PALLACK; TOM BEAL AND BECKY PALLACK, ARIZONA DAILY STAR, Arizona Daily Star (AZ), FINAL ed, pA1
Thursday, May 26, 2011

TEXT:

University's largest project in its history will study life's origin

NASA has chosen the University of Arizona to head up an \$800 million robotic space mission that will visit an asteroid and extract a sample that could provide clues to the origin of life on Earth.

The ancient asteroid, dating from the beginning of our solar system 4.5 billion years ago, should be brimming with the precursors of organic life, said Michael Drake, principal investigator on the OSIRIS-REx mission and head of the UA's Lunar and Planetary Laboratory.

It will be the largest project ever led by the UA and will keep generations of researchers and students engaged in uncovering clues to the beginnings of life, Drake said.

"I just about hit the ceiling with joy," UA President Robert Shelton said.

Shelton and the team toasted with champagne after a news conference Wednesday.

"It's extraordinary," said Joaquin Ruiz, UA dean of science. "It solidifies the reputation of our department of planetary science as being a leader in space exploration missions. We just finished Mars Phoenix. This is bigger."

The \$428 million Phoenix Mars Lander - also led by a team from the UA Lunar and Planetary Lab - was the first NASA mission led by a public university. This mission has already moved into that mission's offices in the UA Science Operations Center, 1415 N. Sixth Ave.

"Having the facility was a major head start," Drake said. "No other university has this capability."

Optical cameras onboard the craft will be built by a UA team led by Peter Smith, who was principal investigator on the Phoenix Mars Lander.

Launch of the rocket carrying this latest UA-developed spacecraft is scheduled for 2016.

Return of its cargo - samples of Asteroid 99RQ36 - is planned for 2023.

Studies of the asteroid should also help NASA develop plans for shifting the course of large asteroids bound for Earth, Drake said.

This particular asteroid, about a third of a mile in diameter, will approach the Earth in 2186 and has been given a one-in-1,800 chance of entering Earth's atmosphere.

Drake said the mission will be able to address humanity's origin and its destiny.

"The origin is, 'Where did the organics come from that led to us?' The destiny is, 'Will we go the way of the dinosaurs?' "

Drake and his team, which includes deputy principal investigator Dante Lauretta, have been developing this mission for nearly a decade. It was first submitted for a NASA grant in 2004 but was deemed too costly for that earlier program.

The resubmitted proposal was chosen as one of three finalists for a NASA New Frontiers grant in December 2009, and the UA was given \$3.3 million to flesh out its proposal.

Researchers know from telescope studies that the asteroid is "carbonaceous," said Drake - the type of asteroid that may have seeded Earth with the carbon-based building blocks of life.

"These types of asteroids are kind of a time capsule from 4.5 billion years ago when the solar system formed," Drake said.

Drake said planets such as Earth repeatedly "sterilized themselves" during formation in oceans of liquid lava. "Yet here we are with a complex organic environment. Those organics had to come from somewhere," he said.

"This particular object is very rich in organic material. You cannot tell from telescopes what they are, but they are likely to be amino acids."

The most technically challenging part of the mission, Drake said, will come when the spacecraft goes close enough to "kiss" the surface of the asteroid, using a robotic arm with an elbow and shoulder joint to gather at least 60 grams of matter.

First, the spacecraft will slowly catch up to the asteroid and match its speed before going into orbit around it. The small asteroid has virtually no gravity. Landing on it is impossible.

The spacecraft will spend a year mapping the asteroid's surface with a variety of instruments. It will match the asteroid's rotation and descend in stages to a safe spot for that "kiss." Its arm will disturb the surface with a blast of pure hydrogen and suck up the sample rocks and dirt that it disturbs.

Drake described the arm as a pogo stick with a sample collection device on the end that "looks a bit like a car's air filter."

The spacecraft will then head back to Earth's orbit and release its sample return capsule, before heading back into space, where NASA may find other things for it to do.

Specifications call for gathering at least 60 grams of material, but Drake said the team hopes to get closer to the capsule's capacity of 2 kilograms (2.2 pounds).

At any rate, it will be enough material for generations of researchers to study, he said. He noted that moon samples from the Apollo mission are being studied today by scientists who weren't even alive in 1970.

The science of this mission won't have to wait for that return, Drake said.

It begins when the instruments aboard OSIRIS-REx begin sending data, providing the closest glimpse of an asteroid ever. Those instruments include the OSIRIS-REx Camera Suite (OCAMS), being

developed by the University of Arizona; a visible-Infrared spectrometer supplied by NASA Goddard; a thermal emission spectrometer from Arizona State University; and a laser altimeter from the Canadian Space Agency.

Students at MIT and the Harvard-Smithsonian Astrophysical Observatory, winners of a NASA competition for an additional instrument, will develop an X-ray imaging spectrometer for the spacecraft.

To contact reporters: Tom Beal, tbeal@azstarnet.com or 573-4158; Becky Pallack, bpallack@azstarnet.com or 807-8012.

On StarNet: Find more science, technology and health stories at azstarnet.com/news/science

Business reaction

Business leaders gathered downtown for a Tucson Regional Economic Opportunities forum on economic development cheered the news Wednesday afternoon when TREO President Joe Snell interrupted the meeting to break the news.

Snell said the NASA mission validates Tucson as a science leader. "People ask me all the time: What do you sell most often? It's the science coming out of the U of A," he said.

Besides the trickle-down effect of the money the mission will bring to Tucson, Snell said OSIRIS-Rex, like the UA's Phoenix Mars Lander mission, will help efforts to sell the community as a major destination for high-tech companies.

What's with the name?

OSIRIS-REx stands for Origins Spectral Interpretation Resource Identification Security-Regolith Explorer.

Regolith is a layer of loose, heterogeneous material, such as dust, soil and broken rock.

Mission facts

Launch:

2016

Rendezvous with asteroid:

2020

Sample return:

2023

Cost:

\$800 million

(\$1 billion with rocket cost).

Spent locally:

\$200 million

(estimated).

Partners:

NASA's Goddard Space Flight Center, Arizona State University and the Canadian Space Agency.

Be a friend

OSIRIS-REx is on Facebook.

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Record - 4

DIALOG(R)

Astronomers Discover That Galaxies Are Either Asleep or Awake,

M2 PressWIRE,

Monday, June 20, 2011

TEXT:

RDATE:20062011

New Haven, Conn. -- Astronomers have probed into the distant universe and discovered that galaxies display one of two distinct behaviors: they are either awake or asleep, actively forming stars or are not forming any new stars at all.

Scientists have known for several years that galaxies in the nearby

universe seem to fall into one of these two states. But a new survey of the distant universe shows that even very young galaxies as far away as 12 billion light years are either awake or asleep as well, meaning galaxies have behaved this way for more than 85 percent of the history of the universe. (Looking at galaxies farther away is like looking back in time when they were much younger, because of how long it takes the light they emit to reach us here on Earth.)

"The fact that we see such young galaxies in the distant universe that have already shut off is remarkable," said Kate Whitaker, a Yale University graduate student and lead author of the paper, which is published in the June 20 online edition of the *Astrophysical Journal*.

In order to determine whether the galaxies were asleep or awake, Whitaker and her colleagues fabricated a new set of filters, each one sensitive to different wavelengths of light, which they used on a 4-meter Kitt Peak telescope in Arizona. They spent 75 nights peering into the distant universe and collecting light from 40,000 galaxies ranging in distance from the nearby universe out to 12 billion light years away. The resulting survey is the deepest and most complete ever made at those distances and wavelengths of light.

The team deciphered the galaxies' dual behavior based on the color of the light they emit. Because of the physics of star formation, active, wakeful galaxies appear bluer, while the light emitted by passive, sleepy galaxies tends toward the redder end of the spectrum.

The researchers found that there are many more active galaxies than passive ones, which agrees with the current thinking that galaxies start out actively forming stars before eventually shutting down.

"We don't see many galaxies in the in-between state," said Pieter van Dokkum, a Yale astronomer and another author of the paper. "This discovery shows how quickly galaxies go from one state to the other, from actively forming stars to shutting off."

Whether the sleeping galaxies have completely shut down remains an open question, Whitaker said. However, the new study suggests the active galaxies are forming stars at rates about 50 times greater than their sleepy counterparts.

"Next, we hope to determine whether galaxies go back and forth between waking and sleeping or whether they fall asleep and never wake up again," van Dokkum said. "We're also interested in how long it takes galaxies to fall asleep, and whether we can catch one in the act of dozing off."

Other authors of the study include Ivo Labbe (Leiden University and

Carnegie Observatories); Gabriel Brammer (Yale University and European Southern Observatory); Mariska Kriek (Princeton University and Harvard-Smithsonian Center for Astrophysics); Danilo Marchesini (Tufts University); Ryan Quadri and Marijn Franx (Leiden University); Adam Muzzin, Rachel Bezanson, Kyoung-Soo Lee, Britt Lundgren, Erica Nelson, Tomer Tal and David Wake (Yale University); Rik Williams (Carnegie Observatories); Garth Illingworth (UCO/Lick Observatory); and Gregory Rudnick (University of Kansas).

Citation: arXiv:1105.4609v1

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Wolbach Library: CfA in the News ~ Week ending 3 July 2011

1. **NEARBY GALAXY BOASTS 2 MONSTER BLACK HOLES, BOTH ACTIVE**, US Federal News, Tuesday, June 28, 2011
2. **On space station, relief as orbiting junk hurtles by**, KENNETH CHANG, International Herald Tribune, p2, Thursday, June 30, 2011
3. **Debris Gives Space Station Crew Members a 29,000-M.P.H. Close Call**, KENNETH CHANG, New York Times (NY), Late Edition - Final ed, p12, Wednesday, June 29, 2011
4. **A pioneering US aerospace entrepreneur is accused of helping Iran's satellite program**, DOUGLAS BIRCH, Canadian Press, Monday, June 27, 2011
5. **US space entrepreneur accused of aiding Iran**, DOUGLAS BIRCH, AP Online regional - US, Monday, June 27, 2011

Record - 1

DIALOG(R)

NEARBY GALAXY BOASTS 2 MONSTER BLACK HOLES, BOTH ACTIVE

US Federal News

Tuesday, June 28, 2011

TEXT:

COLLEGE PARK, Md., June 28 -- The University of Maryland issued the following news release:

A University of Maryland-led study using NASA's Swift satellite and the Chandra X-ray Observatory has found a second supersized black hole at the heart of an unusual nearby galaxy already known to be sporting one.

The galaxy, which is known as Markarian 739 or NGC 3758, lies 425 million light-years away toward the constellation Leo. Only about 11,000 light-years separate the two cores, each of which contains a black hole gorging on infalling gas.

The study appeared in the June 22 issue of The Astrophysical Journal Letters.

"At the hearts of most large galaxies, including our own Milky Way, lies a supermassive black hole weighing millions of times the sun's mass," said Michael Koss, the study's lead author at the University of Maryland and

NASA's Goddard Space Flight Center in Greenbelt, Md. "Some of them radiate billions of times as much energy as the sun."

Astronomers refer to galaxy centers exhibiting such intense emission as active galactic nuclei (AGN). Yet as common as monster black holes are, only about one percent of them are currently powerful AGN. Binary AGN are rarer still: Markarian 739 is only the second identified within half a billion light-years.

Many scientists think that disruptive events like galaxy collisions trigger AGN to switch on by sending large amounts of gas toward the black hole. As the gas spirals inward, it becomes extremely hot and radiates huge amounts of energy.

Since 2004, the Burst Alert Telescope (BAT) aboard Swift has been mapping high-energy X-ray sources all around the sky. The survey is sensitive to AGN up to 650 million light-years away and has uncovered dozens of previously unrecognized systems. Follow-up studies by Koss and colleagues published in 2010 reveal that about a quarter of the Swift BAT AGN were either interacting or in close pairs, with perhaps 60 percent of them poised to merge in another billion years.

"If two galaxies collide and each possesses a supermassive black hole, there should be times when both black holes switch on as AGN," said University of Maryland coauthor Richard Mushotzky, a professor of astronomy at Maryland. "We weren't seeing many double AGN, so we turned to Chandra for help."

Zoom into Markarian 739, a nearby galaxy hosting two monster black holes. Using NASA's Swift and Chandra, astronomers have shown that both black holes are producing energy as gas falls into them. The object is only the second-known binary active galactic nucleus within half-a-billion light-years. (No audio. Animation begins with visible light view of Markarian 739 and transitions into an artistic rendering of the two black holes. Credit: NASA's Goddard Space Flight Center)

Swift's BAT instrument is scanning one-tenth of the sky at any given moment, its X-ray survey growing more sensitive every year as its exposure increases. Where Swift's BAT provided a wide-angle view, the X-ray telescope aboard the Chandra X-ray Observatory acted like a zoom lens and resolved details a hundred times smaller.

For decades, astronomers have known that the eastern nucleus of Markarian 739 contains a black hole that is actively accreting matter and generating prodigious energy. The Chandra study shows that its western neighbor is too. This makes the galaxy one of the nearest and clearest cases of a binary AGN.

The distance separating the two black holes is about a third of the distance separating the solar system from the center of our own galaxy. The dual AGN of Markarian 739 is the second-closest known, both in terms of distance from one another and distance from Earth. However, another galaxy known as NGC 6240 holds both records.

How did the second AGN remain hidden for so long? "Markarian 739 West shows no evidence of being an AGN in visible, ultraviolet and radio observations," said coauthor Sylvain Veilleux, also a professor of astronomy at Maryland. "This highlights the critical importance of high-resolution observations at high X-ray energies in locating binary AGN."

The research team also includes Ezequiel Treister and David Sanders at the University of Hawaii's Institute for Astronomy in Honolulu, Kevin Schawinski at Yale University in New Haven, Conn., and Ranjan Vasudevan, Neal Miller and Margaret Trippe at the University of Maryland, College Park.

Swift, launched in November 2004, is managed by Goddard. It was built and is being operated in collaboration with Penn State University, the Los Alamos National Laboratory in New Mexico, and General Dynamics in Falls Church, Va.; the University of Leicester and Mullard Space Sciences Laboratory in the United Kingdom; Brera Observatory and the Italian Space Agency in Italy; plus additional partners in Germany and Japan.

The Marshall Space Flight Center manages the Chandra program for NASA's Science Mission Directorate in Washington. The Smithsonian Astrophysical Observatory controls Chandra's science and flight operations from Cambridge, Mass. For any query with respect to this article or any other content requirement, please contact Editor at htsyndication@hindustantimes.com

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Record - 2

DIALOG(R)

On space station, relief as orbiting junk hurtles by,
KENNETH CHANG,
International Herald Tribune, p2,
Thursday, June 30, 2011

TEXT:

One of the hundreds of thousands of pieces of space-age litter orbiting Earth has zipped uncomfortably close to the International Space Station.

The six crew members on the space station took refuge in their "lifeboats" - two Soyuz space capsules they would use to escape a crippled station - as the unidentified object hurtled past them Tuesday at a speed of 47,000 kilometers, or 29,000 miles, per hour, missing the station by only 335 meters, or 1,100 feet.

"We believe the probability that it would hit the station was about 1 in 360," said Lark Howorth, who leads the team at the National Aeronautics and Space Administration that tracks the space station's trajectory. NASA rules call for precautions when the risk of impact is greater than 1 in 10,000. In the section of the station run by the United States, astronauts closed the hatches in case the debris - commonly known as space junk - crashed through, to limit the danger of explosive decompression. To prepare for a rapid departure, the clamps holding the Soyuz capsules to the station were released.

"They would be one command away from releasing the hooks and undocking," Edward Van Cise, NASA's lead flight director, said.

Mission controllers gave the all-clear signal four minutes later.

It was only the second time in the 10-year history of people living on the space station that the crew had needed to take such precautions; on March 12, 2009, a piece of an old satellite motor went zipping by. If the station had been hit, the crew could have quickly undocked and returned to Earth.

Usually, when NASA gets a warning several days in advance that something might come too close to the station, it moves the station by firing thrusters. Or, if a space shuttle happens to be visiting, the shuttle can nudge the station out of danger. That has happened 12 times.

This time, however, the warning came Monday evening, less than 15 hours in advance, too little time to plan a maneuver.

Since the first artificial satellite, Sputnik 1, was launched in 1957, the space neighborhood has become cluttered with human-made detritus - more than half a million pieces, by recent estimates, from the size of a marble on up. If the orbits of two intersect, the result can be a destructive collision.

"It's getting kind of dangerous," said Jonathan McDowell, an astrophysicist at the Harvard-Smithsonian Center for Astrophysics who has become an expert on space debris. "Most active satellites now have a regular process of

maneuvering to avoid debris."

NASA estimates that for each six-month period, there is a 1-in-100 chance that some or all of the space station crew might need to evacuate, and most of that risk comes from the possibility of impact from debris or natural micrometeoroids. Over 10 years, the current planned lifetime of the station, the cumulative risk is nearly one in five.

"It's at the level where it probably won't happen in the lifetime of the station, but it could easily," Mr. McDowell said.

The debris includes spent rocket stages, and sometimes over time residual fuel combines and explodes. "You now no longer have a rocket stage," Mr. McDowell said. "You have 500 pieces of shrapnel."
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Record - 3

DIALOG(R)

Debris Gives Space Station Crew Members a 29,000-M.P.H. Close Call,
KENNETH CHANG,
New York Times (NY), Late Edition - Final ed, p12,
Wednesday, June 29, 2011

TEXT:

One of the hundreds of thousands of pieces of space-age litter orbiting Earth zipped uncomfortably close to the International Space Station on Tuesday.

The six crew members of the space station took refuge in their "lifeboats" -- two Soyuz space capsules they would use to escape a crippled station -- as the unidentified object hurtled past them at a speed of 29,000 miles per hour, missing the space station by only 1,100 feet. The episode took place at 8:08 a.m. Eastern time.

"We believe the probability that it would the hit the station was about 1 in 360," said Lark Howorth, who leads the team at NASA that tracks the space station's trajectory. NASA rules call for precautions when the risk of impact is greater than 1 in 10,000.

In the section of the station run by the United States, astronauts closed the hatches in case the debris -- commonly known as space junk -- crashed through, to limit the danger of explosive decompression. To prepare for a rapid departure, the clamps holding the Soyuz capsules to the station were

released.

"They would be one command away from releasing the hooks and undocking," said Edward Van Cise, NASA's lead flight director.

Mission controllers gave the all-clear signal four minutes later, and the crew members returned to work. There was no sign of damage or impact to the station.

It was only the second time in the 10-year history of people living on the space station that the crew needed to take such precautions; on March 12, 2009, a piece of an old satellite motor went zipping by.

If the station had been hit, the crew could have quickly undocked and returned to Earth. The risk of space junk hitting a Soyuz capsule is much slimmer.

Usually, when NASA gets a warning, several days in advance, that something that might come too close to the station, it moves the station by firing thrusters. Or, if a space shuttle happened to be visiting at the time, the shuttle would nudge the station out of danger. That has happened 12 times.

This time, however, the warning came Monday evening, less than 15 hours in advance, too little time to plan a maneuver.

Since the first artificial satellite, Sputnik 1, was launched was in 1957, the space neighborhood has become cluttered with human-made detritus -- more than half a million pieces, by recent estimates, from the size of a marble on up. If the orbits of two intersect, the result can be a destructive collision.

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The debris includes spent rocket stages, and sometimes over time residual fuel combines and explodes. "You now no longer have a rocket stage," Dr.

McDowell said. "You have 500 pieces of shrapnel."

Also still in orbit are broken satellites or almost incidental litter. In the past, lens covers on satellite cameras and sensors were simply popped off and left to float away. Now satellite makers put the lens cap on a hinge.

Military antisatellite tests also make a big mess, notably when the Chinese blew up one of their satellites in 2007.

PHOTO: Crew members on the space station took steps Tuesday to prepare for an emergency evacuation. (PHOTOGRAPH BY AGENCE FRANCE-PRESSE -- GETTY IMAGES)

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Record - 4

DIALOG(R)

A pioneering US aerospace entrepreneur is accused of helping Iran's satellite program,

DOUGLAS BIRCH,
Canadian Press,
Monday, June 27, 2011

TEXT:

WASHINGTON _ Growing up in a provincial town in Iran, Nader Modanlo was fascinated by the flickering TV images of astronauts walking on the moon.

As a teenager, he came to the United States, where he earned degrees in aerospace engineering, became a U.S. citizen and co-founded a pioneering satellite telecommunications company that at one point was worth up to \$500 million. He seemed on the verge of the kind of success that immigrants dream of achieving.

Today, those dreams are burning up like a spacecraft in steep re-entry.

Modanlo's company is bankrupt, his U.S. and Iranian passports have been confiscated and a federal judge has ordered him to wear an electronic monitoring bracelet while he sleeps.

A federal grand jury indicted the Maryland resident last year on charges he secretly brokered the launch from Russia of the first Iranian-owned satellite in 2005, in violation of the U.S. sanctions against Iran. If

convicted on all counts, he could be sentenced to 65 years in prison and ordered to pay \$10 million. Five Iranian nationals were also indicted, but none is in custody.

Iran went on to launch its first satellite aboard an Iranian-built rocket in 2009 and its second earlier this month. Jonathan McDowell of the Harvard-Smithsonian Center for Astrophysics said the June 15 launch of the tiny Rashad-1 satellite, a 34-pound orbiter, shows the country is well on its way to mastering the multi-stage rocket technology that would be needed for long-range nuclear missiles.

McDowell called it an impressive record for a country in the early stages of its space program.

“They might have a couple of more failures in the next couple of launches,” he said. “But after that, they will basically have the capability to know what they’re doing.”

Modanlo, 50, denies that he violated U.S. sanctions and is free on \$250,000 bond. He declined through his lawyers to be interviewed, and officials from the Justice Department and U.S. Immigration and Customs Enforcement likewise declined to discuss the case. But experts, court documents and other public records describe how his ambitions might have led him into trouble. The trial is expected to begin in October 2012.

The 2005 launch from Russia of the Sina-1 satellite came one day after newly elected Iranian President Mahmoud Ahmadinejad said Israel must be “wiped off the map.” To many, the launch seemed to back up this threat.

David Albright of the Institute for Science and International Security, an expert on nuclear proliferation, said Iran is focused on the military applications of space science. “One of the goals of the program, and it appears to be an ongoing program, is to develop a missile that can carry a nuclear warhead if Iran decides to build one,” he said.

Iranian officials insist that they are pursuing nuclear technology strictly for peaceful purposes. But their refusal to disclose all their nuclear activities has raised international suspicions, and has led to four rounds of United Nations sanctions since 2006.

A recent International Atomic Energy Agency report said there was evidence Iranian scientists were studying ways to build nuclear warheads compact enough to be carried by a missile. Ahmadinejad recently announced Iran was expanding its uranium enrichment program, bringing the country another step closer to the capacity to build weapons.

The Justice Department said Modanlo's case is just one of more than 150

filed by prosecutors in the past four years against arms traders and middlemen suspected of helping Tehran illegally acquire U.S. technology. Defendants have been accused of using shell companies, offshore bank accounts and faked end-user certificates to supply Tehran with everything from U.S.-made component parts for missile guidance systems to the ultra-high-strength steel needed to build centrifuges that enrich uranium.

Yet Modanlo's case stands out. Unlike most of those prosecuted under the act, he isn't charged with shipping U.S. technology to Iran. Instead, he is suspected of using his business contacts and aerospace engineering experience to help launch Iran's space program.

Modanlo said he came to the U.S. from the Iranian city of Sari on the Caspian Sea coast in 1979 _ the year of the Islamic revolution, according to interviews with The Washington Post and other publications in the 1990s. After earning degrees in engineering and aeronautics from George Washington University, he worked on projects for the Defence Department and NASA.

Modanlo and business partner Michael Ahan in 1992 founded Final Analysis Inc., based in offices near NASA's Goddard Space Flight Center. They planned to loft a network of up to 32 small, low-earth orbiting telecommunications satellites that were designed to provide low-cost messaging and cargo tracking services.

“It was a good idea, and he (Modanlo) was one of the early guys thinking about it,” said researcher David Boyle of Texas A&M University, whose lab developed communications gear for Final Analysis.

Modanlo's plan was to save millions by launching half-a-dozen communications satellites at a time using Soviet ICBMs, designed to carry multiple nuclear warheads aimed at the U.S. He and Ahan signed a deal with a top former Soviet missile scientist, Dr. Alexander I. Ilyin of Gloria Polyot, or “Glory Flight” in English. The private company employed scientists and technicians working at a missile factory in the Siberian town of Omsk.

The swords-into-ploughshares deal fit neatly into Washington's drive to encourage former Soviet weapons scientists to move into civilian jobs.

A Polyot rocket carried a Final Analysis test satellite, FAISAT-1, into orbit in January 1995 _ the first launch of a U.S. satellite from post-Soviet Russia. But the orbiter quickly went silent. McDowell, the satellite expert, said the onboard computer wasn't hardened against radiation and may have fried in a solar storm.

Final Analysis scrambled to launch a second satellite, FAISAT-2v, in

September 1997, but that failed as well. Modanlo later said the orbiter's Russian-built solar panels didn't generate enough power.

Despite the setbacks, Modanlo and Ahan raised millions from dozens of private investors and struck a deal with a subsidiary of a major defence contractor, General Dynamics, to provide engineering, networking and ground operations services for the planned satellite network.

But the two aerospace pioneers were increasingly at odds over the direction of their company. After they split, Final Analysis was forced into corporate bankruptcy in September 2001.

After almost 11 years, the bankruptcy case is still in litigation. Claims, counterclaims and appeals have led to at least 10 related cases in county, state and federal courts in the U.S.

While Modanlo struggled to keep control of his company in the courts, the indictment said, he facilitated a series of meetings in Moscow between Polyot and Iranian government officials, including Sirous Naseri, a consultant to the Iranian foreign ministry, and Hamid Malmirian, general director of Iran's state-financed National Geographical Organization. Both are among the five co-defendants in the case.

Russia signed a deal in December 2001 to provide Iran with satellites, launch services and a satellite control centre for \$15 million. According to the indictment, a few months later Modanlo and several co-defendants founded a company called Prospect Telecom in Switzerland that was used to launder a \$10 million fee to Modanlo for setting up the satellite deal.

In bankruptcy court filings, some disgruntled investors claimed Modanlo had used forged signatures and documents to divert more than \$6 million from his satellite business. Modanlo said the money represented legitimate payments to Gloria Polyot.

The civil court claims drew the attention of the U.S. government, and in May 2004, federal agents raided Modanlo's suburban home and business office. They hauled off 120 computers, discs and drives.

But the American investigation didn't derail the Iran-Russia satellite project. In October 2005, Polyot launched the 375-pound Sina-1 from the Plesetsk Cosmodrome in a forest about 500 miles (800 kilometres) north of Moscow. The tiny orbiter carried two cameras and bore a map of Iran on its skin.

The Russian and Israeli press speculated that Sina-1 was designed to spy on Israeli and U.S. forces in the Mideast. But McDowell said the orbiter's

low-resolution cameras made it more suitable for its announced purpose, surveying agricultural cropland and mapping the effects of earthquakes, floods and other natural disasters.

The White House under President George W. Bush never commented publicly on the launch. But the deputy director of Russia's Federal Security Service said months later that Moscow was co-operating in a U.S. investigation of allegations that Modanlo had tried to transfer missile and space-related technologies to Iran.

Prosecutors and defence lawyers in the Modanlo case face unusual hurdles. The paper trail is gargantuan. The bankruptcy of the company Final Analysis and the cases it spawned have generated thousands of documents over the past decade. Court papers show it took months for the government to download two terabytes of digital data seized from Modanlo's home and office into a searchable database.

Getting the co-operation of key Iranian and Russian witnesses could be difficult or impossible. And the key piece of evidence in the case, the Sina-1 satellite, is in plain sight but forever out of reach.

It's still circling the earth every 99 minutes.
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Record - 5

DIALOG(R)

US space entrepreneur accused of aiding Iran,

DOUGLAS BIRCH,
AP Online regional – US,
Monday, June 27, 2011

TEXT:

WASHINGTON_Growing up in a provincial town in Iran, Nader Modanlo was fascinated by the flickering TV images of astronauts walking on the moon.

As a teenager, he came to the United States, where he earned degrees in aerospace engineering, became a U.S. citizen and co-founded a pioneering satellite telecommunications company that at one point was worth up to \$500 million. He seemed on the verge of the kind of success that immigrants dream of achieving.

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confiscated and a federal judge has ordered him to wear an electronic monitoring bracelet while he sleeps.

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But the American investigation didn't derail the Iran-Russia satellite project. In October 2005, Polyot launched the 375-pound Sina-1 from the

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Wolbach Library: CfA in the News ~ Week ending 10 July 2011

1. **Star-struck**, Karen Weintraub, Boston Globe (MA), Sunday, July 10, 2011

Record - 1

DIALOG(R)

Star-struck,

Karen Weintraub,

Boston Globe (MA)

Sunday, July 10, 2011

TEXT:

Intrigued - but intimidated - by what lies in the heavens? Investigating the wonders of the cosmos is easier than you'd think. Start with a clear night, a dark spot, and a star chart for guidance. "The sheer beauty will transport you," promises Michael Deneen, chair of the Gloucester Area Astronomy Club. "The scientific part - that the light hitting your eyes started its journey before there were even human beings on Earth - is very rewarding." A good pair of binoculars goes almost as far as a decent telescope, but if you want to see more, the following groups hold regular "star parties," welcoming guests to peer through their telescopes - no experience, knowledge, or payment necessary.

MUSEUM OF SCIENCE

The Gilliland Observatory on the roof of the museum's parking garage is open Friday nights from 8:30 to 10, weather permitting. Call the hot line, 617-589-0267, after 5:30 p.m. on Fridays for information about that night's observing session. The hot line also provides basic information on current features in the sky. Museum parking rates apply, but the observatory is free. Located at 1 Science Park, Boston. For more information, go to <http://www.mos.org/events>.

BOSTON UNIVERSITY'S COIT OBSERVATORY

The university's observatory is open for public viewing on clear Wednesday nights from 8:30 to 9:30 through September (7:30 to 8:30 from October through March). The evening starts with a short introduction; observations follow. Call 617-353-2630, no earlier than two hours ahead, to find out if that week's viewing will be held. The observatory is located at 725

Commonwealth Avenue in Boston, above the Astronomy Department. The stairwell to the observatory is on the fifth floor next to Room 520. There is no disabled access. For more information, go to <http://www.bu.edu/astronomy/events>

THE HARVARD-SMITHSONIAN CENTER FOR ASTROPHYSICS

This observatory in Cambridge offers monthly public observatory nights on the third Thursday of the month during the school year (beginning in September). This summer, there will be a public event on July 20, beginning with an 8 p.m. lecture (doors open at 7:30) aimed at those of high school age and older, then observing (for all ages) from the roof, if weather permits. The programs are held in the center's Phillips Auditorium, 60 Garden Street. Park for free in the lots marked "Observatory Staff." For more information, call 617-495-7461, or go to <http://www.cfa.harvard.edu/events/mon.html>

GLOUCESTER AREA ASTRONOMY CLUB

This club sets up telescopes on most clear weekend nights at Bearskin Neck in Rockport and welcomes the public to join its members. The primary missions of the club are to encourage people to stargaze and to keep them from wasting money on bad telescopes. Call Michael Deneen at 978-325-2741 for the viewing schedule, or go to <http://www.gaac.us>.

NORTH SHORE AMATEUR ASTRONOMY CLUB

The area's second-largest club holds public observing sessions after dusk on Fridays, weather permitting, at Veasey Memorial Park, 201 Washington Street, Groveland. The parking lot and observing area are on the right before the top of the hill. Dim your lights before entering the parking area

The group also runs public observing sessions with the Merrimack College Observatory's 20-inch telescope every clear Wednesday after dusk (call 978-837-5011 for a status update). The telescope is on the top floor of the Mendel Science Center at Merrimack College, 315 Turnpike Street, in North Andover

For more information and viewing schedules, go to <http://www.nsaac.org>

SOUTH SHORE ASTRONOMICAL SOCIETY

The society, founded in 1958, celebrates International Astronomy Day each spring, often with a visit from "Galileo." It holds public viewings at the Scituate Town Library, 85 Branch Street, after sundown on Thursdays and most alternate Saturdays at Centennial Field on Pine Street in Norwell, weather permitting. For more information, go to <http://www.ssastros.org>

ASTRONOMICAL SOCIETY OF SOUTHERN NEW ENGLAND

This knowledgeable group of amateurs holds monthly meetings and observing parties at 7 p.m. on the second Saturday of each month at the Carpenter Museum, Locust Avenue and Bay State Road in Rehoboth. For more information, go to <http://www.assne.org>

CAPE COD ASTRONOMICAL SOCIETY

If you're vacationing on the Cape, this club hosts summertime star parties every Thursday (except the first of the month, when the group holds its monthly meeting) starting at 8:30 p.m. at the Werner Schmidt Observatory behind Dennis-Yarmouth Regional High School at 210 Station Avenue in South Yarmouth. If skies are cloudy, call 508-398-4765 after 7:45 p.m. to check for cancellations. For more information, go to <http://www.ccas.ws>

AMATEUR TELESCOPE MAKERS OF BOSTON

Founded 77 years ago, New England's largest amateur club meets the second Thursday of every month at Cambridge's Harvard-Smithsonian Center for Astrophysics. Meetings are open to the public, but the group's Westford clubhouse is not. However, members suggested three ideal spots to view the night sky. The University of Massachusetts HarborWalk Park, 100 Morrissey Boulevard, Dorchester, offers good views in every direction except north, where Boston's skyline lights wash out the horizon. Or try the Myles Standish Park on Cranberry Road in South Carver. The North Acton Recreation Area Park, 25 Ledge Rock Way in Acton, is also good, but call police or the recreation department first, for permission to visit after nightfall

Karen Weintraub is a regular Globe contributor. Send comments to magazine@globe.com.

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Wolbach Library: CfA in the News ~ Week ending 17 July 2011

1. **EVOLVED STARS LOCKED IN FATALISTIC DANCE,** US Federal News, Wednesday, July 13, 2011

Record - 1

DIALOG(R)
EVOLVED STARS LOCKED IN FATALISTIC DANCE,
US Federal News,
Wednesday, July 13, 2011

TEXT:

WASHINGTON, July 13 -- The Smithsonian Institution issued the following press release:

White dwarfs are the burned-out cores of stars like our Sun. Astronomers have discovered a pair of white dwarfs spiraling into one another at breakneck speeds. Today, these white dwarfs are so near they make a complete orbit in just 13 minutes, but they are gradually slipping closer together. About 900,000 years from now - a blink of an eye in astronomical time - they will merge and possibly explode as a supernova. By watching the stars converge, scientists will test both Einstein's general theory of relativity and the origin of some peculiar supernovae.

The two white dwarfs are circling at a bracing speed of 370 miles per second (600 km/s), or 180 times faster than the fastest jet on Earth. "I nearly fell out of my chair at the telescope when I saw one star change its speed by a staggering 750 miles per second in just a few minutes," said Smithsonian astronomer Warren Brown, lead author of the paper reporting the find.

The brighter white dwarf contains about a quarter of the Sun's mass compacted into a Neptune-sized ball, while its companion has more than half the mass of the Sun and is Earth-sized. A penny made of this white dwarf's material would weigh about 1,000 pounds on Earth.

Their mutual gravitational pull is so strong that it deforms the lower-mass star by three percent. If the Earth bulged by the same amount, we would have tides 120 miles high.

The discovery team has been hunting for pairs of white dwarfs using the MMT telescope at the Whipple Observatory on Mt. Hopkins, Arizona. These star pairs are too close together to distinguish photographically. By looking at the spectra, however, Brown and his team were able to differentiate the two stars and measure their relative motions. These stars are also oriented such that they eclipse each other every 6 minutes.

"If there were aliens living on a planet around this star system, they would see one of their two suns disappear every 6 minutes - a fantastic light show." said Smithsonian astronomer and co-author Mukremin Kilic. These eclipses provide a very accurate clock, which is extremely useful for measuring any changes in the system.

General relativity predicts that moving objects will create ripples in the fabric of space-time, called gravitational waves. These waves carry away energy, causing the stars to inch closer together and orbit each other faster and faster.

"Though we have not yet directly measured gravitational waves with modern instruments, we can test their existence by measuring the change in the separation of these two stars," said co-author J. J. Hermes, a graduate student at the University of Texas at Austin. "Because they don't seem to be exchanging mass, this system is an exceptionally clean laboratory to perform such a test."

The team expects to conduct this test in a few months, when the star pair emerges from behind the Sun as seen from Earth.

Some models predict merging white dwarf pairs such as these are the source of a rare class of unusually faint stellar explosions called underluminous supernovae.

"If these systems are responsible for underluminous supernovae, we will detect these binary white dwarf systems with the same frequency that we see the supernovae. Our survey isn't complete, but so far, the numbers agree," said Brown.

This work will provide an important observational test on theories of white dwarf mergers, which are thought to produce many kinds of supernovae, not just the underluminous type.

This research appears in a paper accepted for publication by The Astrophysical Journal Letters. Brown's co-authors are Mukremin Kilic (Harvard-Smithsonian Center for Astrophysics/CfA), J. J. Hermes (University of Texas at Austin), Carlos Allende Prieto (Instituto de Astrofísica de

Canarias, Spain), Scott J. Kenyon (CfA) and D. E. Winget (University of Texas at Austin). For any query with respect to this article or any other content requirement, please contact Editor at htsyndication@hindustantimes.com

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Wolbach Library: CfA in the News ~ Week ending 24 July 2011

1. **Aurorae on 'hot Jupiters' 1000 times brighter than displays we see on Earth!**, ANI, Asian News International, Saturday, July 23, 2011
2. **EXOPLANET AURORA: AN OUT-OF-THIS-WORLD SIGHT**, US Federal News, Thursday, July 21, 2011
3. **The impact of free access to the scientific literature: a review of recent research (EC)**, Davis, Philip M., Walters, William H., Journal of the Medical Library Association, v99, n3, p208
4. ArtsCalendar, Press-Register (Mobile, AL), Press-Register 01 ed, p02, Sunday, July 10, 2011
5. **Proposed mine's lighting holds risk for astronomy**, TONY DAVIS, ARIZONA DAILY STAR, Arizona Daily Star (AZ), FINAL ed, pA1, Tuesday, July 5, 2011
6. **August 1986**. Sinnott, Roger W. Sky & Telescope, v122, n2, p10(1), Monday, August 1, 2011

Record - 1

DIALOG(R)

Aurorae on 'hot Jupiters' 1000 times brighter than displays we see on Earth!,
ANI,
Asian News International,
Saturday, July 23, 2011

TEXT:

Washington, July 22 (ANI): Do you think the auroral displays we have on Earth are the most dazzling ones? Well, think again.

A team, co-led by an Indian-origin scientist, has created a model that shows aurorae on distant 'hot Jupiters' could be 100-1000 times brighter than the displays we see on Earth.

These aurorae would also ripple from equator to poles (due to the planet's proximity to any stellar eruptions), treating the entire planet to an otherworldly spectacle.

Earth's aurorae, or Northern and Southern Lights, are caused when particles erupt from the sun and slam into our planet's magnetic field, creating vast glowing strips in the sky and sometimes interfering with satellite communications.

Particularly strong aurorae result when Earth is hit by a coronal mass ejection or CME - a gigantic blast that sends billions of tons of solar plasma (electrically charged, hot gas) into the solar system.

The same process can occur on planets orbiting distant stars, known as exoplanets.

Lead author Ofer Cohen, a SHINE-NSF postdoctoral fellow at the Harvard-Smithsonian Center for Astrophysics (CfA) and co-author Vinay Kashyap used computer models to study what would happen if a gas giant in a close orbit, just a few million miles from its star, were hit by a stellar eruption. They wanted to learn the effect on the exoplanet's atmosphere and surrounding magnetosphere.

A 'hot Jupiter' would feel a stronger and more focused blast, like the difference between being 100 miles from an erupting volcano or one mile away.

"The impact to the exoplanet would be completely different than what we see in our solar system, and much more violent," said Kashyap.

In the model, a CME hits the 'hot Jupiter' and weakens its magnetic shield. Then CME particles reach the gas giant's atmosphere. Its aurora lights up in a ring around the equator, 100-1000 times more energetic than Earthly aurorae. Over the course of about 6 hours, the aurora then ripples up and down toward the planet's north and south poles before gradually fading away.

Despite the extreme forces involved, the exoplanet's magnetic field shields its atmosphere from erosion.

"Our calculations show how well the planet's protective mechanism works. Even a planet with a magnetic field much weaker than Jupiter's would stay relatively safe," said Cohen.

The study has important implications for the habitability of rocky worlds orbiting distant stars. Since red dwarf stars are the most common stars in our galaxy, astronomers have suggested focusing on them in the search for Earthlike worlds.

The study, available online, will soon be published in *The Astrophysical*

Journal. (ANI)

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Record - 2

DIALOG(R)

EXOPLANET AURORA: AN OUT-OF-THIS-WORLD SIGHT,

US Federal News,

Thursday, July 21, 2011

TEXT:

WASHINGTON, July 21 -- The Smithsonian Institution issued the following press release:

Earth's aurorae, or Northern and Southern Lights, provide a dazzling light show to people living in the polar regions. Shimmering curtains of green and red undulate across the sky like a living thing. New research shows that aurorae on distant "hot Jupiters" could be 100-1000 times brighter than Earthly aurorae. They also would ripple from equator to poles (due to the planet's proximity to any stellar eruptions), treating the entire planet to an otherworldly spectacle.

"I'd love to get a reservation on a tour to see these aurorae!" said lead author Ofer Cohen, a SHINE-NSF postdoctoral fellow at the Harvard-Smithsonian Center for Astrophysics (CfA).

Earth's aurorae are created when energetic particles from the Sun slam into our planet's magnetic field. The field guides solar particles toward the poles, where they smash into Earth's atmosphere, causing air molecules to glow like a neon sign. The same process can occur on planets orbiting distant stars, known as exoplanets.

Particularly strong aurorae result when Earth is hit by a coronal mass ejection or CME - a gigantic blast that sends billions of tons of solar plasma (electrically charged, hot gas) into the solar system. A CME can disrupt Earth's magnetosphere - the bubble of space protected by Earth's magnetic field - causing a geomagnetic storm. In 1989, a CME hit Earth with such force that the resulting geomagnetic storm blacked out huge regions of Quebec.

Cohen and his colleagues used computer models to study what would happen if a gas giant in a close orbit, just a few million miles from its star, were hit by a stellar eruption. He wanted to learn the effect on the exoplanet's

atmosphere and surrounding magnetosphere.

The alien gas giant would be subjected to extreme forces. In our solar system, a CME spreads out as it travels through space, so it's more diffuse once it reaches us. A "hot Jupiter" would feel a stronger and more focused blast, like the difference between being 100 miles from an erupting volcano or one mile away.

"The impact to the exoplanet would be completely different than what we see in our solar system, and much more violent," said co-author Vinay Kashyap of CfA.

In the model, a CME hits the "hot Jupiter" and weakens its magnetic shield.

Then CME particles reach the gas giant's atmosphere. Its aurora lights up in a ring around the equator, 100-1000 times more energetic than Earthly aurorae. Over the course of about 6 hours, the aurora then ripples up and down toward the planet's north and south poles before gradually fading away.

Despite the extreme forces involved, the exoplanet's magnetic field shields its atmosphere from erosion.

"Our calculations show how well the planet's protective mechanism works," explained Cohen. "Even a planet with a magnetic field much weaker than Jupiter's would stay relatively safe."

This work has important implications for the habitability of rocky worlds orbiting distant stars. Since red dwarf stars are the most common stars in our galaxy, astronomers have suggested focusing on them in the search for Earthlike worlds.

However since a red dwarf is cooler than our Sun, a rocky planet would have to orbit very close to the star to be warm enough for liquid water. There, it would be subjected to the sort of violent stellar eruptions Cohen and his colleagues studied. Their future work will examine whether rocky worlds could shield themselves from such eruptions.

This research has been accepted for publication in The Astrophysical Journal. For any query with respect to this article or any other content requirement, please contact Editor at htsyndication@hindustantimes.com

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Record - 3

DIALOG(R)

The impact of free access to the scientific literature: a review of recent research (EC),

Davis, Philip M,

Walters, William H,

Journal of the Medical Library Association, v99, n3, p208,

Friday, July 1, 2011

TEXT:

HEADNOTE

Objectives: The paper reviews recent studies that evaluate the impact of free access (open access) on the behavior of scientists as authors, readers, and citers in developed and developing nations. It also examines the extent to which the biomedical literature is used by the general public.

Method: The paper is a critical review of the literature, with systematic description of key studies.

Results: Researchers report that their access to the scientific literature is generally good and improving. For authors, the access status of a journal is not an important consideration when deciding where to publish. There is clear evidence that free access increases the number of article downloads, although its impact on article citations is not clear. Recent studies indicate that large citation advantages are simply artifacts of the failure to adequately control for confounding variables. The effect of free access on the general public's use of the primary medical literature has not been thoroughly evaluated.

Conclusions: Recent studies provide little evidence to support the idea that there is a crisis in access to the scholarly literature. Further research is needed to investigate whether free access is making a difference in non-research contexts and to better understand the dissemination of scientific literature through peer-to-peer networks and other informal mechanisms.

INTRODUCTION

A principal argument in support of open access publishing rests on the belief that the subscriptionbased publishing model has produced a crisis of accessibility to the scientific literature [1-6]. This paper evaluates that claim, reviewing the current literature and showing the ways in which free access has (or has not) had an impact on scholars, clinicians, and the general public in developed and developing nations.

The review assesses impact in terms of reading, citation, and related forms of use. It does not evaluate the extent to which the freely available

scientific literature is technically accessible, indexed, cataloged, or available for potential use. The discussion deals only with the scholarly literature, thereby excluding studies of online newspapers, magazines, and trade publications. It also focuses on the natural sciences, since most of the research on free access has dealt with fields such as the biomedical, physical, and computer sciences. Although "open access" is the usual term for scholarly work that is freely accessible online, the term "free access" is used here, since open access is often understood to include issues of copyright, archiving, funding, and social justice that are not addressed in this discussion.

The paper first reviews the impact of free access on the research practices of scholars in developed and developing nations, then examines the use of freely available biomedical literature by health professionals and the lay public. It concludes with a discussion of avenues for further research.

METHODS

The analysis is based on a review of current empirical studies (January 2001 through December 2010) that attempt to measure - directly or indirectly - access to and use of the scientific literature by academics, clinicians, and the lay public. Relevant works were identified from several sources: bibliographic databases, cited references, personal correspondence, and prior experience with the topic. Studies of how information is produced, published, and made publicly available, such as papers on the economics of scientific publishing, are excluded. Also excluded are works that rely solely on personal convictions and anecdotal evidence, as well as those that report redundant findings (such as conference presentations, posters, and summary reports).

APPROACHES TO STUDYING SCHOLARS' USE OF THE SCIENTIFIC LITERATURE

Current research on the use of the scientific literature follows two main methodological approaches. The first makes use of surveys and interviews to examine scholars' perceptions and opinions of the scholarly communication system. The second relies on bibliometric evidence - on unobtrusive studies of what scientists download, read, and cite.

Each approach has both strengths and weaknesses. Surveys can be used to elicit the responses of thousands of individuals in order to draw conclusions about a target population. In-depth interviews, while limited in their generalizability, can be used to explore a topic in detail and to examine the values and motivations of interview participants. Nonetheless, poorly constructed or poorly executed surveys and interviews are susceptible to many forms of bias, including sampling bias (the inability to reach a representative target audience); nonresponse bias (the

underrepresentation of particular subgroups in the sample); response bias (bias associated with the survey instrument itself - the framing, formulation, and ordering of survey questions, for example); acquiescence bias (the tendency for respondents, when in doubt, to respond in the affirmative); and social desirability bias (the tendency for respondents to provide a response they believe to be socially supportive), among others [7, 8]. Many of the studies described in this review suffer from one or more forms of bias.

Unobtrusive methods, such as counting article downloads or citations, offer a more direct approach to measuring what scientists actually do, rather than what they say they do. While these methods avoid the potential biases of survey and interview research, many forms of unobtrusive methods are susceptible to limitations of their own, the most common of which is interpretive. Downloads are often equated with reading, for example, yet this connection is purely inferential. Devoid of context, a download statistic does not reveal who was responsible for the download (or whether the agent was even human), why the article was downloaded, or how the article was used (if it was used at all). Moreover, download statistics can vary substantially based on the characteristics of the user interface [9]. Last, a citation implies - but does not require - that the document has been accessed and read. Because an author may cite from the abstract of an article or simply copy a reference from another paper [10, 11], citation data may overstate the extent to which the scientific literature has been consulted.

In evaluating scholars' use of the research literature, it is important to acknowledge the limits of what each study can add to knowledge of the issues. As most scientists are both readers and authors, their interests and priorities may vary with the role they assume at any particular time [12].

AUTHORSHIP AND USE OF THE SCIENTIFIC LITERATURE BY SCHOLARS IN DEVELOPED NATIONS

Studies based on surveys and interviews

Over the past thirty years, periodic studies of the information-seeking and reading behavior of scientists in the United States have revealed three trends: (1) scientists are reading more articles while spending less time searching and retrieving them; (2) scientists now read from a broader group of journals and extend their reading into the older literature; and (3) scientists have become more reliant on institutional (library) access to journal collections, although they also make use of informal sources such as preprint servers and colleagues [13-21].

Overall, most surveyed researchers indicate that they have adequate access

to the scientific literature and that access conditions are generally improving. An international survey of authors conducted in 2004 revealed that 61% of respondents indicated that they had "good" or "excellent" access to the journal literature. Three-quarters (76%) of respondents also felt that access was easier than it was 5 years ago [22]. A similar study of immunologists and microbiologists conducted in 2004 revealed that two-thirds of respondents (67%) reported they had "good" or "excellent" access to the literature [23]. Nearly 84% claimed that access was much better now than it had been 5 years before, and almost all (97%) reported that they were "very up-to-date with the current literature in their area," with less than 35% reporting any need for greater access to the research literature. In a list of 16 potential barriers to higher research productivity, journal access ranked 12th, below everything but greater conference/networking opportunities, better research leadership, more general management training, and clearer legal and ethical frameworks [23].

Surveying international scientific authors in 2007, Ware found that 69% of respondents reported having "good" or "excellent" access to the literature, a figure that varied by region [24]. Authors in the United States and Canada were most satisfied (85% reported "good" or "excellent" access; 3% reported "poor" access), while those in other countries were significantly less satisfied (53% reported "good" or "excellent"; 15% reported "poor"). In Ware's latest study, conducted in 2010 [25], 93% of all respondents reported having "very easy" or "fairly easy" access to the journal literature, a finding which varied from 97% for North American respondents to as low as 78% for African respondents.

Ware also surveyed small and medium-sized commercial enterprises in the United Kingdom, including companies involved in pharmaceuticals, chemicals, computing, and medical and precision instruments [26]. More than 70% of respondents claimed that they had "very easy" or "fairly easy" access to the journal literature, and 60% reported that their level of access had gotten better over the past 5 years. Among enterprises with more than 250 employees, 82% reported having easy access to the journal literature. Ware's study used a sample of convenience, however, and only 4% of potential respondents completed the survey.

While greater access to the scientific literature has undoubtedly altered the behavior of scientists as readers, it is not among their main priorities as authors. In deciding where to submit their work, an international survey of scientists revealed that authors were most concerned with each journal's reputation, readership, impact factor, and speed of publication [27]. In contrast, access status and copyright-related issues were ranked last.

Although these large-scale studies are prone to several forms of bias, such

as sampling bias and nonresponse bias, they are confirmed by a number of smaller but more rigorous studies of authors' preferences. For example, authors submitting manuscripts to the British Medical Journal reported that impact factor, reputation, readership, speed of publication, and quality of peer review were all major factors in deciding where to submit their work. In contrast, only 13% rated free access as important [28].

In-depth interviews with authors and other stakeholders reveal similar values and priorities. A series of interviews with faculty at the University of California, Berkeley, revealed that authors were most concerned about the mechanisms that ensure the quality of journal articles and the integrity of the peer-review process. Other considerations, such as the costs of the scholarly publication system, did not have much impact on their work [29]. Although many librarians "strongly perceive a crisis in scholarly communication," most faculty do not, underscoring a fundamental perceptual difference between these two stakeholder groups.

A recent and more extensive study, by Harley and colleagues, explored the values, motivations, and behavior of 160 interviewees at 45 research universities across the United States [30]. The recurring theme in this report is that the scholarly community is conservative, with a firm dedication to disciplinary norms and an unyielding commitment to external peer-review and assessment. There is little room for experimentation with new forms of publication, especially for new academics. In particular, many faculty view authorpays open access publishing with suspicion due to the potential conflict between publication fees and rigorous peer-review. Overall, Harley and colleagues "heard little about a crisis in scholarly communication" [30]. The only faculty who perceived a crisis were some of those in the humanities, who noted that the diminishing output of university presses made it more difficult to publish their work as academic books.

Several months after the Harley report, Schonfeld and Housewright released another report on the perceptions and behavior of faculty with regard to scholarly communication [31]. Their findings, based on a series of longitudinal surveys conducted every three years since 2000, were remarkably consistent with those of the Harley report. With regard to publishing, faculty attitudes are fundamentally conservative and are guided almost entirely by career advancement. Faculty expressed little interest in transforming the scholarly communication system, and across all disciplines, free access to journal content was consistently ranked last among the factors considered by authors when selecting a journal in which to publish. In contrast, the absence of publication fees was ranked as the second most important factor, suggesting, as Schonfeld and Housewright [31] pointed out, that the author-pays model of open access publishing might be at odds with the attitudes of many faculty. As numerous studies have shown,

the primary goal of most faculty is to publish in journals that are widely read by scholars in their field [23, 27, 28, 32]. If transforming the scholarly publishing system is a goal of faculty, that goal is nonetheless eclipsed by issues of career advancement.

Table 1 (online only) presents a summary of the major studies described in this section.

Studies based on unobtrusive methods

Downloads. Usage data compiled from the online transaction logs of Elsevier and Oxford University Press reveal two major trends of the past several years: an increase in the number of journals available at a typical university and an even larger increase in the number of article downloads [33]. Publishers who offer package deals view these data as an indication that they are providing increasing value to the academic community [34]. While these trends suggest the importance of commercial access to the scientific literature, little is known about the effect of free access on readership.

A case study of article downloads for the journal *Nucleic Acid Research* revealed that moving from a subscription-access model to an open access model resulted in more than twice the number of article downloads (portable document format [PDF] and hypertext markup language [HTML] combined), although most of this increase was attributed to Internet robots (automated applications that index web pages) rather than human intention [35]. Likewise, randomized controlled trials of open access publishing revealed that free access has a significant, independent impact on the number of downloads, although robots account for roughly half of the increase [36]. Articles that were made freely available received about twice as many full-text downloads but correspondingly fewer PDF downloads, suggesting that the primary benefit to the non-subscriber community is in browsing [36-38]. Due to the nature of these studies, which rely on transactional usage logs, it is only possible to make inferential statements about reader behavior. Further investigation is required to determine who is accessing these articles and for what purpose.

Citations. The impact of online and open access on scholars' citation behavior is not entirely clear. There is some dispute over whether increased access has broadened the scope of cited material. Using a complex inferential model, Evans [39] reported that commercial access to the literature through large online collections and full-text databases has led to a reduction in the scope of the articles that are likely to be cited, with an emphasis on newer articles from a smaller number of journals. McCabe and Snyder refuted these claims, asserting that Evans' model suffered from a methodological flaw [40]. Moreover, Lariviere and

colleagues [41] reached a different conclusion: that citations to the scientific literature are becoming more dispersed over time. Their findings are supported by a number of author surveys [13-21].

Several studies have indicated that free (or open) access to scientific publications leads to significant increases in the number of article citations [42-51]. These studies imply that the demand for access to the scientific literature has not been fully met by current distribution models. Other studies claim that free access is responsible for accelerating the citation process [52-57] or that it may have preferential effects for researchers in developing countries [58, 59].

Most studies investigating the association between access status and citations are based on various forms of unobtrusive, observational analysis. As Craig and colleagues [60] illustrate in their comprehensive review of the literature, many of these studies suffer from three methodological problems: (1) failure to control for confounding variables (i.e., failure to distinguish clearly between the impact of access status and the effects of related variables); (2) failure to provide more than correlation as evidence of a causal relationship; and (3) inadequate specification of the observation window for the citation process. As a number of critical studies have shown, these issues make it difficult to determine whether free access has a real, independent effect on citation rates [36, 54-57, 60-66]. McCabe and Snyder argue that the large citation effects reported in prior studies are simply artifacts of the researchers' inability to control for important covariates such as time and differences in article quality [40].

To isolate the effect of free access on article readership and citations, Davis and colleagues conducted several controlled experiments that allowed them to randomly assign free-access status to articles on the websites of various academic journals. In theory, random assignment allows the researchers to control for potential differences at the start of the experiment, including unobserved variables such as article quality, between the treatment and control group. In their first study, involving eleven journals in physiology, they found that open access articles received more article downloads, yet no more citations than subscription articles in the first year after publication [36]. A larger trial involving thirty-six journals in the sciences, social sciences, and humanities demonstrated no citation difference at three years [37, 38].

Overall, the conclusions of Craig and colleagues [60] are well supported by subsequent work. After controlling statistically or methodologically for confounding effects, there is little evidence that open access status has an independent effect on citation counts. Table 2 (online only) presents a summary of the key papers that examine the impact of free access on

citation rates.

AUTHORSHIP AND USE OF THE SCIENTIFIC LITERATURE BY SCHOLARS IN DEVELOPING NATIONS

The high cost of Western scientific journals poses a major barrier to researchers in developing nations. While researchers in North America and Western Europe rely primarily on institutional (library) access to scholarly journals, the situation is different in many developing nations. Researchers in India, for example, rely more heavily on informal access to the scientific literature because their institutions are unable to provide the research literature they require [59].

Collaborative projects such as HighWire's Free Access to Developing Economies [67] and multipublisher programs focusing on disciplines such as agriculture (Access to Global Online Research in Agriculture [AGORA]), health and medicine (Health InterNetwork Access to Research Initiative [LUNARI]), and the environment (Online Access to Research in the Environment [OARE]) have attempted to bridge the access gap by providing free or heavily subsidized access to institutions in the world's poorest regions [68]. Several studies have attempted to ascertain whether researchers in developing countries have benefited from free access by determining whether free access has influenced their authorship and citation behavior. In her dissertation, Ross [69] evaluated the effectiveness of the HTNARI and AGORA programs by analyzing the citations to participating journals before and after the programs were initiated. Her results were mixed: In some regions, citations to the participating journals increased, while in others, they decreased. No systematic geographical pattern was reported.

An analysis of open access and subscription journals in the field of biology revealed that authors in developing countries are no more likely than authors in developed countries to cite or to publish in open access journals [70]. Likewise, a study of conservation biology journals and book chapters revealed that authors in developing countries do not cite freely available articles at a higher rate than articles requiring subscriptions [64]. Both these studies were based on small samples with high variability, so they might not have the statistical power to detect small effects. However, the absence of strong effects in both these studies suggests that the impact of free access on developing-country publishing or citation patterns, if it indeed exists, is likely to be small.

A larger, comparative study of Swiss and Indian scholars revealed that articles written by Indian researchers had shorter reference lists and were more likely to cite articles from open access journals [59]. The effect sizes reported by Gaule were small, though. Controlling for the publication

source, Indian reference lists were 6% (less than 2 references) shorter and contained just 0.16 more citations to open access articles. Considering that Indian research institutions have far poorer access to the published literature than their Swiss counterparts, the impact of free access appears to be modest. Supplementing his bibliometric analysis with a follow-up survey, Gaule [59] found that Indian scholars routinely requested copies of articles from the authors of the studies and from their colleagues at better-endowed institutions. Some respondents admitted asking former students who had moved to North American or European institutions for help with access to the journal literature.

On a global scale, Evans and Reimer [58] reported that free access to the published literature had a small but significant effect on citation behavior, especially for authors in developing nations. However, McCabe and Snyder concluded that the apparent geographical differences in citation rates were an artifact of the methods Evans and Reimer used. Using a similar dataset, McCabe and Snyder found no regional differences in citation rates [40]. While the developing world benefits from online access to the scientific literature, McCabe and Snyder report, that gain is no greater than the benefit derived by scholars in the United States and other English-speaking Western countries.

The greatest reported impact of free online access was mentioned in a press release from Research4Life [71]. The authors claimed that the total annual output of peer-reviewed research articles increased substantially among countries that participated in the HTNARI, AGORA, and OARE programs. Unfortunately, the press release did not provide information on the methods used to reach that conclusion, and no attempt was made to control for potentially important confounding factors, such as country wealth, national expenditures on research and development, number of active scientists, emergence of research centers in high-impact fields such as medicine, or improvements in library and information technology infrastructures. The authors also provided no data on the number of articles published in each country, as even modest increases in article publication in countries with historically low output can result in high percentage increases. In the absence of more detailed information, the Research4Life results should be considered speculative at this point.

IMPACT OF FREE ACCESS ON CLINICAL DECISION MAKING

To date, only one study has evaluated the clinical implications of free access to the medical literature. In a pair of related experiments, Hardisty and Haaga [72] investigated whether increased access to relevant journal articles had an impact on the use of the articles in clinical psychotherapy. Participating mental health professionals were provided with 1 of 4 access conditions: (1) no mention of the relevant article, (2) a

citation to the article without a hyperlink, (3) a citation with a link to the article (which cost \$11.95 for all but registered subscribers), or (4) a citation with a link to a free copy of the article. After 1 week, participants read a vignette on the topic covered by the article and were asked about their recommendations for a medical intervention. In both studies, participants in group 4 were most likely to report having read the article. However, in only 1 study did reading the article translate into making a recommendation consistent with the information it presented. These results indicate that while free access increases the likelihood of downloading and reading research articles, it does not necessarily influence clinical practice. Further research is necessary, however, because Hardisty and Haaga's study represents just one clinical setting and one of several possible evaluation methods.

USE OF THE BIOMEDICAL LITERATURE BY THE GENERAL PUBLIC

The empowerment of health care consumers through universal access to original research has been cited as a key benefit of free access to the scientific literature [73]. However, relatively little is known about the use of scientific literature by the general public. Anecdotal descriptions are not uncommon - for instance, patients bringing medical literature they found online into the doctor's office - but relatively few studies have investigated how the public uses the primary research literature rather than consumer-focused websites, blogs, and discussion lists.

It is clear, however, that Americans are actively seeking health information online. Periodic telephone surveys of American adults conducted by the Pew Research Center reveal that the percentage of adults who look for health information online increased substantially between 2002 and 2008 [74]. By 2006, 80% of American Internet users had searched for information on at least 1 health-related topic [75]. That figure, unchanged in 2010, varies with income, race, and other demographic and socioeconomic characteristics [76]. For those with a disability or chronic disease, the percentage is even higher, about 86% [77]. Those with chronic conditions are also especially likely to report that online searching has affected their treatment decisions and their interactions with doctors. Respondents who experienced recent health crises are also more likely to get a second opinion or to ask their doctor new questions based on their online research, and, not surprisingly, individuals with home broadband access are more than twice as likely as dial-up users to conduct health research online [78]. According to the Pew telephone surveys, most Internet users begin their research on health or medical topics by using a general search engine such as Google rather than a health-related website [75]. These results are confirmed by naturalistic observational studies of how laypersons search for online health information in an experimental setting [79-81].

Distinguishing primary literature from secondary and user-generated sources

The Pew telephone surveys list many sources of medical information including websites, blogs, commentary, and podcasts, but they do not ask respondents to distinguish between scholarly and nonscholarly resources [74, 82]. In particular, they make no specific mention of journals or scientific articles as sources of medical information, although they do distinguish "Internet" from "printed reference material" [82], as well as identifying cell phones and mobile applications [83]. Likewise, the Health Information National Trends Survey (HINTS) of the National Cancer Institute asks several questions about sources of health information, but the available responses represent a potentially confusing set of information providers, media, and delivery mechanisms [84]. For example, question HC02 asks, "The most recent time you looked for information about health or medical topics, where did you go first?" and offers response categories such as "Internet" (61.0%); "Doctor or health care provider" (13.9%); "Books" (8.4%); "Brochures, pamphlets, etc." (3.8%); and "Magazines" (3.4%). It is difficult to discern what the researcher is implying - or, indeed, what the survey respondent might be thinking - when asked about Internet use. Magazines, books, brochures, and health care providers can all be accessed via the Internet, just as doctors and other health care providers communicate in person, via the Internet, and through books, brochures, and magazines. A more recent (2010) survey of the health-seeking behavior of adults separated "Internet" from "Media," the latter consisting of newspapers, magazines, and television [85]. Neither of these studies distinguished between the primary medical literature (e.g., scholarly journals) and popular health magazines.

Most medical and health-related websites suffer from significant problems in terms of accuracy, bias, and completeness [86, 87]. Nongovernmental websites are especially prone to these problems [88]. While laypersons claim that they use a number of criteria in evaluating the credibility of medical websites, few of them actually check the authority of web resources or are able to later recall the sources of their information [79]. Indeed, just 15% of telephone survey respondents claimed that they "always" checked the source and date of the information they found online, and 10% claimed that they did so "most of the time" [89].

Evaluating websites retrieved through a series of online searches for medical terms, Laurent and colleagues found that the user-generated online encyclopedia, Wikipedia, ranked higher in the search results than professional sites such as MedlinePlus, which is maintained by the National Library of Medicine and the National Institutes of Health [90]. Indeed, Wikipedia appeared on the first page, among the first ten results, for the overwhelming majority of medical keyword searches conducted in Google,

Google UK, Yahoo, and MSN. Despite significant errors of omission and the absence of source attribution [87], Wikipedia is a prominent source of online health information.

No study has systematically evaluated the extent to which the general public makes use of the primary medical literature rather than secondary and user-generated sources such as Wikipedia and WebMD. Nonetheless, the available evidence shows that "the Internet" (however survey respondents might define it) is the primary source of health-related information for the American public and that typical Internet users are far more likely to encounter secondary sources of health information than the primary health sciences literature. Research has shown that the quality of consumer health information can be improved through better integration of the primary literature into online health resources and through public involvement in the development of such resources. However, even these efforts involve the use of tools and interfaces that repackage, summarize, and simplify the results of medical research - not on the unmediated reading of the scientific literature by the general public [91-93]. Overall, the published evidence does not indicate how (or whether) free access to the scientific literature influences consumers' reading or behavior.

SUMMARY AND DISCUSSION

Access to the scientific literature is not a serious concern of most scholars in developed nations, and most researchers feel that their access to the literature is steadily improving. While free access leads to greater readership, its overall impact on citations is still under investigation. The large access-citation effects found in many early studies appear to be artifacts of improper analysis and not the result of a causal relationship.

Current research reveals no evidence of unmet demand for the primary medical or health sciences literature among the general public. This does not necessarily reflect the absence of unmet demand; it may simply indicate that the question has not been addressed adequately. Likewise, almost no studies have evaluated whether free access to the scientific literature has had an impact on the use of scientific information in non-research contexts such as teaching, medical practice, industry, and government.

Sources of bias in the research literature

Most studies on the use of the primary scientific literature reflect the opinions and behaviors of those who are well integrated into the system of scholarly communication. This might be regarded as a form of bias because the true population of interest includes not just those who currently rely on the research literature, but those who might make good use of it if they were more fully aware of its utility. Arguably, the greatest value of open access journals and archives is their potential to make scholarly

information available to those who consume, but do not contribute to, the scientific literature. At present, however, there is little evidence that this potential has been realized. Admittedly, the existence of a resource (such as a library collection or a body of open access literature) has value independent of the number of downloads, citations, or other indicators of use: option value (the value of the personal right to use the resource in the future), existence value (the value derived from the knowledge that the resource is available for others' use), and bequest value (the value of making the resource available to future generations of scholars) [94]. However, these kinds of utility are difficult to measure; are not as readily apparent to authors, readers, and publishers; and are of less immediate value than the indicators of use that drive the present-day scholarly communication system.

Impediments to broader access

The studies presented here suggest that publication fees are perhaps the greatest impediment to broader participation in open access initiatives. While fewer than 30% of open access journals charge publication fees, those journals represent half of all open access articles [95]. Moreover, the proportion is much higher for particular disciplines and publisher types. For example, publication fees were levied for approximately 69% of the open access biology articles published in 2008/09 (all publisher types combined) and for 76% of the commercially published open access articles in 6 subject areas [95]. At the same time, there is clear evidence that faculty generally do not like publication fees [31], and many fear that the pay-to-publish model may compromise the integrity of peer review [30]. It is important to realize that individuals' opinions of general publishing practices may be contrary to their attitudes about particular journals. For instance, PLoS Biology and PLoS Medicine both charge relatively high publication fees, but neither seems to have trouble attracting submissions. The business model adopted by these 2 journals may or may not be transferable to other journals or publishers, but it does demonstrate that at least some free-access journals have the potential to transcend the limitations noted here.

Alternative routes of access to the scientific literature

Most research on access to the scientific literature assumes a traditional and hierarchical flow of information from the publisher to the reader, with the library often serving as an intermediary between the two. Very little has been done to investigate alternative routes of access to the scientific literature. If consumers of the scientific literature operate in the same way as consumers of cultural media (music and video, for example), studies that focus on publisher-initiated communication might overlook important components of the scholarly communication system. While interlibrary

lending is one such component, the direct transfer of documents among colleagues may represent an even larger flow of information. Gaule's [59] study of access to scientific information in India suggests that informal peer-to-peer sharing is very common in countries with a history of poor access to the scientific literature. For authors, the practice of fulfilling reprint requests by physical post has largely been replaced by transmitting articles by email or by directing readers to publicly accessible online archives or the public Internet [96].

A 2009 mandate of the US National Institutes of Health requires researchers in receipt of federal funding to deposit their final, peer-reviewed manuscripts in PubMed Central [97]. Several research universities have also set forth their own self-archiving requirements [98]. Open access archives such as PubMed Central may attenuate existing access inequalities, but only if authors' manuscripts are adequate substitutes for the published record. This requires, among other things, that manuscripts are posted online in a timely fashion, made readily discoverable by readers (through indexing or other mechanisms), and preserved for future use.

Further research

As noted earlier, there is a clear need for empirical research dealing with the impact of free access on the use of the scientific literature by the general public and by communities that consume, but do not contribute to, the scholarly literature. It is also important to gain a better understanding of the constructs and measures that are commonly used in studies of scholarly publishing. For instance, to what extent do downloads and citations correspond to the careful reading of articles?

Research on free access might also be improved through more careful attention to the various forms of bias that persist in both surveys and observational studies. For instance, studies of the impact of free access on citation rates have been hindered by a number of methodological problems including selection bias and incomplete model specification (e.g., failure to control for all relevant confounding variables). Studies of free access are likely to benefit from a greater understanding of these problems and a stronger consensus on the most effective ways of dealing with them.

Finally, further research should investigate the extent to which scholars rely on informal sharing of the scientific literature. This kind of sharing is often poorly documented, since individuals are not required to track and report document transactions to the publisher, nor are institutional repositories, subject repositories, public websites, or peer-to-peer file sharing programs. By relying entirely on publisher-provided usage data, researchers may underestimate the extent to which scholarly works are disseminated through such secondary and tertiary pathways. It is possible that these alternate methods of access help to attenuate the current

inequalities in formal access to the scholarly literature.

SIDEBAR

Highlights

* Researchers in the sciences do not see access to the scientific literature as an especially important problem.

* Authors consider factors such as journal reputation and the absence of publication fees when deciding where to submit their work. In contrast, free access is not a significant factor in their submission decisions.

Implications

* While open access has the potential to expand the authorship and readership of the scientific literature, that potential has not yet been realized.

* Librarians who encourage scientists to publish in open access journals should be aware of the authors' priorities and perspectives. Authors in the sciences tend to focus on citation impact, reputation, and accessibility to a specialized readership - not breadth of readership, copyright, or access status.

* Journal publishers that charge publication fees may want to consider alternative sources of revenue. Authors' resistance to publication fees is a major barrier to greater participation in open access initiatives.

FOOTNOTE

(EC) Supplemental Tables 1 and 2 are available with the online version of this journal.

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See end of article for authors' affiliations. DOI: 10.3163/1536-5050.99.3.008

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Record - 4

DIALOG(R)

ArtsCalendar,

Press-Register (Mobile, AL), Press-Register 01 ed, p02,
Sunday, July 10, 2011

TEXT:
ArtsCalendar

Gulf Coast Exploreum Science
Center - "Spaced Out Summer"

runs through Aug. 28

with "Black Holes: Space
Warps & Time Twists," produced

by Harvard-Smithsonian

Center for Astrophysics.

Designed like a space mission
in which visitors are sent out to
search for evidence of real
black holes in our universe.

Admission: \$12 for adults; \$11
for youth and seniors; \$10 for
children. Combo admission is
\$16, \$15 and \$14 and includes

the IMAX movie. Info,
251-208-6879 or [www.exploreum.](http://www.exploreum.com)

com.

JON HAUGE/Correspondent

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Record - 5

DIALOG(R)

Proposed mine's lighting holds risk for astronomy

TONY DAVIS, ARIZONA DAILY STAR,
Arizona Daily Star (AZ), FINAL ed, pA1,
Tuesday, July 5, 2011

TEXT:

US study cites potential harm; Rosemont vows steps to mitigate effects

City lights brighten the sky west of David Levy's backyard observatory in the Vail area, but the skies are darker and starrier to the east.

Those contrasting views illustrate what could be at stake for dark skies in the Tucson area due to the Rosemont Mine, according to the U.S. Forest Service's preliminary report on the proposed mine's environmental impact. Levy, an internationally known amateur comet discoverer, as well as astronomers on Mount Hopkins are concerned that the mine's projected increases in sky brightness would make their work more difficult - or impossible.

Rosemont Copper has pledged to meet Pima County's lighting code, although as a mine it is legally exempt from it.

But the mine, producing about as much light as 10,000 homes, will hurt the region's observatories to a "substantial, adverse degree," the Forest Service report says.

The mine would have fixed lights at its headquarters and pit processing area, mobile lighting of mine pit shovels and ore loaders, and portable light towers at active mining areas, the Forest Service report said. The mine's heap leach pad - a process to extract precious metals - would have its own lighting. Lights would line the mine's access road to Arizona 83.

To lessen the impact on dark skies, the company would use shields, dimmers, cutoff lighting fixtures, timers, motion sensors and directional lighting, the Forest Service report said. Its buildings would be painted or stained to produce flat-toned, non-reflective surfaces. Roads, material-transfer points and processing areas would be treated with dust-control agents, water sprays and wind barriers to limit release of dust into the air.

But those plans' effectiveness can't be measured yet because they must be subject to federal mine-safety requirements and the mine's nighttime operational needs, the service's report said.

For Levy, who has discovered 23 comets - 10 from Tucson - a 22 percent brighter sky spells trouble for his open-air observatory, consisting of 15 telescopes and lying 3 1/2 miles south of Interstate 10. He has discovered

two comets there since moving to the area in 1996. He said his work there has been an integral part of the writing and speaking work on astronomy that has helped him earn a living.

He no longer looks at the western sky because Tucson's growth has lit it too much to see stars well, he said. If the mine brightens the eastern sky too much, he might have to abandon comet-watching there, said Levy, 63.

Jon Fast, a Tucsonan who supports the mine, said he's sorry if it would interfere with astronomers' work, but "what are you going to do for jobs - more Burger Kings and Jack in the Boxes and call centers?"

"With progress comes some things that you don't want to go with," said Fast, a safety consultant who has lived in the Tucson area since 1996. "That's just the way things are in this world. It's not like it was 50 years ago."

The mine would add 406 well-paying jobs and continue Arizona's tradition as the largest copper-producing state, backers have pointed out.

But Levy's departure would be a loss for Tucson, said Philip Massey, an astronomer at Flagstaff's Lowell Observatory.

"He is a very famous astronomer. He is in some ways the mini-Carl Sagan of his generation," Massey said.

At Whipple, the impact of a 10 percent brighter sky depends on what you're looking at and how far away it is, astronomers say.

"If you are looking at a distant galaxy, it's very different from looking at individual stars," said Emilio Falco, project director at the observatory, part of the Harvard-Smithsonian Center for Astrophysics. "Distant galaxies are faint, so they are the first thing you lose when you start getting more light pollution. It could be terrible for your project."

Tradeoffs like these between the mine and astronomy always occur with a major development, a prominent Rosemont supporter said.

"We have to step back and be as objective as we can be, and ask ourselves: With the millions of dollars of tax revenue, the jobs and all the positives of Rosemont, which will provide the greater good for the community?" said Mike Varney, president and CEO of the Tucson Metropolitan Chamber of Commerce.

But County Administrator Chuck Huckelberry wrote the Forest Service last week that its environmental report failed to consider the mine's impacts on

existing investment and planned expansions of facilities and research in astronomy and space sciences in the Tucson area. Statewide, about \$1.2 billion has been invested in these areas, he wrote:

"Damage to this significant industry and the resultant loss of jobs and investment in the region cannot be ignored."

Contact reporter Tony Davis at tdavis@azstarnet.com or 806-7746.

On StarNet: For stories on nature, the environment and wildlife, go to azstarnet.com/environment

US report SEES NIGHT-SKY IMPACT

*

* Skies would be 22 percent brighter at a 20-degree angle above the horizon near Levy's Jarnac Observatory, five miles north of the mine site. The 20 degrees represent the lowest useful area of the sky for astronomical observations.

* Skies would brighten 10 percent at 20 degrees at the Whipple Observatory on Mount Hopkins, 10 miles west of the mine.

* At the Empire Ranch, east of Arizona 83 and a few miles south of the mine, brightness would rise 32 percent. The Tucson Amateur Astronomy Association held monthly stargazing parties there until about eight months ago, and individual members still go there occasionally.

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Record - 6

DIALOG(R)

August 1986.

Sinnott, Roger W.,

Sky & Telescope, v122, n2, p10(1),

Monday, August 1, 2011

TEXT:

Smaller Milky Way? "A combination of new and old observing techniques has revealed that the Milky Way may be 25 percent smaller than previously thought....

[ILLUSTRATION OMITTED]

"At a recent seminar, Mark Reid of the Harvard-Smithsonian Center for Astrophysics ... described how his group used four radio telescopes spanning the United States from California to Massachusetts to observe the molecular cloud Sagittarius B2 North at a wavelength of 1 centimeter [and obtained] a distance to the galactic center of 23,000 [+ or -] 4,000 light-years. This value is very much smaller than the traditional 33,000 light-years found in most astronomy textbooks and somewhat less than the official distance of about 28,000 light-years sanctioned by the International Astronomical Union in 1985."

While no doubt on the low side, this value was certainly a move in the right direction. More recent studies by Reid and others, using a variety of techniques, put the galactic center at about 26,000 light-years.

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Wolbach Library: CfA in the News
Week ending 31 July 2011

1. **Chandra X-Ray Observatory Images Gas Flowing Toward Black Hole**, Fars News Agency (Iran), Saturday, July 30, 2011
2. **Researchers from Harvard-Smithsonian Center for Astrophysics Describe Findings in Astronomy Research**, Science Letter, p574, Tuesday, August 2, 2011
3. **Research in the Area of Astronomy Reported from Harvard-Smithsonian Center for Astrophysics**, Science Letter, p499, Tuesday, August 2, 2011
4. **Recent Studies from Harvard-Smithsonian Center for Astrophysics Add New Data to Astronomy Research**, Science Letter, p305, Tuesday, August 2, 2011
5. **New Astronomy Research Reported from Harvard-Smithsonian Center for Astrophysics**, Science Letter, p155, Tuesday, August 2, 2011
6. **Findings in General Science Reported from L.F. Smith and Co-Researchers**, Science Letter, p117, Tuesday, August 2, 2011
7. **Alone in the Universe**, Smith, Howard A, American Scientist, v99, n4, p320 Friday, July 1, 2011
8. **CHANDRA X-RAY TELESCOPE IMAGES GAS FLOWING TOWARD BLACK HOLE IN UNIVERSITY OF ALABAMA-LED STUDY**, US Federal News, Wednesday, July 27, 2011
9. **NASA's Wise Mission Finds First Trojan Asteroid Sharing Earth's Orbit**, NewsPress, Thursday, July 28, 2011
10. **NASA's Chandra Observatory Images Gas Flowing Toward Black Hole**, PR Newswire, Wednesday, July 27, 2011

Record - 1

DIALOG(R)

Chandra X-Ray Observatory Images Gas Flowing Toward Black Hole,
Fars News Agency (Iran),
Saturday, July 30, 2011

TEXT:

The observations from NASA's Chandra X-ray Observatory will help tackle two of the most fundamental problems in modern astrophysics: understanding how black holes grow and how matter behaves in their intense gravity.

The black hole is at the center of a large galaxy known as NGC 3115, which is located about 32 million light years from Earth. A large amount of previous data has shown material falling toward and onto black holes, but none with this clear a signature of hot gas.

By imaging the hot gas at different distances from this supermassive black hole, astronomers have observed a critical threshold where the motion of gas first becomes dominated by the black hole's gravity and falls inward. This distance from the black hole is known as the "Bondi radius."

"It's exciting to find such clear evidence for gas in the grip of a massive black hole," said Ka-Wah Wong of the University of Alabama, who led the study that appears in the July 20th issue of *The Astrophysical Journal Letters*. "Chandra's resolving power provides a unique opportunity to understand more about how black holes capture material by studying this nearby object."

As gas flows toward a black hole, it becomes squeezed, making it hotter and brighter, a signature now confirmed by the X-ray observations. The researchers found the rise in gas temperature begins about 700 light years from the black hole, giving the location of the Bondi radius. This suggests the black hole in the center of NGC 3115 has a mass about two billion times that of the sun, making it the closest black hole of that size to Earth.

The Chandra data also show the gas close to the black hole in the center of the galaxy is denser than gas further out, as predicted. Using the observed properties of the gas and theoretical assumptions, the team then estimated that each year gas weighing about 2 percent the mass of the sun is being pulled across the Bondi radius toward the black hole.

Making certain assumptions about how much of the gas's energy changes into radiation, astronomers would expect to find a source that is more than a million times brighter in X-rays than what is seen in NGC 3115.

"A leading mystery in astrophysics is how the area around massive black holes can stay so dim, when there's so much fuel available to light up," said co-author Jimmy Irwin, also of the UA in Tuscaloosa. "This black hole is a poster child for this problem."

There are at least two possible explanations for this discrepancy. The first is that much less material actually falls onto the black hole than flows inside the Bondi radius. Another possibility is that the conversion of energy into radiation is much less efficient than is assumed.

Different models describing the flow of material onto the black hole make different predictions for how quickly the density of the gas is seen to rise as it approaches the black hole. A more precise determination of the rise in density from future observations should help astronomers rule out some of these models.

NASA's Marshall Space Flight Center in Huntsville, Ala., manages the Chandra program for the agency's Science Mission Directorate in Washington. The Smithsonian Astrophysical Observatory controls Chandra's science and flight operations from Cambridge, Mass.

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Record - 2

DIALOG(R)

Researchers from Harvard-Smithsonian Center for Astrophysics Describe Findings in Astronomy Research,

Science Letter, p574,
Tuesday, August 2, 2011

TEXT:

"We report spectroscopic observations of the red giant star HR5692, previously known to be a binary system both from other spectroscopic work and from deviations in the astrometric motion detected by the Hipparcos satellite. Earlier International Ultraviolet Explorer (IUE) observations had shown the presence of a hot white dwarf companion to the giant primary," investigators in Cambridge, Massachusetts report (see also).

"We have combined our radial velocity observations with other existing measurements and with the Hipparcos intermediate astrometric data to determine a complete astrometric-spectroscopic orbital solution, providing the inclination angle for the first time. We also determine an improved parallax for the system of 10.12 ± 0.67 mas. We derive the physical properties of the primary, and with an estimate of its mass from stellar evolution models ($1.84 \pm 0.40M(\text{circle dot})$), we infer the mass of the white dwarf companion to be $M\text{-WD} = 0.59 \pm 0.12M(\text{circle dot})$," wrote R.P. Stefanik and colleagues, Harvard-Smithsonian Center for Astrophysics.

The researchers concluded: "An analysis of an IUE white dwarf spectrum, using our parallax, yields $T\text{-eff} = 30,400 \pm 780$ K, $\log g = 8.25 \pm 0.15$, and a mass $M\text{-WD} = 0.79 \pm 0.09M(\text{circle dot})$, in marginal agreement with the dynamical mass."

Stefanik and colleagues published their study in *Astronomical Journal* (Observations And Orbital Analysis Of The Giant White Dwarf Binary System Hr 5692. *Astronomical Journal*, 2011;141(5):144).

For additional information, contact R.P. Stefanik, Harvard Smithsonian Center Astrophysics, 60 Garden St., Cambridge, MA 02138, United States.

The publisher of the *Astronomical Journal* can be contacted at: IOP Publishing Ltd., Dirac House, Temple Back, Bristol BS1 6BE, England.

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Record - 3

DIALOG(R)

Research in the Area of Astronomy Reported from Harvard-Smithsonian Center for Astrophysics,
Science Letter, p499,
Tuesday, August 2, 2011

TEXT:

"Kepler's first major discoveries are two hot ($T > 10,000$ K) small-radius objects orbiting stars in its field. A viable hypothesis is that these are the cores of stars that have each been eroded or disrupted by a companion star," scientists in Cambridge, Massachusetts report (see also).

"The companion, which is the star monitored today, is likely to have gained mass from its now-defunct partner and can be considered to be a blue straggler. KOI-81 is almost certainly the product of stable mass transfer; KOI-74 may be as well, or it may be the first clear example of a blue straggler created through three-body interactions. We show that mass-transfer binaries are common enough that Kepler should discover similar to 1000 white dwarfs orbiting main-sequence stars. Most of these, like KOI-74 and KOI-81, will be discovered through transits, but many will be discovered through a combination of gravitational lensing and transits, while lensing will dominate for a subset. In fact, some events caused by white dwarfs will have the appearance of "anti-transits"-i.e., short-lived enhancements in the amount of light received from the monitored star. Lensing and other mass-measurement methods provide a way to distinguish white dwarf binaries from planetary systems. This is important for the success of Kepler's primary mission, in light of the fact that white dwarf radii are similar to the radii of terrestrial planets, and that some white dwarfs will have orbital periods that place them in the habitable zones of their stellar companions. By identifying transiting

and/or lensing white dwarfs, Kepler will conduct pioneering studies of white dwarfs and of the end states of mass transfer. It may also identify orbiting neutron stars or black holes," wrote R. Distefano and colleagues, Harvard-Smithsonian Center for Astrophysics.

The researchers concluded: "The calculations inspired by the discovery of KOI-74 and KOI-81 have implications for ground-based wide-field surveys as well as for future space-based surveys."

Distefano and colleagues published their study in *Astronomical Journal* (Transits And Lensing By Compact Objects In The Kepler Field: Disrupted Stars Orbiting Blue Stragglers. *Astronomical Journal*, 2011;141(5):142). For more information, contact R. Distefano, Harvard Smithsonian Center Astrophysics, 60 Garden St., Cambridge, MA 02138, United States.

Publisher contact information for the *Astronomical Journal* is: IOP Publishing Ltd., Dirac House, Temple Back, Bristol BS1 6BE, England.

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Record - 4

DIALOG(R)

Recent Studies from Harvard-Smithsonian Center for Astrophysics Add New Data to Astronomy Research,
Science Letter, p305,
Tuesday, August 2, 2011

TEXT:

According to the authors of recent research from Cambridge, Massachusetts, "The study of short-duration gamma-ray bursts (GRBs) experienced a complete revolution in recent years thanks to the discovery of the first afterglows and host galaxies starting in May 2005. These observations demonstrated that short GRBs are cosmological in origin, reside in both star forming and elliptical galaxies, are not associated with supernovae, and span a wide isotropic-equivalent energy range of similar to 10^{48} - 10^{52} erg."

"However, a fundamental question remains unanswered: What are the progenitors of short GRBs? The most popular theoretical model invokes the coalescence of compact object binaries with neutron star and/or black hole constituents. However, additional possibilities exist, including magnetars formed through prompt channels (massive star core-collapse) and delayed channels (binary white dwarf mergers, white dwarf accretion-induced collapse), or accretion-induced collapse of neutron stars. In this review I

summarize our current knowledge of the galactic and sub-galactic environments of short GRBs, and use these observations to draw inferences about the progenitor population. The most crucial results are: (i) some short GRBs explode in dead elliptical galaxies; (ii) the majority of short GRBs occur in star forming galaxies; (iii) the star forming hosts of short GRBs are distinct from those of long GRBs, and instead appear to be drawn from the general field galaxy population; (iv) the physical offsets of short GRBs relative to their host galaxy centers are significantly larger than for long GRBs; (v) there is tentative evidence for large offsets from short GRBs with optical afterglows and no coincident hosts; (vi) the observed offset distribution is in good agreement with predictions for NS-NS binary mergers; and (vii) short GRBs trace under-luminous locations within their hosts, but appear to be more closely correlated with the rest-frame optical light (old stars) than the UV light (young massive stars). Taken together, these observations suggest that short GRB progenitors belong to an old stellar population with a wide age distribution, and generally track stellar mass. These results are fully consistent with NS-NS binary mergers and rule out a dominant population of prompt magnetars," wrote E. Berger and colleagues, Harvard-Smithsonian Center for Astrophysics (see also).

The researchers concluded: "However, a partial contribution from delayed magnetar formation or accretion-induced collapse is also consistent with the data."

Berger and colleagues published their study in *New Astronomy Reviews* (The environments of short-duration gamma-ray bursts and implications for their progenitors. *New Astronomy Reviews*, 2011;55(1-2):1-22).

For additional information, contact E. Berger, Harvard Smithsonian Center Astrophysics, 60 Garden St., Cambridge, MA 02139, United States.

Publisher contact information for the journal *New Astronomy Reviews* is: Elsevier Science Ltd., the Boulevard, Langford Lane, Kidlington, Oxford OX5 1GB, Oxon, England.

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Record - 5

DIALOG(R)

New Astronomy Research Reported from Harvard-Smithsonian Center for Astrophysics,

Science Letter, p155,

Tuesday, August 2, 2011

TEXT:

"Using light curves from the HATNet survey for transiting extrasolar planets we investigate the optical broadband photometric variability of a sample of 27, 560 field K and M dwarfs selected by color and proper motion ($V - K$ greater than or similar to 3.0, $\mu > 30 \text{ mas yr}^{-1}$), plus additional cuts in $J - H$ versus $H - K - S$ and on the reduced proper motion). We search the light curves for periodic variations and for large-amplitude, long-duration flare events," investigators in Cambridge, Massachusetts report (see also).

"A total of 2120 stars exhibit potential variability, including 95 stars with eclipses and 60 stars with flares. Based on a visual inspection of these light curves and an automated blending classification, we select 1568 stars, including 78 eclipsing binaries (EBs), as secure variable star detections that are not obvious blends. We estimate that a further similar to 26% of these stars may be blends with fainter variables, though most of these blends are likely to be among the hotter stars in our sample. We find that only 38 of the 1568 stars, including five of the EBs, have previously been identified as variables or are blended with previously identified variables. One of the newly identified EBs is 1RXS J154727.5+450803, a known $P = 3.55$ day, late M-dwarf SB2 system, for which we derive preliminary estimates for the component masses and radii of $M-1 = M-2 = 0.258 \pm 0.008 M_{\odot}$ and $R-1 = R-2 = 0.289 \pm 0.007 R_{\odot}$. The radii of the component stars are larger than theoretical expectations if the system is older than similar to 200 Myr. The majority of the variables are heavily spotted BY Dra-type stars for which we determine rotation periods. Using this sample, we investigate the relations between period, color, age, and activity measures, including optical flaring, for K and M dwarfs, finding that many of the well-established relations for F, G, and K dwarfs continue into the M dwarf regime. We find that the fraction of stars that is variable with peak-to-peak amplitudes greater than 0.01 mag increases exponentially with the $V - K - S$ color such that approximately half of field dwarfs in the solar neighborhood with M less than or similar to $0.2 M_{\odot}$ are variable at this level," wrote J.D. Hartman and colleagues, Harvard-Smithsonian Center for Astrophysics.

The researchers concluded: "Our data hint at a change in the rotation-activity-age connection for stars with M less than or similar to $0.2 M_{\odot}$."

Hartman and colleagues published their study in *Astronomical Journal* (A PHOTOMETRIC VARIABILITY SURVEY OF FIELD K AND M DWARF STARS WITH HATNet. *Astronomical Journal*, 2011;141(5):166).

For additional information, contact J.D. Hartman, Harvard Smithsonian

Center Astrophysics, 60 Garden St., Cambridge, MA 02138, United States.

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Record - 6

DIALOG(R)

Findings in General Science Reported from L.F. Smith and Co-Researchers,
Science Letter, p117,
Tuesday, August 2, 2011

TEXT:

"This study examined the scientific understanding of astronomical pictures by experts and nonexperts. It explored how both groups perceive astronomical images and their understanding of both what they are seeing and the science that underlies the images," researchers in Dunedin, New Zealand report (see also).

"Data comprised $n = 8,866$ responses from a survey linked to the NASA Astronomical Picture of the Day website and four focus groups held at the Harvard-Smithsonian Center for Astrophysics. Results indicated that variations in presentation of color, explanation, and scale affect comprehension of astronomical imagery. With those who are more expert, shorter, more technical explanations are effective; however, scales are still necessary for complete comprehension. Experts tend to look at the images from a more scientific, data-oriented perspective while nonexperts are more likely to focus, especially initially, on the aesthetic or emotional values of the images," wrote L.F. Smith and colleagues.

The researchers concluded: "Results provide suggestions for educational outreach to the public."

Smith and colleagues published their study in Science Communication (Aesthetics and Astronomy: Studying the Public's Perception and Understanding of Imagery From Space. Science Communication, 2011;33(2):201-238).

For additional information, contact L.F. Smith, 145 Union St., POB 56, Dunedin 9054, NEW ZEALAND.

Publisher contact information for the journal Science Communication is:

Sage Publications Inc., 2455 Teller Rd., Thousand Oaks, CA 91320, USA.

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Record - 7

DIALOG(R)

Alone in the Universe,

Smith, Howard A,

American Scientist, v99, n4, p320,

Friday, July 1, 2011

TEXT:

HEADNOTE

Despite the growing catalog of extrasolar planets, data so far do not alter estimates that we are effectively on our own

The first known extrasolar planet (that is, a planet orbiting around a normal star other than our Sun) was 51 Pegasi b, discovered only about 16 years ago. Today, thanks largely to NASA's orbiting Kepler satellite, there are more than 1,500 known extrasolar planets (or planetary candidates), about 431 with confirmed detections and reasonably well-determined parameters (such as radius, mass and orbital characteristics).

These discoveries are exciting not only to astrophysicists; the public is also keen to learn about Earthlike extrasolar planets and the possibility that some might host life, even intelligent life. Last year the Royal Society of London sponsored a symposium with the dramatic title "The Detection of Extra-terrestrial Life and the Consequences for Science and Society." Participants observed, "Should it turn out that we are not alone in the universe, it will fundamentally affect how humanity understands itself," and cited polls suggesting that most people believe we do have cosmic company (half of this group think aliens have already visited). The public wants to believe in aliens (or extraterrestrial intelligence, ETI), some say, because they believe that "ETI comes from 'utopian societies which are free of war, death, disease or any other . . . mid-20th century problems' and could 'help mankind overcome its problems.'"

Scientists and the press often encourage people to adopt these sensational attitudes. Last March, for example, the New York Times ran an op-ed piece on extrasolar planets by astronomer Ray Jayawardhana under an image of a sky full of stars labeled with "THEM" signposts. The author was reassuring: People should not fret about "life elsewhere, especially if it turns out to

be in possession of incredible technology [that can] make us feel small and insignificant." He did not speculate on the possibility that this science-fiction scenario might instead make people feel inconsequential or prompt them to treat each other, or our planet, casually.

The dawn of the era of extrasolarplanet (or exoplanet) discovery provides us with the first bits of hard information to use in reconsidering the likelihood of this popular attitude. The spin has been that because planets are common, alien civilizations must be abundant. But that doesn't follow. The evidence so far does not alter the improbability that any ETI exists near enough to us to matter. It is therefore much more crucial for theology, philosophy, politics and popular opinion to ponder how humanity understands itself if we might be effectively alone in the universe - humanity being a species that is rare, precious and neither irrelevant nor cosmically insignificant.

Traditional Attitudes

Life - specifically intelligent life, not just microbes - could be ubiquitous in a universe that is as spacious and rich as ours; it is possibly teeming with Earthlike planets hosting life. Perhaps intelligent beings are the inevitable product of life and evolution. This view has been the traditional attitude, and one typical portrayer was Percival Lowell, an astronomer famous for his advocacy of canals on Mars, who wrote in his 1908 book, *Mars as the Abode of Life*:

From all we have learned of its constitution on the one hand or of its distribution on the other we know life to be as inevitable a phase of planetary evolution as is quartz or feldspar or nitrogenous soil. Each and all of them are only manifestations of chemical affinity.

Today we know that Mars has no artificial canals, and that this assertion was unsupported wishful thinking. Don Goldsmith and Tobias Owen, in their classic book, *The Search for Life in the Universe* (1993 edition), present a more modern view:

We anticipate that all planetary systems will have a set of rocky inner planets, with atmospheres produced by outgassing, weathering and escape, for the same reasons that our own rocky inner planets have atmospheres. Judging from our own example, the chances seem good that one of these inner planets will orbit its star at the "right" distance.... We say one in every two to be conservative.

Nowadays this view, too, appears narrow. The single most remarkable finding of the new research on extrasolar planets is that an enormous variety of systems exist - a diverse range of often-bizarre environments that is

considerably broader than had usually been imagined before the first one was discovered. More than 50 likely Earth-sized planets have been spotted so far. Earthlike planets, with signs of liquid water and a congenial atmosphere, have as yet fallen below the detection threshold, although in the next few years, with the added patience it takes to measure a few of their yearly transits, it is reasonable to think that some will be found. It may turn out that our own solar system is average - but we know now that at least some planetary systems are unlike ours. Meanwhile, the results make it possible to improve models of planet formation, which in turn offer improved guidance on planets in general.

Alone "For All Practical Purposes"

Two clarifications are essential. First, only the existence of intelligent beings is relevant. Primitive life may yet be discovered on Mars; perhaps even multicellular animals will be found on a nearby extrasolar planet. These revolutionary discoveries would help us reconstruct how life on Earth evolved, but unless a species is capable of conscious, independent thought and has the ability to communicate, we will still be alone - with no one to teach or learn from, no one to save us from ourselves (and no one to battle against). Intelligent life, for the purposes of this discussion, means life able to communicate between stars; this implies having something like radio technology. Our own society, by this definition, is only about 100 years old. If intelligent life is common in a universe that is 13.7 billion years old, then surely we are among the youngest forms in existence. As the physicist Enrico Fermi famously observed, however, the fact that there is no other known intelligent life indicates that the assumption is wrong - intelligent life is not common. Cosmologist Paul Davies explores this absence in detail in his 2010 book, *The Eerie Silence: Renewing Our Search for Alien Intelligence*.

The second important caveat derives from two features of the world that were unknown to Percival Lowell. The first is relativity - the fastest any signal can travel is the finite speed of light. The second is the expanding nature of the universe (presumably the result of a "big bang" creation event, although the origin of the expansion is not critical to the conclusions): Distant galaxies recede from us at an accelerating rate. Even if ETI is infinitesimally rare, in an infinite universe, every physically possible scenario, however bizarre, will exist. Stephen Hawking and other physicists argue for the existence of "many universes," thereby inflating the notion of infinities and life forms. Such possibilities may be philosophically amusing, but they are practically irrelevant. We cannot communicate with, or even directly measure anything about, this unlimited vastness because it lies beyond the cosmic horizon, the distance set by how far light can travel in the age of the universe. Waiting longer will not help: The universe is getting bigger and expanding away from us. In fact,

for purposes of communication the limit is even stricter. The universe is not simply expanding-it is accelerating outward, and Harvard astrophysicist Avi Loeb has shown that light sent from Earth today can never even catch up to galaxies whose light has taken about 10 billion years to reach us. Even though they are well within our cosmic horizon, such galaxies are forever beyond our reach and receding quickly. Even if the universe lasts forever, any aliens there will never enjoy our stray transmissions of I Love Lucy.

The finite speed of light also sets a practical limit on closer stars. Most stars in our Milky Way galaxy, and presumably its billions of planets, are hundreds of thousands of light-years away, so it will take hundreds of thousands of years for any ETI there to see our signals, and that long again for us to receive a reply. To be alone for all practical purposes means to be without any communication - or even the knowledge that any signal is coming - for a very long time. How long before we feel such solitude? My choice is 100 human generations; subjectively this seems like practically forever. Because one generation corresponds to 25 years (and at least one round-trip of messages is necessary), I limit the following estimates to stars closer to Earth than 1,250 light-years. We know a lot about the stars in this neighborhood and so we can be quantitative. If we choose to examine a smaller volume, say, that accessible within one lifetime, the chances of success go down by a factor of a million - because the number of stars is proportional to the volume of space and scales with time (distance) cubed - but we will have a yes-or-no answer sooner. However, if we expand the search volume and the probabilities of success, the wait time goes up.

Of course it is possible that some distant alien civilization scans the galaxy's billions of stars for juvenile Earths, predicts their evolution and optimistically sends out greetings eons ahead of time - perhaps as signals or robotic probes - timed to arrive just when intelligent species (such as us) have evolved and are starting to listen. But it is hard to imagine such an enterprise being practical. No wonder there are no signals, nor even faint traces, despite decades of looking. As Fermi argued, they are not there. If perchance (in the spirit of Jayawardhana's remarks) some fantastic, faster-than-light technology were possible, then Fermi's observation implies that beings with ETI are not only not living in our galaxy, but there are not many living anywhere in the universe.

Estimating the Chances

One way to figure the odds is to use the Drake Equation, a set of multiplicative factors tracking the various phenomena thought to be necessary to get to intelligent life. It is not a mathematical formulation of a physical process, and every researcher who uses it breaks down the individual terms somewhat differently, but all estimate the same thing -

the number of civilizations around today. At its simplest, the result is a product of five terms: the number of suitable stars, the number of suitable planets around such a star, the probability of life developing on a suitable planet, the probability that life evolves to be intelligent and the typical lifetime of a civilization compared to the lifetime of its star.

The individual factors, sub-factors and their values have been hotly debated since Frank Drake introduced the formula in the 1950s, because only the first variable could be reasonably estimated from physical evidence or extrapolated from a statistically meaningful sample, the number of solar-type stars (although the group of "suitable" stars might include more types).

The new results from extrasolarplanet searches impact the second term. As more extrasolar planetary discoveries are announced, I hope this discussion will help the public to evaluate whether they might be suitable sites for intelligent beings. The other factors remain rather mysterious and are extrapolations from an example of one - life on Earth. The usual attitude is that with about 1020 stars in the visible universe, even overestimating these factors by hundreds still leaves plenty of civilizations out there. But if we are unwilling to wait for a billion years to hear from ETI, and therefore only consider our stellar neighborhood, then small reductions matter a lot. It is impossible to increase the chances much over these early, optimistic estimates, but it is easy indeed to make the chances very much smaller.

The Sun lies in a cavity of interstellar gas, called the Local Bubble, which extends over roughly 600 light-years. It in turn is located in Gould's Belt, a spur of stars, star clusters and molecular clouds between two of the Milky Way galaxy's spiral arms, stretching from the Orion nebula to the Ophiucus-Scorpius clouds and on to the Perseus clusters - a distance of about 1,200 light-years in its longest dimension. The approximate number of stars per cubic light-year here is 0.004, to within a factor of two, or about 30 million stars of all types in a volume of radius 1,250 light-years. This result provides a first factor in the Drake Equation considering the distance limit that has been set, so the second term is the next to be considered.

Rare Earths?

The first thousand extrasolar planets discovered were the easiest to find in part because they are either large or have orbits close enough to their stars that their multiple transits in front of their stars can be observed, confirmed and studied in a few years. In their statistical review of 1,235

Kepler planetary candidates (planets not yet completely confirmed) that orbit in less than 50 days, University of California at Berkeley astrophysicist Andrew Howard and his team analyzed the trends they represent, including the finding that smaller planets are more abundant. There has not, however, been quite enough time to find Earthlike planets. Indeed, most of the stars studied have no planets of any kind yet detected, but in a few more years we may know more about them. The website for Exoplanet Data Explorer at <http://exoplanets.org> regularly updates the confirmed results. These first discoveries could represent unusual members of the family. Nonetheless, the new results have driven important refinements to models of planetary formation and evolution.

The "rare Earth" hypothesis expresses the idea that Earthlike planets genuinely suitable for intelligent life are few and far between. Paleontologist Peter Ward and astrophysicist Donald Brownlee of the University of Washington, among others, delineate a set of familiar conditions that planets must satisfy for intelligence to prosper, which I have bundled into four essential ones: stability, habitability and water, planetary mass and planetary composition.

To meet the stability condition, the host star must be stable in size and radiative output for the billions of years it takes for intelligence to evolve. Our Sun is among the less-common types of stars. Over 90 percent of stars are smaller than the Sun, many with less than one-tenth of the Sun's mass. It may be hard for a planet around a small star to evolve intelligent life because small stars are cooler and their habitable zones - the range of distances where the temperatures allow water to be liquid - lie closer to the star. When a planet is in this closer region, it tends to become gravitationally (tidally) locked to the star, with one side perpetually facing the star. (Tidal locking keeps one face of the Moon pointing toward Earth.) But then half of the planet will be in the dark and cold, and the other half at constant noon. Life seems improbable in such a place, although some argue that life could develop in the zones with intermediate conditions.

At the other extreme, stars more massive than the Sun are also probably unsuitable; bigger stars burn hotter and live shorter lives. Stars with twice the mass of the Sun exist in a stable, hydrogenburning, or "main sequence," phase for only a few billion years, about 18 percent as long as the Sun's lifetime - yet billions of years more than this were needed for evolution of intelligent life on Earth. Stars of more than about eight times the Sun's mass will die as supernovae after only tens of millions of years. Fewer than about 10 percent of all stars are in a nominally acceptable range of masses, from about 0.7 to 1.7 solar masses.

Moreover, a star's age also matters. Stars that are too young will not have

had time for life to evolve; older ones are problematic because a star's luminosity increases with time (the Sun will be 40 percent more luminous in another 3.5 billion years), and thus the location of its habitable zone changes. Another concern is that most stars have a companion star orbiting; about two-thirds of solar-type stars are binaries. Their planets might orbit one star, or the other, or both, but these situations raise a flag because the changing gravitational influence of an orbiting companion star potentially could disrupt the long gestational period of a planet in a habitable zone.

The second condition for intelligent life, habitability and water, further explores the concept that a suitable planet must reside in the habitable zone of its star or have some other mechanism to maintain liquid water. The orbit must be stable as well, sufficiently circular or otherwise unchanging, so that it remains suitable for billions of years. The single most remarkable result from the discovery of extrasolar planets is their variety: systems that have extreme elliptical orbits, giant planets orbiting very close to their stars (called "hot Jupiters") and other unexpected properties. It is important to stress again that technology is only just now able to detect Earth-sized planets. The presence of hot Jupiters in a system does not exclude the existence of Earthlike planets farther away in the star's habitable zone, it just makes it more complicated. Planets are thought to form far from a star by the gradual coalescence of dust grains in a protoplanetary disk into larger and larger bodies. Once formed, these planets generally tend to migrate into closer orbits as they interact with material in the disk. As they migrate, such planets would presumably disrupt small bodies that might have been in the habitable zone, although one might remain there subsequently.

Another factor is the eccentricity of a planet's orbit - a measure of the closest distance of the planet to the star compared to its largest distance - which thus determines the annual variations it receives in stellar illumination. Severe orbital variations do not preclude liquid water but could inhibit the development of biological systems. An eccentric orbit also increases the likelihood that in a system of similar planets, one occasionally might be chaotically disrupted. Earth's orbit is nearly circular. Of the 431 extrasolar planets currently known with confirmed and published orbital parameters, only 11 - 2.2 percent - have eccentricity values less than that of Earth; 20 percent vary in their stellar distances by a factor of two during their year, and 50 percent vary in stellar distance by 20 percent.

A related parameter is the obliquity of a planet, the angle between its spin axis and the axis of its orbit around its star. Earth's obliquity, 23.5 degrees, is the consequence of a massive collision it had with a giant object early in its existence, which created the Moon. The approximate

stability of Earth's obliquity is maintained by torque from the Moon. This apparently ideal value of obliquity ensures that the climate on Earth's surface over the course of a year is neither too hot nor too cold, as first one pole points slightly toward the Sun during Earth's yearly orbit, and then the other receives more daylight. Scientists have estimated that if Earth's obliquity were as high as 90 degrees, a substantial part of its surface would become uninhabitable. No other planet in our own solar system has such a stable, much less congenial, obliquity; that of Mars seems to have varied chaotically between about 0 and 60 degrees (but is currently about 25 degrees). Current models of Earth-sized planet formation suggest that high obliquity angles should be common, the result of collisions from all directions in early stages of formation, although the subsequent evolution of obliquities is less well understood. The rotation axes of stars can also be tilted with respect to the orbital plane. Measurements of exoplanets suggest so far that stars hosting hot Jupiters also have large obliquities, probably the result of strong gravitational perturbations in these extreme systems. Again, the current set of observed extrasolar planets represents the tip of the iceberg; most extrasolar planetary systems could be different. However, the explanations advanced so far to explain these observed parameters are general; whatever tends to produce highly elliptical orbits, for instance, is presumably at work, in some fashion, in other, still-unknown systems.

The third condition is planetary mass. A suitable planet must be massive enough to hold an atmosphere, but not so massive that plate tectonics are inhibited, because that would reduce geological processing and its crucial consequences for life. Current estimates are that planets smaller than about 0.4 Earth masses are unsuited for long-term atmospheres; if a planet is bigger than about 4 Earth masses, assuming it is rocky, then planetologists estimate it will be unable to produce the plate tectonics thought necessary to refresh the atmosphere with volcanoes or other processes associated with the carbon cycle. The frequency with which such planets occur is still not known, but the first indications from the Kepler satellite are that they are abundant: For planets in close orbits, about 13 percent are Earth-sized, and there is evidence that in larger orbits their numbers would be greater, especially in systems around smaller stars.

Then there is planetary composition. A suitable planet obviously must contain the elements needed for complex molecules (carbon, for example), but it also needs elements that are perhaps not necessary for making life itself but that are essential for an environment that can host intelligent life: silicon and iron, for example, to enable plate tectonics, and a magnetic field to shield the planet's surface from lethal charged winds from its star. The core of Earth remains liquid because of the presence of radioactive elements, whose heat keeps the iron molten and energizes Earth's internal temperature structure.

The relative abundance of the elements is not uniform throughout the galaxy, however, meaning that some regions may be incapable of hosting intelligent life. Furthermore, the need for radioactive elements means that a supernova, the primary source of radioactive elements, must have exploded in the vicinity of a suitable planet relatively recently (but not so close or so recently as to be dangerous). The Local Bubble in which the Sun resides is thought to have been caused by supernovae explosions, and so it might be the case that some key elements present in the Sun and Earth are deficient in other regions of our 1,250 light-year zone.

Finally, many planets may exist in open space, having been forcibly ejected from their stellar systems by multibody gravitational interactions. It is a stretch to imagine life on them developing and evolving to intelligence without the radiant energy of a stable star.

Getting to Life

Even under ideal conditions life might not develop easily. The fact that life has not yet been created in the laboratory means that it is not trivially generated. Mars lies approximately in the habitable zone, but it hosts no civilizations. Even if life were the inevitable outcome of chemical processes on every planet with liquid water, there is no evidence that such fertility occurs quickly. On Earth life took about a billion years to form and another few billion years to produce us. If sometimes the chemistry runs slower by a factor of two or three, or evolution is sidetracked, it may be too late: A Sun-like star would have swollen in size to fill the orbit of Earth. Believers in ETI sometimes counter that some life might evolve from noncarbon-based forms much more efficiently. Besides the absence of any plausible evidence for such a possibility, most agree that at a minimum intelligence requires complexity. Even if their brains are not made with DNA, such aliens must evolve over timescales long enough for comparably complex organs to mature.

The development of intelligent life appears to require more than just planetary suitability. Consider the unlikely accidents - perhaps essential? perhaps incidental? - that facilitated humanity's evolution. A gigantic collision early in Earth's history created the Moon, knocking Earth's axis over enough to make the obliquity and salutary seasons we enjoy, but not quite enough to shatter Earth entirely. Meanwhile the Moon that was produced generates Earth's tides and stabilizes Earth's wobble. A few billion years later, the dinosaurs, which had successfully dominated the planet for 100 million years, were fortuitously wiped out by another, smaller asteroid so powerful it destroyed them all, yet did not kill off the mammals. Many scientists have noted that there were roughly 15 mass extinctions, six of them catastrophic, on Earth before humans emerged on the scene, underscoring the complex, tumultuous, and perilous history of

our evolution.

Many other contingent conditions on Earth enabled life to thrive. Water is essential, but if Earth had much more water in its oceans, there would be no landmass for fish to crawl onto and evolve into toolmakers. Moreover, the route that evolution took was circuitous. Evolutionary biologist Stephen J. Gould famously argued that our evolution was so random that it could probably never repeat; British paleontologist Simon Conway Morris argues that convergence of life on Earth toward humanity was inevitable, but only because of our extraordinarily perfect environment. Not least, the main uncertainty in Drake's original formulation is the longevity of an intelligent civilization, because if it typically survives for only a short time (recall that our own radio-based civilization is only about 100 years old), then very few must be around now.

The probabilities associated with all these biological terms are very uncertain, and astronomy provides no new evidence to evaluate them. Traditional discussions tend to imagine either that intelligence is inevitable on any approximately suitable planet, or that it is unlikely. Drake now guesses that "only about 1 in 10 million stars has a detectable civilization," so in our 100-generation volume of space comprising 30 million stars, there might be two others. Readers can make their own estimates. There will be no civilization if a star is too large or too small, if a planet's orbit or obliquity is wrong, if its size or chemical composition is unsuited, if its surface is ill equipped, if its geologic and meteoritic history is too inauspicious, if the powerful chemistry needed to generate the first life forms is too intricate or too slow, if evolution from proteins to intelligence is too often aborted or directed into sterile tangents, or if civilizations die off easily. If we are to have company in our volume of the galaxy, the likelihood on average for each of these conditions has to be pretty high - better than 20 percent. If the probability of some, such as the chances for life to form, evolve or survive, is much smaller, then even if the others are 100 percent certain, it is unlikely there are any stars near us hosting intelligent beings.

The Misanthropic Principle

Despite fervent imaginings and enthusiastic reassurances about ETI, the indications are still that we are likely to be alone, presiding over our volume of the galaxy like inhabitants of a magnificent but remote island. Even after 100 generations, humanity might not have received a cosmic greeting or know whether one will ever arrive. The anthropic principle is the name given to the observation that the physical constants in the cosmos are remarkably finely tuned, making it a perfect place to host intelligent life. Physicists offer a "many-worlds" explanation of how and why this might be the case.

My feeling is that a misanthropic principle could also be applicable. I use this term to express the idea that the possible environments and biological opportunities in this apposite cosmos are so vast, varied and uncooperative (or hostile), either always or at some time during the roughly 3-to-4 billion years intelligent life requires to emerge, that it is unlikely for intelligence to form, thrive and survive easily.

To recognize this conclusion is to have a renewed appreciation for our good fortune, and to acknowledge that life on Earth is precious and deserves supreme respect. Even if we are not unique in the universe - though we may not know one way or the other for eons - we are fortunate. An awareness of our rare capabilities can spur deeper humility and an acknowledgement of a responsibility to act with compassion toward people and our fragile environment. Meanwhile, the ongoing discovery of amazing new worlds, including Earthlike cousins, will refine our understanding of and perspective on our planet and its salutary environment.

SIDEBAR

For relevant Web links, consult this issue of American Scientist Online:

<http://www.americanscientist.org/issues/id.91/past.aspx>

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as a visiting scientist at NASA Headquarters. This article is based on an invited talk given to the annual meeting of the American Association for the Advancement of Science in February 2011. Address: Harvard-Smithsonian Center for Astrophysics, MS-65, 60 Garden Street, Cambridge, MA 02138. E-mail: hsmith@cfa.harvard.edu
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Record - 8

DIALOG(R)

**CHANDRA X-RAY TELESCOPE IMAGES GAS FLOWING TOWARD BLACK HOLE
IN UNIVERSITY OF ALABAMA-LED STUDY,**

US Federal News,
Wednesday, July 27, 2011

TEXT:

TUSCALOOSA, Ala., July 27 -- The University of Alabama issued the following news release:

The flow of hot gas toward a black hole has been clearly imaged for the first time in X-rays. The observations from NASA's Chandra X-ray Observatory, analyzed by University of Alabama astronomers, will help tackle two of the most fundamental problems in modern astrophysics: understanding how black holes grow and how matter behaves in their intense gravity.

The black hole is at the center of a large galaxy known as NGC 3115, which is located about 32 million light-years from Earth. A large amount of previous data has shown material falling toward and onto black holes, but none with this clear a signature of hot gas.

By imaging the hot gas at different distances from the supermassive black hole, astronomers have observed a critical threshold where the motion of gas first becomes dominated by the black hole's gravity and falls inward. The distance from the black hole is known as the "Bondi radius."

"It's exciting to find such clear evidence for gas in the grip of a massive black hole," said Dr. Ka-Wah Wong, a post-doctoral researcher at The University of Alabama, who led the study that appears in the July 20 issue of The Astrophysical Journal Letters. "Chandra's resolving power provides a unique opportunity to understand more about how black holes capture material by studying this nearby object."

As gas flows toward a black hole, it becomes squeezed, making it hotter and

brighter, a signature now confirmed by the X-ray observations.

The researchers found the rise in gas temperature begins about 700 light years from the black hole, giving the location of the Bondi radius. This suggests the black hole in the center of NGC 3115 has a mass about two billion times that of the sun, making it the closest black hole of that size to Earth.

The Chandra data also show that the gas close to the black hole in the center of the galaxy is denser than gas further out, as predicted. Using the observed properties of the gas and theoretical assumptions, the team then estimated that each year gas weighing about 2 percent the mass of the sun is being pulled across the Bondi radius toward the black hole.

Making certain assumptions about how much of the gas's energy changes into radiation, astronomers would expect to find a source that is more than a million times brighter in X-rays than what is seen in NGC 3115.

"A leading mystery in astrophysics is how the area around massive black holes can stay so dim, when there's so much fuel available to light up," said co-author Dr. Jimmy Irwin, assistant professor in UA's department of physics and astronomy. "This black hole is a poster child for this problem."

There are at least two possible explanations for this discrepancy. The first is that much less material actually falls onto the black hole than flows inside the Bondi radius. Another possibility is that the conversion of energy into radiation is much less efficient than is assumed.

Different models describing the flow of material onto the black hole make different predictions for how quickly the density of the gas is seen to rise as it approaches the black hole. A more precise determination of the rise in density from future observations should help astronomers rule out some of these models.

NASA's Marshall Space Flight Center in Huntsville manages the Chandra program for the agency's Science Mission Directorate in Washington. The Smithsonian Astrophysical Observatory controls Chandra's science and flight operations from Cambridge, Mass.

More information, including images and other multimedia, can be found at: <http://chandra.nasa.gov>

UA's department of physics and astronomy is part of the College of Arts and Sciences, the University's largest division and the largest liberal arts college in the state. Students from the College have won numerous national

awards including Rhodes Scholarships, Goldwater Scholarships and memberships on the USA Today Academic All American Team. For any query with respect to this article or any other content requirement, please contact Editor at htsyndication@hindustantimes.com

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Record - 9

DIALOG(R)

NASA's Wise Mission Finds First Trojan Asteroid Sharing Earth's Orbit,
NewsPress,
Thursday, July 28, 2011

TEXT:

Astronomers studying observations taken by NASA's Wide-field Infrared Survey Explorer (WISE) mission have discovered the first known "Trojan" asteroid orbiting the sun along with Earth.

Trojans are asteroids that share an orbit with a planet near stable points in front of or behind the planet. Because they constantly lead or follow in the same orbit as the planet, they never can collide with it. In our solar system, Trojans also share orbits with Neptune, Mars and Jupiter. Two of Saturn's moons share orbits with Trojans.

Scientists had predicted Earth should have Trojans, but they have been difficult to find because they are relatively small and appear near the sun from Earth's point of view.

"These asteroids dwell mostly in the daylight, making them very hard to see," said Martin Connors of Athabasca University in Canada, lead author of a new paper on the discovery in the July 28 issue of the journal Nature. "But we finally found one, because the object has an unusual orbit that takes it farther away from the sun than what is typical for Trojans. WISE was a game-changer, giving us a point of view difficult to have at Earth's surface."

The WISE telescope scanned the entire sky in infrared light from January 2010 to February 2011. Connors and his team began their search for an Earth Trojan using data from NEOWISE, an addition to the WISE mission that focused in part on near-Earth objects, or NEOs, such as asteroids and comets. NEOs are bodies that pass within 28 million miles (45 million kilometers) of Earth's path around the sun. The NEOWISE project observed more than 155,000 asteroids in the main

belt between Mars and Jupiter, and more than 500 NEOs, discovering 132 that were previously unknown.

The team's hunt resulted in two Trojan candidates. One called 2010 TK7 was confirmed as an Earth Trojan after follow-up observations with the Canada-France-Hawaii Telescope on Mauna Kea in Hawaii.

The asteroid is roughly 1,000 feet (300 meters) in diameter. It has an unusual orbit that traces a complex motion near a stable point in the plane of Earth's orbit, although the asteroid also moves above and below the plane. The object is about 50 million miles (80 million kilometers) from Earth. The asteroid's orbit is well-defined and for at least the next 100 years, it will not come closer to Earth than 15 million miles (24 million kilometers).

"It's as though Earth is playing follow the leader," said Amy Mainzer, the principal investigator of NEOWISE at NASA's Jet Propulsion Laboratory (JPL) in Pasadena, Calif. "Earth always is chasing this asteroid around."

A handful of other asteroids also have orbits similar to Earth. Such objects could make excellent candidates for future robotic or human exploration. Asteroid 2010 TK7 is not a good target because it travels too far above and below the plane of Earth's orbit, which would require large amounts of fuel to reach it.

"This observation illustrates why NASA's NEO Observation program funded the mission enhancement to process data collected by WISE," said Lindley Johnson, NEOWISE program executive at NASA Headquarters in Washington. "We believed there was great potential to find objects in near-Earth space that had not been seen before."

NEOWISE data on orbits from the hundreds of thousands of asteroids and comets it observed are available through the NASA-funded International Astronomical Union's Minor Planet Center at the Smithsonian Astrophysical Observatory in Cambridge, Mass.

JPL manages and operates WISE for NASA's Science Mission Directorate in Washington. The principal investigator, Edward Wright, is a professor at the University of California, Los Angeles. The mission was selected under NASA's Explorers Program, which is managed by the agency's Goddard Space Flight Center in Greenbelt, Md. The science instrument was built by the Space Dynamics Laboratory in Logan, Utah.

The spacecraft was built by Ball Aerospace & Technologies Corp., Boulder, Colo. Science operations and data processing take place

at the Infrared Processing and Analysis Center at the California Institute of Technology in Pasadena. Caltech manages JPL for NASA.

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Record - 10

DIALOG(R)

NASA's Chandra Observatory Images Gas Flowing Toward Black Hole,

PR Newswire,

Wednesday, July 27, 2011

TEXT:

WASHINGTON, July 27, 2011 /PRNewswire-USNewswire/ -- The flow of hot gas toward a black hole has been clearly imaged for the first time in X-rays.

The observations from NASA's Chandra X-ray Observatory will help tackle two of the most fundamental problems in modern astrophysics: understanding how black holes grow and how matter behaves in their intense gravity.

(Logo:)

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By imaging the hot gas at different distances from this supermassive black hole, astronomers have observed a critical threshold where the motion of gas first becomes dominated by the black hole's gravity and falls inward. This distance from the black hole is known as the "Bondi radius."

"It's exciting to find such clear evidence for gas in the grip of a massive black hole," said Ka-Wah Wong of the University of Alabama, who led the study that appears in the July 20th issue of The Astrophysical Journal Letters. "Chandra's resolving power provides a unique opportunity to understand more about how black holes capture material by studying this nearby object."

As gas flows toward a black hole, it becomes squeezed, making it hotter and brighter, a signature now confirmed by the X-ray observations. The researchers found the rise in gas temperature begins about 700 light years from the black hole, giving the location of the Bondi radius. This suggests the black hole in the center of NGC 3115 has a mass about two billion times that of the sun, making it the closest black hole of that size to Earth.

The Chandra data also show the gas close to the black hole in the center of the galaxy is denser than gas further out, as predicted. Using the observed properties of the gas and theoretical assumptions, the team then estimated that each year gas weighing about 2 percent the mass of the sun is being pulled across the Bondi radius toward the black hole.

Making certain assumptions about how much of the gas's energy changes into radiation, astronomers would expect to find a source that is more than a million times brighter in X-rays than what is seen in NGC 3115.

"A leading mystery in astrophysics is how the area around massive black holes can stay so dim, when there's so much fuel available to light up," said co-author Jimmy Irwin, also of the UA in Tuscaloosa. "This black hole is a poster child for this problem."

There are at least two possible explanations for this discrepancy. The first is that much less material actually falls onto the black hole than flows inside the Bondi radius. Another possibility is that the conversion of energy into radiation is much less efficient than is assumed.

Different models describing the flow of material onto the black hole make different predictions for how quickly the density of the gas is seen to rise as it approaches the black hole. A more precise determination of the rise in density from future observations should help astronomers rule out some of these models.

NASA's Marshall Space Flight Center in Huntsville, Ala., manages the Chandra program for the agency's Science Mission Directorate in Washington. The Smithsonian Astrophysical Observatory controls Chandra's science and flight operations from Cambridge, Mass.

More information, including images and other multimedia, can be found at:

and

SOURCE NASA

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Wolbach Library: CfA in the News
Week ending 7 August 2011

1. **Lighting the universe: rethinking what the first stars were like.** Cowen, Ron, Science News, v180, n3, p26(4), Saturday, July 30, 2011

2. **A better space.** Clough, G. Wayne, Smithsonian, v42, n4, p28(1), Friday, July 1, 2011

3. **In the Orbit of Copernicus.** Gingerich, Owen., Copernicus, Nicolaus, American Scholar, p43-9, Tuesday, July 12, 2011

Record - 1

DIALOG(R)

Lighting the universe: rethinking what the first stars were like.

Cowen, Ron

Science News, v180, n3, p26(4)

Saturday, July 30, 2011

TEXT:

The Big Bang wasn't all it has been cracked up to be. Sure, it created the universe. But after the heat of the primordial fireball faded, the cosmos plunged into darkness. The universe was cold and black--a sea of hydrogen and helium atoms mixed with a mysterious dark form of matter making its presence known only by its gravity. No stars.

It took a series of violent events--starting about 100 million years after the Big Bang--to end the cosmic Dark Ages. First, the evenly spread dark matter gathered into clumps, pulling in hydrogen gas that coalesced into clouds. Then pressure inside the clouds grew strong enough to fuse atoms, triggering nuclear reactions. The first stars created this way looked like roses with diaphanous petals, unfolding against a sea of darkness. The universe was finally in bloom.

[ILLUSTRATION OMITTED]

The first stars marked a milestone in the history of the universe, bringing light and warmth back to the cosmos. Later, those primeval stars met their end in spectacular explosions known as supernovas, which seeded the universe with its first dollops of oxygen, carbon and silicon. Those elements made it possible for a second generation of stars to form.

The second-gen stars eventually burned through the opaque fog of hydrogen atoms and set the skies twinkling. These stars gathered into the first recognizable galaxies--dwarf galaxies of a few million stars. Dwarf galaxies merged, and after billions of years life emerged in one of the bigger galaxies, on a smallish backwater planet called Earth.

On that much, astronomers agree. But new simulations that track the star-formation process further than ever before are casting doubt on earlier ideas about the properties of the first stars. They've been cast as loners and extremely massive, for instance. But now the massive-loner theory is in dispute. And that has profound consequences for nearly everything that happened next, because the mass of the first stars may have determined the size of the first galaxies and how quickly the second generation of stars could assemble to form them.

"There is widespread confusion and disagreement," says astronomer Jason Tumlinson of the Space Telescope Science Institute in Baltimore. "I can no longer say with any confidence what the first stars were like." But, he adds, "that's what makes the field so exciting."

New simulations, new ideas

Retracing the steps of star formation is a tricky business. Less than a decade ago, computer simulations by Tom Abel of Stanford's Kavli Institute for Particle Astrophysics and Cosmology and his colleagues indicated that the first stars were whoppers--between 30 and 300 times as heavy as the sun--and that each formed in solitary confinement within separate clouds of gas (SN: 6/8/02, p. 362). The gas showed no sign of fragmenting into several stars; instead, it appeared that the condensing object would keep growing to become one behemoth. And because massive stars die out in just a few million years, none of these first stars could still exist in the universe today.

Although the researchers could follow the steps toward star formation during the first 100 million years or so of cosmic history, they could not track the additional 100,000 years it takes for an infant star to grow to its final size. The team had to stop because supercomputers couldn't--and still can't--precisely track the rapid changes in density a cloud core undergoes as it becomes a star.

Using a mathematical trick, however, other teams have now gone slightly further, simulating about 1,000 years more of the star-formation process. Rather than attempting to track the rapid changes in the dense cloud core, these teams in effect ignore the core, treating it as a sink or black hole, with material falling onto the central region simply disappearing from sight.

Adopting that approach, the researchers have found evidence that a disk of material that forms around each of the embryonic stars can fragment into several fledgling stars, much the way the disk of material around the infant sun broke into clumps that formed the planets (SN: 2/26/11, p. 18).

The net result, as these astrophysicists now see it, is that stars could have been born in pairs or even threesomes. Since they coalesce from the same cloud, each partner would be lighter than if it had formed in solitary confinement.

"Whether at the end of this process one, two or a few massive stars will remain is currently unknown," says Abel. Some studies even suggest that very small fragments, weighing no more than the mass of the sun, might form. Because low-mass stars take billions of years to burn out, some of the first stars could have survived to the present day, some researchers suggest.

To find out what the first stars were like, researchers are now looking to the scars those stars left behind--the extent to which they broke apart nearby atoms of hydrogen gas.

For instance, if most of the first stars were single and massive, they would have transformed the early universe into a giant hunk of Swiss cheese. That's because big stars emit copious amounts of ultraviolet light, which ionizes surrounding gases--stripping electrons from the neutral hydrogen and helium atoms that veiled the cosmos during the Dark Ages. The birth of each individual star would create an ionized bubble, or hole, in the gases around it. Over time, the universe would be riddled with these holes. Once the holes grew large enough to overlap, the universe would be almost completely ionized--as evidence suggests it has been ever since the cosmos was a few hundred million years old.

But if the very first stars were extremely massive, they could have prevented other stars from forming. The energy from their ultraviolet emissions would break molecules of hydrogen into atoms. Without hydrogen molecules, which provide a clump-promoting cooling effect, the dark matter at the heart of star formation would not have enough gravity to pull gas into a star.

If the new simulations showing that primeval stars were born with partners are correct, the universe might never have gone through a Swiss cheese phase, Zoltan Haiman of Columbia University thinks. If the partnerships were close enough, one star would be more likely to collapse to become a black hole and draw matter from the other, emitting X-rays in the process. Far more penetrating than ultraviolet light, the X-rays would rapidly strip electrons from hydrogen and helium atoms throughout the cosmos, leaving a uniformly ionized universe instead of holes, Haiman suggested in the April

7 Nature.

The stellar-partnership scenario could explain an enduring puzzle in the universe today, suggests a team led by I. Felix Mirabel of the French Atomic and Alternative Energies Commission in Gif-sur-Yvette, France and the Institute for Astronomy and Space Physics in Buenos Aires. The leading theory of dark matter predicts that the Milky Way should be surrounded by hundreds of dwarf galaxies, but observers have found only about 25. Mirabel's team suggests in the April *Astronomy & Astrophysics* that the other dwarf galaxies exist but can't be seen because they're starless--shadowy leftovers from the early universe, when such galaxies were too small to either forge or hold onto the first stars.

[GRAPHIC OMITTED]

[ILLUSTRATION OMITTED]

Researchers, however, don't agree on how these X-ray-emitting partnerships would affect the universe. According to Haiman, the partners would emit so much more heat than a lone star that they would delay the formation of the first galaxies.

The extra heat from the stellar partners could boost the temperature and pressure of surrounding gases and prevent any clump of matter weighing less than a billion suns from corralling the gas to make new stars. Waiting around until dark matter clumps were that heavy may have delayed the onset of galaxy formation by 100,000 years.

But other astronomers disagree. Some theorists argue that rather than delaying the first galaxies, X-ray-emitting binaries would promote cooling that would hasten star formation. Tumlinson notes that through a chain of chemical reactions, X-rays would promote the formation of the HD molecule, in which one hydrogen atom is replaced by its heavier isotope, deuterium. That molecule might act as a new coolant.

"People argue about this for hours at meetings and still there's no consensus," notes Tumlinson.

Ground truth

As the theorists continue to debate their models, observations to test their ideas are about to begin.

New arrays of radio telescopes will look for imprints that the first stars left behind on the clouds of hydrogen atoms surrounding them. Radio astronomers can tune in to radio waves from hydrogen atoms that existed at different epochs of the Dark Ages--before, during and after the first stars

formed--thanks to shifts in wavelength caused by the expansion of the universe.

In particular, astronomers will look for radio emissions with wavelengths of 21 centimeters, which neutral hydrogen emits but ionized hydrogen cannot. If the Swiss cheese model is correct and the first stars were massive loners, observers should see the holes created when the stars broke apart the neutral hydrogen atoms.

By using 21-centimeter radiation to pinpoint if and when holes formed and merged, low-frequency radio telescopes such as LOFAR, a set of radio dishes spread across the Netherlands and other parts of Europe, will map out the history of the first stars, says Avi Loeb of the Harvard-Smithsonian Center for Astrophysics in Cambridge, Mass. Such maps should indicate whether the first stars were massive loners after all.

Last year in *Physical Review D*, Loeb and his Harvard-Smithsonian colleague Jonathan Pritchard calculated that even a relatively inexpensive single radio dish that would record the intensity of the 21-centimeter radio emission averaged over the entire sky could indicate when the first stars were born and how quickly they ionized helium and hydrogen atoms by emitting ultraviolet light or X-rays.

Other researchers are attempting to read a fossil record of the elements cast into space by the very first generation of stars. Theorist John Wise of Princeton University and his colleagues are trying to simulate the second generation of stars, dubbed Pop II, which are the first stars that got incorporated into galaxies. Because Pop II stars are small enough to be relatively long-lived, researchers can examine them to see what they inherited from their parents' generation.

"Astronomers are actually able to see Pop II stars in galaxies" and learn about their predecessors, says Wise. In addition to giant, 30-meter ground-based telescopes that astronomers are now planning to build, the James Webb Space Telescope, which researchers hope will launch late this decade, will closely examine Pop II stars from the first galaxies.

But researchers aren't just waiting for Webb to be launched. Astronomers using the European Southern Observatory's Very Large Telescope in Chile are getting a head start by re-examining the surfaces of eight elderly Milky Way stars. The stars are at least 12 billion years old and are probably members of the Pop II generation, Cristina Chiappini of the Leibniz Institute for Astrophysics Potsdam in Germany and her colleagues report in the April 28 *Nature*.

The team found high abundances of two rare, heavy elements--strontium and yttrium--relative to iron. To explain the composition of those

second-generation stars, the researchers propose that the first stars were massive and rotated rapidly, spinning about 250 times faster than the sun. By mixing different layers of nuclear-burning gases, these whirling dervishes could trigger a chain of nuclear reactions that could have produced the high levels of strontium and yttrium.

If the first stars were fast rotators, they would be more likely to end their lives as gamma-ray bursts, Tumlinson notes in a commentary accompanying the Nature article. Such bursts are the most powerful explosions in the universe and would serve as cosmic fireworks that would brilliantly signal the first stars' demise.

The bursts would be the ultimate messengers--death throes that traveled billions of light-years through space to reach Earth. For Loeb, recording those signals would be the thrill of a lifetime. "This is our roots, our origins," he says. The bursts would put humans face to face "with our earliest ancestors, one star at a time."

After the Bang The universe was a quiet place for millions of years after the Big Bang, plunged into darkness when electrons and protons cooled enough to combine into neutral hydrogen atoms. Today, scientists are reconstructing the series of events that led to the first stars, galaxies and ultimately the universe as seen today.

[ILLUSTRATION OMITTED]

0 years Big Bang

[ILLUSTRATION OMITTED]

-17 million years Dark Ages begin; universe is cold and dark

[ILLUSTRATION OMITTED]

100 million years First stars form

[ILLUSTRATION OMITTED]

-200 million years Second generation of stars begins

[ILLUSTRATION OMITTED]

300-500 million years First galaxies of second-generation stars

[ILLUSTRATION OMITTED]

9 billion years Solar system forms

[ILLUSTRATION OMITTED]

13.75 billion years Today

Ron Cowen is a freelance science writer in Maryland.

Explore more

* See simulations of the first stars by Tom Abel and colleagues: www.slac.stanford.edu/~tabel/GB/index.html

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Record - 2

DIALOG(R)

A better space.

Clough, G. Wayne,

Smithsonian, v42, n4, p28(1),

Friday, July 1, 2011

TEXT:

THREE MUSEUMS are by far and away in a league of their own for "world's most-visited museum." Beijing's Palace Museum hosts almost 12 million visitors annually; the Louvre more than eight million; our own National Air and Space Museum, including its Steven F. Udvar-Hazy Center near Washington Dulles International Airport, nearly nine-and-a-half million. Of course just attracting large numbers is not our purpose. Rather we aim to provide a singular and memorable experience to each visitor. In that regard, the Air and Space Museum is about to get even better.

Charles Alcock, who is director of the Harvard-Smithsonian Center for Astrophysics, says he fell in love with space as a child on his first visit to the museum during a trip from his home in New Zealand. He remembers seeing such icons as the Wright Flyer, the Spirit of St. Louis and John Glenn's Mercury Friendship 7 space capsule. As it did for Alcock, the Air and Space Museum inspires awe and imagination in today's visitors. The legendary Lockheed SR-71 Blackbird looks ready to take off on another reconnaissance mission. Viewing the Lockheed Sirius Tingmissartoq that Charles Lindbergh and Anne Morrow Lindbergh flew in the 1930s to chart the flight paths of commercial airlines, you can sense the wonder native people must have experienced seeing their first airplane. Its name derives from an Inuit youth who called it "one who flies like a bird."

How can the museum get any better? Director Jack Dailey and his staff have found a way. In April the Udvar-Hazy Center completed construction of an addition, including the Mary Baker Engen Restoration Hangar where visitors will be able to watch the magic of aircraft restoration--which often starts with planes that come to the museum in parts and pieces.

And the center was recently named as the future home of the space shuttle Discovery in 26-plus years of operation, it logged 148 million miles, an all-time shuttle record. Early next year, NASA will fly Discovery on the back of a specially adapted Boeing 747 to Dulles Airport and deliver it to the center. The 747 will then transport the space shuttle Enterprise, currently on view at the center, to the Intrepid Sea, Air & Space Museum in New York City.

The Udvar-Hazy Center's new addition and the acquisition of Discovery will continue the tradition of inspiring generations of young men and women with the world of flight and the possibilities that are yet to come.

G. WAYNE CLOUGH is Secretary of the Smithsonian Institution.

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Record - 3

DIALOG(R)

In the Orbit of Copernicus.

Gingerich, Owen.

Copernicus, Nicolaus,

American Scholar, p43-9,

Tuesday, July 12, 2011

TEXT:

United States - The writer, professor emeritus of astronomy and of the history of science at Harvard University and a senior astronomer emeritus at the Smithsonian Astrophysical Observatory, discusses how a serendipitous journey through Poland involved the discovery of Copernicus's bones and a reburial ceremony in the great astronomer's native Poland.

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Wolbach Library: CfA in the News ~ Week ending 14 August 2011

1. **Scientists shine light on darkest planet of all**, Orlando Sentinel, CENTRAL FLORIDA ed, pA16, Saturday, August 13, 2011
2. **Darkest known planet 'discovered'**, Indian News, Friday, August 12, 2011
3. **Darkest planet discovered**, Courier Mail (Australia), 1 - First with the news ed, p37, Saturday, August 13, 2011
4. **Rabenschwarzer Planet**, Stuttgarter Zeitung, p14, Saturday, August 13, 2011
5. **Une étrange exoplanete plus noire que le charbon**, ATS, Le Temps, Friday, August 12, 2011
6. **Distant planet darker than coal; Scientists call it 'alien world'**, Windsor Star (Canada), Final ed, pD3, Friday, August 12, 2011
7. **Jupiter-sized 'alien' planet that's blacker than coal discovered**, ANI, Asian News International, Friday, August 12, 2011
8. **Astronomers find darkest planet**, UPI Science News, Thursday, August 11, 2011
9. **Study Data from Harvard-Smithsonian Center for Astrophysics Update Knowledge of Astronomy Research**, Science Letter, p972, Tuesday, August 16, 2011

Record - 1

DIALOG(R)

Scientists shine light on darkest planet of all,
Orlando Sentinel, CENTRAL FLORIDA ed, pA16,
Saturday, August 13, 2011

TEXT:

Scientists shine light on darkest planet of all

Astronomers say they've uncovered the darkest world known, a planet blacker than coal that absorbs 99 percent of the light its star sends its way.

TrES-2b, a Jupiter-size gas giant, has a temperature of about 1,800 degrees

and is about 750 light-years from Earth.

"TrES-2b is considerably less reflective than black acrylic paint, so it's truly an alien world," astronomer David Kipping of the Harvard-Smithsonian Center for Astrophysics said in a news release.

COLUMN: World briefing

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Record - 2

DIALOG(R)

Darkest known planet 'discovered',

Indian News,

Friday, August 12, 2011

TEXT:

London, August 12 2011 (PTI) -- Astronomers have discovered what they claim is the darkest known planet -- a distant, Jupiter- sized gas giant known as TrES-2b.

An international team says that the exoplanet reflects less than one per cent of light, which makes it blacker than coal or any planet or moon in our solar system, the 'Monthly Notices of the Royal Astronomical Society' reported.

"TrES-2b is considerably less reflective than black acrylic paint, so it's truly an alien world," said David Kipping of Harvard-Smithsonian Center for Astrophysics, who led the team which made the discovery by analysing data from NASA's Kepler spacecraft.

TrES-2b, a gas exoplanet roughly the size of Jupiter, is around 750 light years away and was discovered in 2006 by the Trans-Atlantic Exoplanet Survey. It orbits its star at a distance of only five million kilometres.

It orbits the star GSC 03549-02811 located about 750 lightyears away in the direction of the constellation Draco.

The exoplanet lacks reflective clouds due to its high temperature. Instead, its exotic atmosphere contains light- absorbing chemicals like vaporized sodium and potassium, or gaseous titanium oxide. Yet none of these chemicals fully explain the extreme blackness of TrES-2b.

"It's not clear what is responsible for making this planet so

extraordinarily dark. However, it's not completely pitch black. It's so hot that it emits a faint red glow, much like a burning ember or the coils on an electric stove," team member David Spiegel of Princeton University said. (MORE) PTI MOT MOT 08121459

(THROUGH ASIA PULSE)

12-08 2011

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Record - 3

DIALOG(R)

Darkest planet discovered,
Courier Mail (Australia), 1 - First with the news ed, p37,
Saturday, August 13, 2011

TEXT:

DARK and foreboding has a new benchmark. TrES-2b, a Jupiter-sized gas planet orbiting a distant star, is darker than coal, reflecting less than 1 per cent of sunlight, according to the Harvard-Smithsonian Centre for Astrophysics.

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Record - 4

DIALOG(R)

Rabenschwarzer Planet,
Stuttgarter Zeitung, p14,
Saturday, August 13, 2011

TEXT:

Astronomie Er glimmt wie ein Stuck Holzkohle, ansonsten schluckt er fast das ganze Licht: Noch ist ein Ratsel, warum TrES-2b so dunkel ist.

US-Astronomen haben im Sternbild Drache den bisher dunkelsten Planeten entdeckt. Die ferne Welt mit der Katalognummer TrES-2b ist schwarzer als Kohle, berichten die Forscher im britischen Fachblatt "Monthly Notices of the Royal Astronomical Society". Der Planet, der etwa so gross ist wie der Jupiter, reflektiert nur ein Prozent des einfallenden Lichts. Zum

Vergleich: der Jupiter, grösster Planet im Sonnensystem, reflektiert mehr als 30 Prozent. TrES-2b zählt zu den Exoplaneten, wie die Planeten genannt werden, die ferne Sterne umkreisen.

"TrES-2b reflektiert wesentlich schwächer als schwarze Acrylfarbe, er ist also wahrhaftig eine fremde Welt", wird David Kipping vom Harvard-Smithsonian Center for Astrophysics in einer Mitteilung zitiert. Was den rund 750 Lichtjahre entfernten Exoplaneten so ausserordentlich schwarz mache, sei bislang nicht klar, erläutert Kippings Co-Autor David Spiegel von der Princeton-Universität. "Allerdings ist er nicht stockfinster. Er ist so heiss, dass er schwach wie ein Stück Holzkohle glimmt oder wie eine Heizschlange im E-Herd.

TrES-2b umrundet seinen Heimatstern in nur rund fünf Millionen Kilometer Abstand, das ist 30-mal näher am Stern, als die Erde der Sonne nahe kommt. In dieser kurzen Distanz erhitzt sich der Exoplanet auf mehr als 1000 Grad Celsius, schreiben die Astronomen. Sie hatten mit dem Nasa-Weltraumteleskop Kepler beobachtet, wie der Planet um seine Sonne kreist.

Dabei konnten sie winzige Helligkeitsschwankungen messen, die sich auf die unterschiedlich stark beleuchtete Fläche des Planeten zurückführen lassen. TrES-2b wendet seinem Zentralgestirn stets dieselbe Seite zu. Die Helligkeit änderte sich lediglich um 0,0006 Prozent - die kleinsten Helligkeitsschwankungen, die je bei einem Exoplaneten nachgewiesen wurden, wie die Wissenschaftler betonen. Diese winzige Fluktuation belege, dass der Planet ausserordentlich schwarz sei. Bei einer stärker reflektierenden Welt hätte die Helligkeit deutlicher geschwankt.dpa

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Record - 5

DIALOG(R)

Une étrange exoplanète plus noire que le charbon,

ATS,

Le Temps,

Friday, August 12, 2011

TEXT:

Cet étrange monde, TrES-2b, qui est de la taille de Jupiter, est composé de gaz, contrairement à la Terre ou Mars, qui sont des planètes rocheuses, selon les auteurs de l'étude. Son orbite est proche de l'étoile GSC 03549-02811, située à 750 années-lumière dans la direction de la constellation de Draco le dragon.

<<TrES-2b a un pouvoir reflechissant considerablement moins fort que de la peinture acrylique noire. C'est donc vraiment un monde etranger>>, a indique David Kipping du Harvard-Smithsonian Center for Astrophysics cite dans un communique de la RAS.

Reperee pour la premiere fois il y a cinq ans, TrES-2b tourne autour de son etoile a une distance de cinq millions de kilometres. C'est tres proche compare a la distance de 150 millions de kilometres entre la Terre et le Soleil. La chaleur est telle que l'atmosphere de cette exoplanete pourrait etre chauffee a plus de 1000 degres Celsius.

Les astronomes ont detecte la presence de matieres chimiques absorbant la lumiere comme du sodium vaporise et de l'oxyde de potassium ou de l'oxyde de titane. Mais aucune de ces substances ne peut expliquer l'obscurite de cette exoplanete plus forte que sur toute autre planete ou lune de notre systeme solaire. TrES-2b, comme notre Lune, serait bloquee par une force gravitationnelle qui fait qu'elle ne presente qu'une seule face a son etoile.

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Record - 6

DIALOG(R)

Distant planet darker than coal; Scientists call it 'alien world',

Windsor Star (Canada), Final ed, pD3,

Friday, August 12, 2011

TEXT:

PARIS - A planet orbiting a distant star is darker than coal, reflecting less than one per cent of the sunlight falling on it, according to a paper published on Thursday.

The strange world, TrES-2b, is a gas giant the size of Jupiter, rather than a solid, rocky body like Earth or Mars, astronomers said.

It closely orbits the star GSC 03549-02811, located about 750 light years away in the direction of the constellation of Draco the Dragon.

"TrES-2b is considerably less reflective than black acrylic paint, so it's truly an alien world," David Kipping of the Harvard-Smithsonian Center for Astrophysics said in a press release issued by Britain's Royal Astronomical Society (RAS). First spotted five years ago, TrES-2b races around its star

at a distance of just five million kilometres. This is scorchingly close when compared to Earth's 150-million-kilometre distance from the Sun and Jupiter's 778 million kilometres.

So fierce is the heat that the exoplanet's atmosphere is cooked to more than 1,000 C.

Signatures from its atmosphere point to the presence of light-absorbing chemicals like vaporized sodium and potassium or titanium oxide.

But none of these substances can explain the planet's darkness, which is more extreme than any planet or moon in our own Solar System. "It's not clear what is responsible for making this planet so extraordinarily dark," said David Spiegel of Princeton University. "However, it's not completely pitch black.

"It's so hot that it emits a faint red glow, much like a burning ember or the coils on an electric stove."

More than 500 extrasolar planets have been identified since 1995. TrES-2b, like our Moon, is believed to be locked by gravitational tide, presenting only one face to its star.

The study, published in the RAS journal Monthly Notices, used NASA's orbiting Kepler spacecraft to make the observations.

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Record - 7

DIALOG(R)

Jupiter-sized 'alien' planet that's blacker than coal discovered,

ANI,

Asian News International,

Friday, August 12, 2011

TEXT:

Washington, Aug 12 (ANI): Astronomers have discovered the darkest known exoplanet in the galaxy that is blacker than coal or any planet or moon in our solar system.

Known as TrES-2b, the distant, Jupiter-sized gas giant reflects less than one percent of the sunlight falling on it.

Scientists used NASA's Kepler spacecraft to make the observations.

"TrES-2b is considerably less reflective than black acrylic paint, so it's truly an alien world," said lead researcher David Kipping of the Harvard-Smithsonian Center for Astrophysics (CfA). TrES-2b, discovered in 2006 by the Trans-Atlantic Exoplanet Survey, or TrES, lacks reflective clouds due to its high temperature.

It orbits its star at a distance of only three million miles. The star's intense light heats TrES-2b to a temperature of more than 1,800 degrees Fahrenheit.

The researchers propose that light-absorbing chemicals such as vaporized sodium and potassium or gaseous titanium oxide in the planet's atmosphere could help explain why it is so dark. Yet none of these chemicals fully explain the extreme blackness of TrES-2b.

"It's not clear what is responsible for making this planet so extraordinarily dark," stated co-author David Spiegel of Princeton University.

"However, it's not completely pitch black. It's so hot that it emits a faint red glow, much like a burning ember or the coils on an electric stove," he added.

TrES-2b is believed to be tidally locked like our moon, so one side of the planet always faces the star. And like our moon, the planet shows changing phases as it orbits its star. This causes the total brightness of the star plus planet to vary slightly.

"By combining the impressive precision from Kepler with observations of over 50 orbits, we detected the smallest-ever change in brightness from an exoplanet: just 6 parts per million," said Kipping.

"In other words, Kepler was able to directly detect visible light coming from the planet itself."

The extremely small fluctuations proved that TrES-2b is incredibly dark.

TrES-2b orbits the star GSC 03549-02811, which is located about 750 light-years away in the direction of the constellation Draco. (ANI)

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Record - 8

DIALOG(R)

Astronomers find darkest planet,

UPI Science News,

Thursday, August 11, 2011

TEXT:

U.S. astronomers say they've discovered the darkest known exoplanet, a distant gas giant blacker than coal or any planet or moon in our solar system.

Scientists at the Harvard-Smithsonian Center for Astrophysics say the Jupiter-sized planet, TrES-2b, reflects less than 1 percent of the sunlight falling on it.

"TrES-2b is considerably less reflective than black acrylic paint, so it's truly an alien world," astronomer David, lead author on the paper reporting the research, said.

TrES-2b orbits at a distance of 3 million miles from its star, which heats the planet to more than 1,800 degrees Fahrenheit, creating an exotic atmosphere containing light-absorbing chemicals like vaporized sodium and potassium, or gaseous titanium oxide.

Yet none of these chemicals fully explain the extreme blackness of TrES-2b, astronomers say.

"It's not clear what is responsible for making this planet so extraordinarily dark," co-author David Spiegel of Princeton University, says. "However, it's not completely pitch black. It's so hot that it emits a faint red glow, much like a burning ember or the coils on an electric stove."

TrES-2b is located about 750 light-years from Earth in the direction of the constellation Draco.

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Record - 9

DIALOG(R)

Study Data from Harvard-Smithsonian Center for Astrophysics Update Knowledge of Astronomy Research,

Science Letter, p972,
Tuesday, August 16, 2011

TEXT:

"We present a method for subtracting point sources from interferometric radio images via forward modelling of the instrument response and involving an algebraic non-linear minimization. The method is applied to simulated maps of the Murchison Wide-field Array but is generally useful in cases where only image data are available," scientists in Cambridge, Massachusetts report (see also).

"After source subtraction, the residual maps have no statistical difference to the expected thermal noise distribution at all angular scales, indicating high effectiveness in the subtraction. Simulations indicate that the errors in recovering the source parameters decrease with increasing signal-to-noise ratio, which is consistent with the theoretical measurement errors. In applying the technique to simulated snapshot observations with the Murchison Wide-field Array, we found that all 101 sources present in the simulation were recovered with an average position error of 10 arcsec and an average flux density error of 0.15 per cent. This led to a dynamic range increase of approximately 3 orders of magnitude. Since all the sources were deconvolved jointly, the subtraction was not limited by source sidelobes but by thermal noise," wrote G. Bernardi and colleagues, Harvard-Smithsonian Center for Astrophysics.

The researchers concluded: "This technique is a promising deconvolution method for upcoming radio arrays with a huge number of elements and a candidate for the difficult task of subtracting foreground sources from observations of the 21-cm neutral hydrogen signal from the epoch of reionization."

Bernardi and colleagues published their study in *Monthly Notices of the Royal Astronomical Society* (Subtraction of point sources from interferometric radio images through an algebraic forward modelling scheme. *Monthly Notices of the Royal Astronomical Society*, 2011;413(1):411-422).

For additional information, contact G. Bernardi, Harvard Smithsonian Center Astrophysics, Garden St. 60, Cambridge, MA 02138, United States.

The publisher's contact information for the journal *Monthly Notices of the Royal Astronomical Society* is: Wiley-Blackwell, Commerce Place, 350 Main St., Malden 02148, MA, USA.

Wolbach Library: CfA in the News ~ Week ending 21 August 2011

1. **The Milky Way's new arm pieces.**, Sky & Telescope, v122, n3, p14(1), Thursday, September 1, 2011
2. **A plea for SAO numbers.**, Fisher, Kurt A., Sky & Telescope, v122, n3, p8(1), Thursday, September 1, 2011

Record - 1

DIALOG(R)

The Milky Way's new arm pieces.,
Sky & Telescope, v122, n3, p14(1),
Thursday, September 1, 2011

TEXT:

Every portrayal of how our Milky Way Galaxy would look from the outside involves a lot of guessing. That's because we're inside the galaxy's dust-ridden disk, which blocks our view of its distant reaches. Radio, infrared, and other techniques have fleshed out a lot of the picture, but the far side of the Milky Way remains especially poorly known.

[ILLUSTRATION OMITTED]

A few years ago, Robert Benjamin (University of Wisconsin) and others used NASA's Spitzer Space Telescope to deduce that our galaxy has just two main spiral arms, not four as had been thought; the other two arms are weaker. The main ones, the Scutum-Centaurus and Perseus arms, appear to connect up nicely with the ends of our galaxy's central bar. The Sun lies along a minor offshoot known as the Orion Spur. Scutum-Centaurus passes between us and the galactic center; Perseus is on the other side of us, farther out.

But there's been little hard evidence to prove that the galaxy's two majestically sweeping arms continue around to its far side--until now. Thomas Dame and Patrick Thaddeus (Harvard-Smithsonian Center for Astrophysics) traced millimeter-wave emission from the carbon monoxide (CO) in giant molecular clouds to identify an arm segment on the far side's outer margin, roughly 50,000 light-years from the Milky Way's center. It's about 60,000 light-years long. Dame and Thaddeus think this is the distant end of the Scutum-Centaurus arm, which would mean that the entire arc is

more than 200,000 light-years long and wraps more than 300[degrees] around the galactic center.

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Record - 2

DIALOG(R)

A plea for SAO numbers.

Fisher, Kurt A.

Sky & Telescope, v122, n3, p8(1),

Thursday, September 1, 2011

TEXT:

James Mullaney's article "Double Stars of Summer" illustrates a common problem: the lack of Smithsonian Astrophysical Observatory (SAO) numbers for stars (July issue, page 40). Amateur astronomy continues to decline despite advances in technology, and two probable causes are light pollution and lack of leisure time. Modern Go To telescopes overcome the problems of star hopping in a light-polluted environment, and the controllers of most Go To mounts index stars by SAO number. Typical amateurs don't have the half hour needed to look up the SAO numbers. I think the hobby would certainly benefit and expand if you simply included the SAO numbers for all the stars in your tables, as well as nearby "synch stars" for deep-sky objects.

Kurt A. Fisher

Salt Lake City, Utah

Editor's note: Several readers have expressed this concern. The underlying problem is that so many Go To controllers offer no way to locate stars by their most common designations, such as Bayer letters, Flamsteed numbers, and Struve numbers. We keep hoping that Go To manufacturers will rectify this deficiency. But as things stand, there's no doubt that we would save many readers time by including SAO numbers. The trick is doing so without taking up an inordinate amount of space in the magazine. We discontinued page references to popular star atlases some years ago for precisely that reason. Meanwhile, almost all Go To controllers allow you to locate objects by right ascension and declination--the one genuinely universal reference system. That's one of the many reasons that we supply R.A. and Dec. in all our tables. We are curious what other readers have to say on this subject.

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Wolbach Library: CfA in the News ~ Week ending 28 August 2011

1. **Giant black hole caught shredding a star to pieces.**, PTI - The Press Trust of India Ltd., Thursday, August 25, 2011
2. **NASA's Swift Satellite Spots Black Hole Devouring a Star**, PR Newswire, Wednesday, August 24, 2011
3. **Black hole caught grabbing a starry treat**, Korea Times, Thursday, August 25, 2011
4. **Supermassive black hole is seen swallowing a star**, Amina Khan, Los Angeles Times, Home Edition ed, p12, Thursday, August 25, 2011
5. **NASA's Swift satellite spots 'dormant' black hole devouring a star**, ANI, Asian News International, Thursday, August 25, 2011
6. **DISTANT BLACK HOLE DISCOVERED DEVOURING SUN-LIKE STAR**, US Federal News, Wednesday, August 24, 2011
7. **Star is lunch for distant black hole**, Amina Khan, Tribune Newspapers, Chicago Tribune, Chicagoland Final ed, p20, Thursday, August 25, 2011
8. **Astronomers say they have witnessed star being consumed by black hole**, Los Angeles Times, Waterloo Region Record, v2011082517187309, First ed, pA10 Thursday, August 25, 2011
9. **Amazed scientists watch as black hole tears star to pieces; First time such an event has been recorded**, Amina Khan, Vancouver Sun (Canada), Final CC ed, pB10 Thursday, August 25, 2011
10. **Rare cosmic event detected**, UPI Science News, Wednesday, August 24, 2011
11. **United States: 'Darkest Planet' Baffles Astronomers**, Thai News Service, Thursday, August 25, 2011
12. **'Darkest Planet' Baffles Astronomers**, VOA News, Voice of America, Tuesday, August 23, 2011
13. **Unity strives for 'greenest campus ever'**, BETH STAPLES Morning Sentinel, Portland Press Herald, Final ed, pB3, Monday, August 22, 2011

Record - 1

DIALOG(R)

Giant black hole caught shredding a star to pieces.

PTI - The Press Trust of India Ltd.

Thursday, August 25, 2011

TEXT:

Giant black hole caught shredding a star to pieces

London, August 25 2011 (PTI) -- For the first time, astronomers have observed a stunning cosmic jet from a super-massive black hole which shredded and then swallowed a luckless star.

The extremely rare phenomenon caused by stellar debris being consumed by the hole has never been observed before. It is known as "relativistic jets" and can reach hundreds of thousands of light years in length.

According to scientists, most galaxies have super-massive black holes -- regions of space that suck in everything nearby with their strong gravitation pull - at their core with masses of millions or even billions of suns, the Daily Mail reported.

Scientists were first alerted to the latest phenomenon in March after NASA's Swift telescope detected several bursts of X-rays from a quiet patch of sky.

Closer observations by a team from the Pennsylvania State University and the Harvard-Smithsonian Center for Astrophysics in Massachusetts revealed that the bursts were the remnants of a star pulled apart when it came too close to a black hole located 3.9 billion light years away.

Dr David Burrows, from Pennsylvania State University which controls Swift, said chemical analysis of the bright flash's ultraviolet light show it comes from material being sucked into a black hole the size of a million suns.

Writing in Nature, the team said that the Swift satellite just happened to be in the path of the jet of star remains that were shot out at 99.5 per cent the speed of light.

"Incredibly, this source is still producing X-rays and may remain bright enough for the Swift satellite to observe into next year. It behaves unlike anything we've seen before," said Dr Burrows.

Record - 2

DIALOG(R)

NASA's Swift Satellite Spots Black Hole Devouring a Star,

PR Newswire,

Wednesday, August 24, 2011

TEXT:

WASHINGTON, Aug. 24, 2011 /PRNewswire-USNewswire/ -- Two studies appearing in the Aug. 25 issue of the journal Nature provide new insights into a cosmic accident that has been streaming X-rays toward Earth since late March. NASA's Swift satellite first alerted astronomers to intense and unusual high-energy flares from the new source in the constellation Draco.

(Logo:)

"Incredibly, this source is still producing X-rays and may remain bright enough for Swift to observe into next year," said David Burrows, professor of astronomy at Penn State University and lead scientist for the mission's X-Ray Telescope instrument. "It behaves unlike anything we've seen before."

Astronomers soon realized the source, known as Swift J1644+57, was the result of a truly extraordinary event -- the awakening of a distant galaxy's dormant black hole as it shredded and consumed a star. The galaxy is so far away, it took the light from the event approximately 3.9 billion years to reach earth.

Burrows' study included NASA scientists. It highlights the X- and gamma-ray observations from Swift and other detectors, including the Japan-led Monitor of All-sky X-ray Image (MAXI) instrument aboard the International Space Station.

The second study was led by Ashley Zauderer, a post-doctoral fellow at the Harvard-Smithsonian Center for Astrophysics in Cambridge, Mass. It examines the unprecedented outburst through observations from numerous ground-based radio observatories, including the National Radio Astronomy Observatory's Expanded Very Large Array (EVLA) near Socorro, N.M.

Most galaxies, including our own, possess a central supersized black hole weighing millions of times the sun's mass. According to the new studies, the black hole in the galaxy hosting Swift J1644+57 may be twice the mass of the four-million-solar-mass black hole in the center of the Milky Way galaxy. As a star falls toward a black hole, it is ripped apart by intense tides. The gas is corralled into a disk that swirls around the black hole and becomes rapidly heated to temperatures of millions of degrees. The innermost gas in the disk spirals toward the black hole, where rapid

motion and magnetism create dual, oppositely directed "funnels" through which some particles may escape. Jets driving matter at velocities greater than 90 percent the speed of light form along the black hole's spin axis. In the case of Swift J1644+57, one of these jets happened to point straight at Earth.

"The radio emission occurs when the outgoing jet slams into the interstellar environment," Zauderer explained. "By contrast, the X-rays arise much closer to the black hole, likely near the base of the jet."

Theoretical studies of tidally disrupted stars suggested they would appear as flares at optical and ultraviolet energies. The brightness and energy of a black hole's jet is greatly enhanced when viewed head-on. The phenomenon, called relativistic beaming, explains why Swift J1644+57 was seen at X-ray energies and appeared so strikingly luminous.

When first detected March 28, the flares were initially assumed to signal a gamma-ray burst, one of the nearly daily short blasts of high-energy radiation often associated with the death of a massive star and the birth of a black hole in the distant universe. But as the emission continued to brighten and flare, astronomers realized that the most plausible explanation was the tidal disruption of a sun-like star seen as beamed emission.

By March 30, EVLA observations by Zauderer's team showed a brightening radio source centered on a faint galaxy near Swift's position for the X-ray flares. These data provided the first conclusive evidence that the galaxy, the radio source and the Swift event were linked.

"Our observations show that the radio-emitting region is still expanding at more than half the speed of light," said Edo Berger, an associate professor of astrophysics at Harvard and a coauthor of the radio paper. "By tracking this expansion backward in time, we can confirm that the outflow formed at the same time as the Swift X-ray source."

Swift, launched in November 2004, is managed by NASA's Goddard Space Flight Center in Greenbelt, Md. It is operated in collaboration with Penn State, the Los Alamos National Laboratory in N.M. and Orbital Sciences Corp., in Dulles, Va., with international collaborators in the U.K., Italy, Germany and Japan. MAXI is operated by the Japan Aerospace Exploration Agency as an external experiment attached to the Kibo module of the space station. For images related to the studies, visit:

SOURCE NASA

CONTACT: Trent J. Perrotto, Headquarters, Washington , +1-202-358-0321, trent.j.perrotto@nasa.gov, or Lynn Chandler, Goddard Space Flight Center,

Greenbelt, Md., +1-301-286-2806, lynn.chandler-1@nasa.gov
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Record - 3

DIALOG(R)

Black hole caught grabbing a starry treat,
Korea Times,
Thursday, August 25, 2011

TEXT:

A giant black hole has been caught with its hand in the proverbial cookie jar, in the earliest stages of ripping apart and consuming a star.

On 28 March, NASA's Swift telescope detected several bright bursts of X-rays coming from a patch of the sky where no X-rays had been detected before.

Now two teams, one led by David Burrows of Pennsylvania State University in University Park and the other by Ashley Zauderer of the Harvard-Smithsonian Center for Astrophysics in Cambridge, Massachusetts, say the bursts were probably chunks of a star that was dismembered when it wandered too close to a black hole located 4.5 billion light years away.

Since the star was orbiting the black hole before it was ripped apart, its remains continue to swirl around the hole, which weighs a million suns, as they gradually get swallowed up. This "chewing" had been predicted theoretically and has possibly been seen around other black holes in the past.

The new observations now show that some of the star's remains were spewed out in a jet at 99.5 per cent the speed of light. Swift just happened to be lying directly in the jet's path, so it was able to make the first ever measurements of such a jet switching on.

The jet is narrow, says Burrows: "If it happens to be pointed at you, you see it, but if not, you miss it." Tracking how long the jet persists could reveal the stellar victim's mass and its original orbital distance, he adds.

"We think we're still seeing emission from the jet," Burrows says. "It probably takes at least months for the star to finish getting swallowed up in the black hole."

Davide Lazzati at North Carolina State University in Raleigh says finding

other such outbursts could help reveal the density of stars in the central regions of galaxies, where colossal black holes like this one live. (New Scientist) [ZZ]

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Record - 4

DIALOG(R)

Supermassive black hole is seen swallowing a star,

Amina Khan,

Los Angeles Times, Home Edition ed, p12,

Thursday, August 25, 2011

TEXT:

Correction Data

For The Record

Los Angeles Times Friday, August 26, 2011 Home Edition Main News Part A
Page 4 News Desk 1 inches; 51 words Type of Material: Correction

Black hole research: An article in the Aug. 25 Section A about new research concerning a supermassive black hole seen swallowing a star included an artist's rendering of the event. The image, which was credited to Amadeo Bachar of Nature, should have been credited to Aurore Simonnet of Sonoma State University.

For the first time, astronomers say they've borne witness to a supermassive black hole consuming a star.

Two papers released Wednesday by the journal Nature describe powerful blasts of radiation whose brightness and behavior can be explained only by a sun-sized star being torn apart by the gravitational forces of a black hole at the center of its galaxy, the authors say.

Scientists believe they have seen the aftermath of such stellar violence before, in the form of fading glows emanating from distant galaxies, in whose centers supermassive black holes usually reside. But they had never caught one in the act.

"This was the first time we saw one of these big black holes going from quiet and silent to very loud and noisy, producing a lot of light and radiation," said Davide Lazzati, an astrophysicist at North Carolina State University who was not involved in the study.

On March 28, a detector on the Earth-orbiting Swift observatory picked up a sudden burst of radiation from a point in the constellation Draco, 4.5 billion light-years away. It automatically swiveled around to point its X-ray telescope toward the odd activity.

As is routine, it beamed a text message down to hundreds of astronomers, including the X-ray telescope's lead scientist, Pennsylvania State University astrophysicist David Burrows, who was lead author of one of the Nature reports. He and several other Swift astronomers set up a conference call to discuss the discovery.

Swift was designed to quickly pick up evidence of gamma-ray bursts and track the high-energy X-rays that follow on the heels of them. These usually are one-time shots of high-energy radiation caused as a star explodes into a supernova, followed by less energetic "afterglow" radiation.

But before the scientists had even hung up their phones, they received a second text: Another burst of radiation had occurred at the same spot.

Two more bright bursts were to follow before the next day was over.

The researchers soon realized that what they were witnessing was too bright to have come from a supernova, which is a common fate for a dying star.

In addition, the patterns of higher- and lower-energy radiation emitted over the days that followed didn't match well any other space phenomena, such as smaller black holes or spinning neutron stars.

Ashley Zauderer, an astronomer at the Harvard-Smithsonian Center for Astrophysics who led the second study, which focused on the radio wave emissions, recalled thinking, "This is crazy."

"I didn't believe it," she said. "I called a colleague and said, 'Will you make sure I didn't make a mistake? Look at this data; it's too bright.' "

Zauderer's radio-wave study mapped the location of the burst to the center of the galaxy, right where a black hole ought to be.

The researchers concluded that the strength and recurrence of what they were seeing could best be explained by a supermassive black hole ripping a star apart and shooting out a jet of radiation in the process.

How did it happen? The team's theory is that a star about the same size as our sun ended up too close to the black hole. The black hole exerts a powerful gravitational pull -- it contains the mass of about a million suns

-- and that caused the side of the star nearest the black hole to stretch toward it, in much the same way that the moon causes the tides on Earth.

Eventually, the gravitational forces shredded the star, and chunks of its plasma streamed toward the black hole. But in the process, some of the material was expelled into a jet of high-energy radiation.

That jet was likely responsible for the mysterious burst astronomers picked up in March.

Burrows estimates that within a few months as much as one-fifth of the mangled star's mass might have been swallowed by the black hole.

The astronomers were lucky to witness the event. It so happened that the jet of radiation was blasting straight toward the Swift spacecraft, like a flashlight beamed in the face.

The likelihood of seeing another star get swallowed up is slim, Burrows said, but that won't keep the team from looking -- especially now that they have an idea of what to look for.

"It might happen once every 10,000 years in a galaxy with a supermassive black hole in the center," Burrows said. "But there are a lot of galaxies out there in the sky."

--

amina.khan@latimes.com

PHOTO: A STAR IS TORN: An artist's rendering shows a bright burst of radiation released when a supermassive black hole pulls in a star and shreds it.

PHOTOGRAPHER: Amadeo Bachar Nature

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Record - 5

DIALOG(R)

NASA's Swift satellite spots 'dormant' black hole devouring a star,

ANI,

Asian News International,

Thursday, August 25, 2011

TEXT:

London, Aug 25 (ANI): NASA's Swift satellite have spotted a truly extraordinary event, the awakening of a distant galaxy's dormant black hole as it shredded and consumed a star.

Two new studies provide new insights into a cosmic accident that has been streaming X-rays toward Earth since late March.

NASA's Swift satellite first alerted astronomers to intense and unusual high-energy flares from the new source in the constellation Draco.

"Incredibly, this source is still producing X-rays and may remain bright enough for Swift to observe into next year," said David Burrows, professor of astronomy at Penn State University and lead scientist for the mission's X-Ray Telescope instrument.

"It behaves unlike anything we've seen before," he stated,

Astronomers soon realized the source, known as Swift J1644+57, was the result of the awakening of a distant galaxy's dormant black hole as it shredded and consumed a star.

The galaxy is so far away that it took the light from the event approximately 9 billion years to reach Earth.

The second study was led by Ashley Zauderer, a post-doctoral fellow at the Harvard-Smithsonian Centre for Astrophysics in Cambridge, Mass.

It examines the unprecedented outburst through observations from numerous ground-based radio observatories, including the National Radio Astronomy Observatory's Expanded Very Large Array (EVLA) near Socorro, N.M.

According to the new studies, the black hole in the galaxy hosting Swift J1644+57 may be twice the mass of the four-million-solar-mass black hole in the centre of the Milky Way galaxy.

The studies were reported in the Aug. 25 issue of the journal Nature. (ANI)
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Record - 6

DIALOG(R)

DISTANT BLACK HOLE DISCOVERED DEVOURING SUN-LIKE STAR,

US Federal News,
Wednesday, August 24, 2011

TEXT:

UNIVERSITY PARK, Pa., Aug. 24 -- Pennsylvania State University issued the following news release:

Two studies in the Aug. 25 issue of the journal *Nature* provide new insights into a cosmic accident that has been streaming X-rays toward Earth since late March. The X-rays are being produced by a distant black hole as it slowly devours a Sun-like star. "Incredibly, this source is still producing X-rays and may remain bright enough for the Swift satellite to observe into next year. It behaves unlike anything we've seen before," said David Burrows, professor of astronomy at Penn State University and the lead scientist for the Swift observatory's X-Ray Telescope instrument.

NASA's Swift satellite, which is controlled by Penn State from the Mission Operations Center near the University Park campus, was the first to alert astronomers to the intense and unusual high-energy flares from this new source in the constellation Draco. Astronomers soon realized that the source, which is now known as Swift J1644+57, was the result of a truly extraordinary event -- the awakening of a distant galaxy's dormant black hole as it shredded and consumed an errant star. The galaxy is so far away that the light from the blast has traveled 3.9 billion years before reaching Earth.

Burrows led the team that produced one of the *Nature* papers about the unusual object. This paper highlights the X-ray and gamma-ray observations from Swift and other detectors, including the Japan-led Monitor of All-sky X-ray Image (MAXI) instrument aboard the International Space Station. The team led by Burrows includes scientists from NASA and other institutions in the United States, United Kingdom, Italy, Japan, Taiwan, and the Republic of Korea.

The second study, led by Ashley Zauderer, a post-doctoral fellow at the Harvard-Smithsonian Center for Astrophysics (CfA) in Cambridge, Mass., examines the unprecedented outburst through observations from numerous ground-based radio observatories, including the National Radio Astronomy Observatory's Expanded Very Large Array (EVLA), a Y-shaped configuration of telescopes near Socorro, N.M.

Most galaxies, including our own, possess a central, super-sized black hole that is millions of times the Sun's mass. According to the new studies, the black hole in the galaxy hosting Swift J1644+57 may be twice the mass of the black hole lurking at the center of our own Milky Way galaxy.

As a star falls toward a black hole, it is ripped apart by intense tides. The gas is corralled into an accretion disk that swirls around the black hole and becomes rapidly heated to temperatures of millions of degrees. The innermost gas in the disk spirals toward the black hole, where rapid motion and magnetism create dual, oppositely directed "funnels" through which some particles may escape. Jets driving matter at velocities greater than 90 percent the speed of light form along the black hole's spin axis. In the case of Swift J1644+57, one of these jets happened to point straight at Earth.

When first detected March 28, the flares initially were assumed to signal a gamma-ray burst, one of the nearly daily short blasts of high-energy radiation often associated with the death of a massive star and the birth of a black hole in the distant universe. But as the emission continued to brighten and flare, astronomers realized that the most plausible explanation was the tidal disruption of a Sun-like star seen as emission beamed toward Earth.

The brightness and energy of a black hole's jet is greatly enhanced when viewed head-on. The phenomenon, called relativistic beaming, explains why Swift J1644+57 was seen at X-ray energies and appeared so strikingly luminous, even though theoretical studies of tidally disrupted stars suggested they would appear as flares at the comparatively lower optical and ultraviolet energies.

By March 30, EVLA observations by Zauderer's team showed a brightening radio source centered on a faint galaxy near Swift's position for the X-ray flares. These data provided the first conclusive evidence that the galaxy, the radio source, and the Swift event were linked. "The radio emission occurs when the outgoing jet slams into the interstellar environment," Zauderer explained. "By contrast, the X-rays arise much closer to the black hole, likely near the base of the jet."

"Our observations show that the radio-emitting region is still expanding at more than half the speed of light," said Edo Berger, an associate professor of astrophysics at Harvard and a coauthor of the radio paper. "By tracking this expansion backward in time, we can confirm that the outflow formed at the same time as the Swift X-ray source."

Swift, launched in November 2004, is managed by NASA's Goddard Space Flight Center in Maryland. It is operated in collaboration with Penn State University in Pennsylvania, the Los Alamos National Laboratory in New Mexico, and Orbital Sciences Corporation in Virginia, with international collaborators in the United Kingdom, Italy, Germany and Japan. MAXI is operated by the Japan Aerospace Exploration Agency as an external experiment attached to the Kibo module of the space station.

To see an animation associated with this story, visit <http://goo.gl/purm0> online. To see images associated with the story, visit <http://live.psu.edu/flickrset/72157627385416677> online.

For more information, contact David Burrows at Penn State University, at 814-863 2466 or burrows@astro.psu.edu, or Barbara Kennedy, Penn State Science PIO, at 814-863-4682 or science@psu.edu. For any query with respect to this article or any other content requirement, please contact Editor at htsyndication@hindustantimes.com

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Record - 7

DIALOG(R)

Star is lunch for distant black hole,

Amina Khan, Tribune Newspapers,
Chicago Tribune, Chicagoland Final ed, p20,
Thursday, August 25, 2011

TEXT:

LOS ANGELES - For the first time ever, astronomers say they've borne witness to a supermassive black hole consuming a star.

Two papers released Wednesday by the journal Nature describe powerful blasts of radiation whose brightness and behavior can be explained only by a sun-size star being torn apart by the gravitational forces of a black hole at the center of its galaxy, the authors say.

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"This was the first time we saw one of these big black holes going from quiet and silent to very loud and noisy, producing a lot of light and radiation," said Davide Lazzati, an astrophysicist at North Carolina State University who was not involved in the study.

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As is routine, it beamed a text message down to hundreds of astronomers,

including the X-ray telescope's lead scientist, Pennsylvania State University astrophysicist David Burrows, who was lead author of one of the Nature reports. He and several other Swift astronomers set up a conference call to discuss the discovery.

Swift was designed to quickly pick up evidence of gamma-ray bursts and track the high-energy X-rays that follow on the heels of them. These usually are one-time shots of high-energy radiation caused as a star explodes into a supernova, followed by less energetic "afterglow" radiation.

But before the scientists had even hung up their phones, they received a second text: Another burst of radiation had occurred at the same spot. Two more bright bursts were to follow before the next day was over.

The researchers soon realized that what they were witnessing was too bright to have come from a supernova, which is a common fate for a dying star.

In addition, the patterns of higher- and lower-energy radiation emitted over the days that followed weren't a close match for any other space phenomena, such as smaller black holes or spinning neutron stars.

Ashley Zauderer, an astronomer at the Harvard-Smithsonian Center for Astrophysics, recalled thinking, "This is crazy."

"I didn't believe it," she said. "I called a colleague and said, 'Will you make sure I didn't make a mistake? Look at this data, it's too bright.' "

Zauderer led the second study, which focused on the radio wave emissions. Her study mapped the location of the burst to the center of the galaxy, right where a black hole ought to be.

The researchers concluded that the strength and recurrence of what they were seeing could best be explained by a supermassive black hole ripping a star apart and shooting out a jet of radiation in the process.

How did it happen? The team's theory is that a star about the same size as our sun ended up too close to the black hole. The black hole exerts a powerful gravitational pull -- it contains the mass of about a million suns -- and that caused the side of the star nearest the black hole to stretch toward it, in much the same way that the moon causes the tides on Earth.

Eventually, the gravitational forces shredded the star, and chunks of its plasma streamed toward the black hole. But in the process, some of the material was expelled into a jet of high-energy radiation.

That jet was likely responsible for the mysterious bursts astronomers picked up in March.

The astronomers were very lucky to witness this event. It so happened that the jet of radiation was blasting straight toward the Swift spacecraft, like a flashlight beamed in the face.

The likelihood of seeing another star get swallowed up is slim, Burrows said, but that won't keep the team from looking.

"It might happen once every 10,000 years in a galaxy with a supermassive black hole in the center," Burrows said. "But there are a lot of galaxies out there in the sky."

askhan@tribune.com

Photo (color): Scientists believe a star about the same size as our sun was shredded when it came too close to a black hole's gravitational force.

ILLUSTRATION COURTESY OF NATURE

Photo (color): An artist's illustration shows radiation being released as a star is drawn toward the black hole. SONOMA STATE UNIVERSITY

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Record - 8

DIALOG(R)

Astronomers say they have witnessed star being consumed by black hole,

Los Angeles Times,

Waterloo Region Record, v2011082517187309, First ed, pA10,

Thursday, August 25, 2011

TEXT:

LOS ANGELES - For the first time ever, astronomers say they've borne witness to a supermassive black hole consuming a star.

Two papers released Wednesday by the journal Nature describe powerful blasts of radiation whose brightness and behaviour can only be explained by a Sun-sized star being torn apart by the gravitational forces of a black hole at the centre of its galaxy, the authors say.

Scientists believe they have seen the aftermath of such stellar violence before, in the form of fading glows emanating from distant galaxies, in whose centers supermassive black holes usually reside. But they had never caught one in the act.

"This was the first time we saw one of these big black holes going from

quiet and silent to very loud and noisy - producing a lot of light and radiation," said Davide Lazzati, an astrophysicist at North Carolina State University who was not involved in the study.

On March 28, a detector on the Earth-orbiting Swift observatory picked up a sudden burst of radiation coming from a point in the constellation Draco, 4.5 billion light years away from Earth. It automatically swivelled around to point its X-ray telescope toward the odd activity.

As is routine, it beamed a text message down to several Swift scientists, including the X-ray telescope's lead scientist, Pennsylvania State University astrophysicist David Burrows, who was lead author of one of the Nature reports. They set up a conference call to discuss the discovery.

Swift was designed to quickly pick up evidence of gamma-ray bursts and track the high-energy X-rays that follow on the heels of them. These usually are one-time shots of high-energy radiation caused as a star explodes into a supernova, followed by less energetic "afterglow" radiation.

But before the scientists had even hung up their phones, they received a second text: Another burst of radiation had occurred at the same spot. Two more bright bursts were to follow before the next day was over.

The researchers soon realized that what they were witnessing was too bright to have come from a supernova, which is a common fate for a dying star.

In addition, the patterns of higher- and lower-energy radiation emitted over the days that followed didn't match well any other space phenomena, such as smaller black holes or spinning neutron stars.

Ashley Zauderer, an astronomer at the Harvard-Smithsonian Center for Astrophysics who led the second study, which focused on the radio wave emissions, recalled thinking, "This is crazy."

"I didn't believe it," she said. "I called a colleague and said, 'Will you make sure I didn't make a mistake? Look at this data, it's too bright.' "

Zauderer's radio-wave study mapped the location of the burst to the centre of the galaxy, right where a black hole ought to be.

The researchers concluded that the strength and recurrence of what they were seeing could best be explained by a supermassive black hole ripping a star apart and shooting out a jet of radiation in the process.

How did it happen? The team's theory is that a star about the same size as

our sun ended up too close to the black hole. The black hole exerts a powerful gravitational pull - it contains the mass of about a million Suns - and that caused the side of the star nearest the black hole to stretch toward it, in much the same way that the moon causes the tides on Earth.

Eventually, the gravitational forces shredded the star, and chunks of its plasma streamed toward the black hole. But in the process, some of the material was expelled into a jet of high-energy radiation.

That jet was likely responsible for the mysterious burst astronomers picked up in March.

Burrows estimates that within a few months as much as one-fifth of the mangled star's mass might have been swallowed by the black hole.

The astronomers were very lucky to witness this event. It so happened that the jet of radiation was blasting straight toward the Swift spacecraft, like a flashlight beamed in the face. The likelihood of seeing another star get swallowed up is slim, Burrows said, but that won't keep the team from looking - especially now that they have an idea of what to look for.

"It might happen once every 10,000 years in a galaxy with a supermassive black hole in the centre."

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Record - 9

DIALOG(R)

Amazed scientists watch as black hole tears star to pieces; First time such an event has been recorded,

Amina Khan

Vancouver Sun (Canada), Final CC ed, pB10

Thursday, August 25, 2011

TEXT:

LOS ANGELES - For the first time, astronomers say they've witnessed a super-massive black hole consuming a star.

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whose centres super-massive black holes usually reside. But they had never caught one in the act.

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Eventually, the gravitational forces shredded the star, and chunks of its plasma streamed toward the black hole. But in the process, some of the material was expelled into a jet of high-energy radiation.

The likelihood of seeing another star get swallowed up is slim, Burrows said, but that won't keep the team from looking - especially now that they have an idea of what to look for.

"It might happen once every 10,000 years in a galaxy with a super-massive black hole in the centre," Burrows said. "But there are a lot of galaxies out there in the sky."

Agence France-Presse / Scientists believe they have seen a super-massive black hole rip a star apart and shoot out a jet of radiation. This is an artist's concept of the event.;

Record - 10

DIALOG(R)

Rare cosmic event detected,

UPI Science News,

Wednesday, August 24, 2011

TEXT:

New insights into a cosmic accident that has been streaming powerful X-rays toward Earth since late March have been provided by two published U.S. studies.

NASA's Swift satellite first alerted astronomers to the intense and unusual high-energy flares from a new source in the constellation Draco, a release from the space agency said Wednesday.

"Incredibly, this source is still producing X-rays and may remain bright enough for Swift to observe into next year," said David Burrows, professor of astronomy at Penn State University and author of one of the studies. "It behaves unlike anything we've seen before."

Astronomers have determined the source, known as Swift J1644+57, is the result of an extraordinary event, the awakening of a distant galaxy's dormant black hole as it shreds and consumes a nearby star.

A separate study by Ashley Zauderer at the Harvard-Smithsonian Center for Astrophysics in Cambridge, Mass., said the X-rays are caused by jets of matter streaming away from the black hole at almost the speed of light along its spin axis as it consumes the star.

In the case of Swift J1644+57, astronomers say, one of these jets happens to point straight at Earth.

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Record - 11

DIALOG(R)

United States: 'Darkest Planet' Baffles Astronomers,

Thai News Service,

Thursday, August 25, 2011

TEXT:

Section: General News - U.S.-based astronomers say they have discovered the darkest alien world currently known to science, locked in tight orbit around a star 750 light years from Earth.

Scientists from the Harvard-Smithsonian Center for Astrophysics (CFA) say the enormous gas planet, known as a "hot Jupiter," reflects less than one percent of the light from its star. Some experts say the oddball world is darker than coal.

Scientists widely agree such planets - as large as Jupiter and hot in temperature - orbit close to their parent stars, but share certain characteristics that make them dark. Even so, the astronomers say science cannot fully explain why the planet they observed is so extraordinarily dark.

The exoplanet - the term for a planet outside Earth's solar system - is only about 5 million kilometers from its star, which raises temperatures there to more than 1,000 degrees Celsius, hot enough to melt gold or copper. The Harvard and Smithsonian researchers say that heat prevents formation of reflective ammonia clouds, such as those blanketing the upper atmosphere of Jupiter, the second brightest planet in our solar system.

Earth is about 30 times as far from its sun as the dark planet, and bright Jupiter is five or times as far from the sun as Earth.

The dark planet's atmosphere contains light-absorbing chemicals, including vaporized sodium and potassium and gaseous titanium oxide. But the Harvard and Smithsonian scientists say those also do not fully explain its extremely dark appearance.

The researchers add, however, that the mysterious "hot Jupiter" is not completely dark. It is so hot that it actually radiates a faint red glow, like a burning ember.

Astronomers first detected the dark planet in 2006, and researchers from the Center for Astrophysics have precisely plotted its brightness since then, using the U.S. space agency's Kepler space telescope, which is designed to locate distant planets.

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Record - 12

DIALOG(R) ,
'Darkest Planet' Baffles Astronomers,
VOA News,
Voice of America,
Tuesday, August 23, 2011

TEXT:

U.S.-based astronomers say they have discovered the darkest alien world currently known to science, locked in tight orbit around a star 750 light years from Earth.

Scientists from the Harvard-Smithsonian Center for Astrophysics (CFA) say the enormous gas planet, known as a "hot Jupiter," reflects less than one percent of the light from its star. Some experts say the oddball world is darker than coal.

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The dark planet is known to scientists as TrES-2b. It orbits the star GSC 03549-02811, about 750 light-years from Earth in the direction of the constellation Draco.

Some information for this report was provided by AP, AFP and Reuters.

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Record - 13

DIALOG(R)

Unity strives for 'greenest campus ever'
BETH STAPLES Morning Sentinel,
Portland Press Herald, Final ed, pB3,
Monday, August 22, 2011

TEXT:

UNITY - Unity College President Stephen Mulkey said heat waves, droughts, floods, tornadoes, wildfires and other extreme weather-related events are occurring at a statistically unprecedented rate in history.

"Science tells us that anthropogenic (human-caused) climate change is very real," said Mulkey, who has a doctorate in biology and ecology from the University of Pennsylvania.

"As a citizen, I'm deeply troubled. It is my opinion that this is one of

the gravest challenges we've ever faced."

Mulkey, who started his job at Unity in July, was most recently director of the environmental science program at the University of Idaho. His academic background includes advising the Century Commission for a Sustainable Florida in 2007 and leading the collaborative development of climate change curriculum for classrooms in the intermountain West, a project funded by NASA.

Mulkey noted the difference between climate and weather.

Climate, he said, is a long-term weather pattern, for a decade or longer, encompassing a large region.

Weather is temperature, humidity, wind, rain, snow, sleet, flooding, blizzards and thunderstorms that take place in the short term in a small area.

According to the National Weather Service, the weather in July in Maine was hot; it was the hottest July on record at Portland International Jetport, and the warmest single month logged since 1940, when records started being kept at the jetport.

WIDESPREAD PROBLEM

But Maine's July temperatures don't compare to what residents of north Texas have been enduring. As of Aug. 8, there had been 38 consecutive days of triple-digit temperatures there.

According to the National Oceanic and Atmospheric Administration, since June there have been wildfires and drought in Arizona and Texas, five deaths attributed to heat in Wisconsin, Tennessee and Maryland, major flooding along the Missouri River, flooding of the Souris River in North Dakota and three tornadoes in Massachusetts.

In April, more than 300 people were killed in four days when 334 tornadoes hit 10 southeastern states.

And that's just in the U.S.

Worldwide since June, flooding in China, mudslides and flooding in Haiti and tropical storms in the Philippines have claimed more than 200 lives.

Mulkey also pointed to two 100-year droughts in the Amazon rain forest from 2005 to 2010.

A 100-year drought is one that statistically has a 1 percent chance of occurring in any given year. Both droughts were disastrous for plants and wildlife.

"It's extremely difficult to say that recent extreme weather is not linked to climate change," Mulkey said.

Mulkey, who was an associate professor of botany at the University of Florida, said 97 percent of climate scientists concur that emissions from fossil fuel combustion, aerosols, cement manufacturing, animal agriculture and deforestation are contributing to increased greenhouse gas concentrations and subsequent increases in the planet's temperature.

The concentration of one greenhouse gas, carbon dioxide, in the Earth's atmosphere is about 390 parts per million; Mulkey said that since 1980 the concentration has risen about 65 parts per million, or 20 percent.

During the 20th century, the surface temperature of the Earth increased 1.4 degrees.

Mulkey said scientists estimate that this century the temperature could rise 5 to 7 degrees globally and in double digits in the far north.

The effects could be considerable.

Climate zones, said Mulkey, are moving north at a rate that some trees and vegetation won't be able to adapt to. Famine and overcrowding could result. With higher temperatures, Mulkey said more people could also be exposed to tick-borne and mosquito-borne diseases.

Rising sea levels could flood millions of homes and business as well as destroy farmland.

ANOTHER VIEW

Not all scientists agree with Mulkey.

Willie Wei-Hock Soon, an astrophysicist at the Harvard-Smithsonian Center for Astrophysics, has said that it is likely that solar variation, not humans, causes climate change.

But Mulkey called some of Soon's research "the worst science" he has seen presented on climate change.

Mulkey said the 3 percent of scientists who claim the climate is not affected by human activity receive a disproportionate amount of media

attention and because of that the general public may not be aware that most climate scientists are in agreement about climate change.

FOSSIL FUEL INDUSTRY IMPACT

Mulkey said it is important to identify funding sources of climate-change studies.

According to the June issue of Mother Jones magazine, some of Soon's research disputing human-caused climate change has been funded by the American Petroleum Institute and ExxonMobil.

Mulkey said vested interests, including the fossil fuel industry, believe they stand to lose if governments tighten environmental regulations.

"I disagree," said Mulkey, adding that calculating conservatively, the green economy could be as lucrative, if not more so, than a petroleum-based economy.

If the petroleum-based economy continues as is, Mulkey said, the entire planet will lose.

"Climate-change policy is the game of the century," said Mulkey.

Mulkey said climate scientists are not experts in policy, but he believes they should have a seat at the decision-making table.

A worldwide approach, he said, is required.

"We have to come up with a solution as a species," he said. "The longer we put it off, the more severe the consequences will be."

Mulkey said collaboration across multiple disciplines is needed to solve environmental problems created by climate change.

PART OF SOLUTION

According to Mulkey, Unity College is well positioned to be part of the solution.

"We're a small, nimble institution," he said of the private college founded in 1965 on 225 wooded acres on Quaker Hill.

Unity, which bills itself as "America's environmental college, seeks to explore the "long-term environmental needs of a changing world, how to prepare students to tackle 21st-century global issues, and how to prepare students for promising environmental careers."

Mulkey said, "My vision is to integrate science of sustainability into our curriculum at all levels."

The 500 students attending Unity choose from majors that include adventure education leadership, conservation law enforcement, aquaculture and fisheries, environmental policy and law, and agriculture, food and sustainability.

Unity, Mulkey said, is striving to be the "greenest college campus ever."

Toward that end, this fall it will open TerraHaus, a 2,000-square-foot residence for 10 students. It is the first American college residence designed to meet the Passive House standard; it is expected to annually use the equivalent of 80 gallons of heating oil, according to a blog about the house created and maintained, in part, by Douglas Fox, Unity's director of the Center for Sustainability and Global Change.

The blog, terrahaus.wordpress.com, says "in zero degree weather, the heating load for TerraHaus could be met almost completely with a standard hair dryer."

Ultimately, Mulkey said, to save the planet, humans need to look in the mirror.

"What motivates excess consumption? What constitutes a good life? We are a finite, very small blue globe ..."

Morning Sentinel Staff Writer Beth Staples can be contacted at 861-9252 or at:
bstaples@centralmaine.com

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Wolbach Library: CfA in the News ~ Week ending 4 September 2011

1. **NEWLY DISCOVERED STAR SHOULDN'T EXIST, SAYS THEORY**, NPR Talk of the Nation, Friday, September 2, 2011
2. **Nearby galaxy has twin black holes**, UPI Science News, Friday, September 2, 2011
3. **NASA's Chandra identify nearest pair of super massive black holes**, Hindustan Times, Thursday, September 1, 2011
4. **Spiralgalaxie mit doppeltem schwarzen Loch entdeckt Ungleiches Paar liefert Hinweis auf Verschmelzung zweier Sternsysteme vor über einer Milliarde Jahren**, Kein Autor!, Berliner Zeitung, v2011, n205, p13, Friday, September 2, 2011
5. **Astronomers find nearest pair of supermassive black holes**, Philippines News Agency, Thursday, September 1, 2011
6. **NASA'S CHANDRA FINDS NEAREST PAIR OF SUPERMASSIVE BLACK HOLES**, US Federal News, Wednesday, August 31, 2011
7. **Darkest known exoplanet: Alien world is blacker than coal**, Korea Times, Monday, August 15, 2011

Record - 1

DIALOG(R)

NEWLY DISCOVERED STAR SHOULDN'T EXIST, SAYS THEORY,
NPR Talk of the Nation,
Friday, September 2, 2011

TEXT:

IRA FLATOW, host: You're listening to SCIENCE FRIDAY. I'm Ira Flatow. Next up, we're getting into the way-back machine, going back 13 billion years ago, near the time of the Big Bang, because this week in the journal Nature, astronomers reported the discovery of a very primitive star formed back then when the universe had very few chemical elements, mostly just hydrogen, helium, a little dash of lithium.

There's just one little problem with this discovery: The star should not exist according to one current theory of star formation. But there it is.

How did it get there? How did it form? Maybe it's back to the drawing board on our theories.

And what about the sun? It was born billions of years later than this early star. How different is it? Well, joining me to talk about this is my guest. She was not involved in the study, but she has found some very old stars herself. We're talking with Anna Frebel. She is a Clay Fellow at the Harvard-Smithsonian Center for Astrophysics in Cambridge, Massachusetts. Welcome to SCIENCE FRIDAY, Dr. Frebel.

Dr. ANNA FREBEL: Hi, thank you very much for having me.

FLATOW: Tell us what is so unusual about this star.

FREBEL: Well, in order to answer that question, let me just zoom out a little bit and sort of put what you said in my own words. The universe, as you mentioned, consisted only of hydrogen, helium and a little bit of lithium right at the Big Bang. That's what all was made in the Big Bang.

And over time, all the heavy elements we're made of - carbon and oxygen and iron - they were made over time in stars and supernovae. So the universe only very slowly built up some quantities of these heavier elements.

Now this new star has very little of especially iron and carbon, and so we then believe that the star must have formed very early on in the universe, and it's one of those stars that has one of the very least amounts of iron and carbon that we know of. And that's what makes it exciting for us. So we can look back in time by studying the chemistry in these stars.

FLATOW: But it doesn't conform to the way we think stars have formed, I understand.

FREBEL: Well, the star formation in the early universe is actually a very big puzzle. Now, we know that star formation today is very complicated, and you would think that in the early universe, when fewer metals and heavy elements existed, it was easier - but, well, it is easier, but it's not easy.

And so there are actually several competing theories for star formation out there. And while we know that these stars exist, and certainly the new one exists, and there is some little quibble now with one theory, but there are several other theories that are not touched by the discovery of this star.

So we're definitely learning something new here, and I think it's very exciting to have a new star that looks slightly different from, for example, the stars that I have formed. So they're all kind of from similar generations, they're all from a similar family, and - but they all look a

little bit different, and they all tell us something new about how star formation actually might have proceeded.

FLATOW: So can you give us an idea or a guess on how a star like this might have formed then?

FREBEL: Yes. So the very first generations of stars that formed in the universe, those were actually quite massive. They were probably 100 times bigger than the sun, more massive than the sun. And the reason for that is that the primordial material, just the hydrogen and helium, that couldn't really cool down enough.

So if you want to make a small star, it needs to - the gas from which it forms needs to become very cold, so it can clump together and essentially make a little ice cube. Now, the smaller your ice cube is supposed to be, your star, the colder it has to get.

And in the early universe, for the very first stars, there just wasn't enough cooling there. There weren't enough cooling mechanisms there. Metals such as carbon and oxygen, they act as cooling agents in a gas. They just radiate energy away. If you don't have that, your gas cannot get very cold and which means you make very big stars.

Now, the newly discovered star is most likely even lighter than the sun. So that means you have to get - you have to cool the gas in order to make that star before the star can actually form and start its nuclear fusion in the center.

And so there are different theories, and this has been going on in the field for several years now, how do we - how can we get the gas to cool. And one idea is that carbon and oxygen, the atoms, the carbon and oxygen atoms, do the job, and there are many stars that support that theory.

FLATOW: So they draw off the heat from the star.

FREBEL: That's - from the gas...

FLATOW: From the gas. Right.

FREBEL: ...right, so it can start forming an ice cube, a clump.

FLATOW: That's counterintuitive to hear that the stars get colder to get hotter.

FREBEL: Yes, yes, yes. Well, you first have to make the star. So as the gas gets cooler, the gas condenses, clumps together, gravitation acts on it. And at some point you kind of have a gas ball there that is dense enough

that it can - as it - and then it keeps falling together based on gravity, and that heats it up in the very core, whereas the outsides are still rather cold.

And then at some point, nuclear fusion starts to burn and to ignite, and only then we actually call it a star. But you have to get to that stage. You have to make it small enough and dense enough in the center that hydrogen burning, so hydrogen gets converted to helium, can actually begin.

FLATOW: And so are there other particles or dust or whatever out there that can act as the cooling agent instead of having...

FREBEL: Exactly, exactly. So it could not just be carbon and oxygen atoms. It could also be dust grains. And dust grains, of course, consist also of some kind of heavy elements, but they are clustered together in little grains, and those grains can be made in supernovae explosions, for example the explosions of the very first stars.

And so this material gets created. The dust grains get made, and they get spilled out into the interstellar medium, and they act as cooling agents there, as well. And so according to that theory, this new star should well exist, even though there is now, you know, a little challenge to this idea that carbon and oxygen atoms, the major cooling channels, the major cooling mechanism, to form these low-mass stars in the early universe.

But I think, you know, a little controversy is always great. It gets us excited. We will go back to the drawing board, and future conferences I'm sure will have a lot of discussions about this. So it's - you know, new data is always exciting, especially when you think about the early universe, which happened such a long time ago, and these stars are one of the few actual data points we can get from this time back then.

FLATOW: Now, scientists, whether you talk to them about not finding the Higgs boson or not understanding a star formation, they get more excited about the negative results than they do about the positive results.

FREBEL: Yeah, because it definitely rules out things. You know, we - everyone has lots of ideas on how it happened, and that's great because we want to find out. But we need the data to rule out all these, you know, sometimes more or less crazy ideas.

(SOUNDBITE OF LAUGHTER)

FREBEL: So it really helps to find something that, you know, looks yet a little bit different because it sparks a lot of new ideas, and hence we can fill in the puzzle of the universe.

FLATOW: If we have in biology biodiversity, what would we call star diversity?

FREBEL: It's definitely chemical diversity...

FLATOW: Yeah, chemical diversity.

FREBEL: ...because we are studying the chemical abundances in these stars because we believe they have been preserved in the outer layers of the stars since the time of their birth.

FLATOW: As Carl Sagan used to call them, star stuff, we're all made of star stuff.

FREBEL: Yes, we are.

(SOUNDBITE OF LAUGHTER)

FREBEL: Yes, as I said, all the elements have been made in stars and supernovae. And the clue with this new star, as well as the ones that I have previously found, is that they were right at the beginning of the stuff. So perhaps only one or two generations of supernovae made the very first amounts of heavy elements, and then these little stars formed from the slightly enriched primordial material, and they're preserved exactly this chemical fingerprint in their surface and transported it with them until today.

And so they are in the Milky Way galaxy today. They're shining right there for us every night, and we use the world's biggest telescopes to observe these fossil stars.

FLATOW: You have one heck of a job. 1-800-989-8255. Let's go to Ed(ph) in Minneapolis. Hi, Ed.

ED: Hi, Ira.

FLATOW: Hi there.

ED: Yeah, my phone is starting to cut out here, so just quickly, I'm just curious. I didn't hear where the star was located at, how old it is and, you know, if it's from the beginning of the universe, how do they really figure that it's from back then?

FLATOW: OK, good question. Where - how close is it? Where is it? Can we see it? And how old is it?

FREBEL: Yeah, I'm not exactly sure what the exact coordinates are right

now, but it's a reasonably bright star. If you have a small amateur telescope, you can probably see it from your backyard, depending on where you live, you know, Northern or Southern Hemisphere. I think this one is located in the Southern Hemisphere. It is not too far away. I heard it's about 4,000 light-years away. And that, for our galaxy, kind of means just the beginning of the outskirts, so not too close, not too far away. And...

FLATOW: And is it in a constellation we can look toward?

FREBEL: I actually have to admit that I don't know the constellation.

FLATOW: I heard it was in Leo.

FREBEL: It's - that is probably true. For us, astronomers, we are a little bit geeky. We usually don't really go by the constellation. So we have, you know, the coordinates that we dial into our telescope and just go.

FLATOW: I know because...

(SOUNDBITE OF LAUGHTER)

FLATOW: ...I read your paper and had all the geeky coordinates and didn't tell me where - how far away it was even in there. And I found...

FREBEL: That is true. But it's 4,000 light-years away. And...

FLATOW: How - well, let me stop you there. Because, you know, if something is that old, near the beginning of the universe, how come it's so close, relatively speaking?

FREBEL: Yeah. That is the beauty of this work with these old stars. If I can just zoom out for a second, again, the way we think that large galaxies like the Milky Way form, is to a hierarchical assembly. Now, that sounds like a mouthful, but what it means is you start in the early universe with a small galaxy. And it - like a little kid, it wants to grow bigger, and it does so by eating up other, even smaller, galaxies and gas and stars and whatever it can find. So it grows and grows and grows, and eats up all these smaller systems.

And any of this old fossil stars that we're finding, based on their chemistry, we can tell that they're formed in the very early universe, probably in a small galaxy. And then, that galaxy was likely eaten up by, you know, a bigger one. And so it got deposited into a new bigger one. And then perhaps, that one itself got eaten up, again, by yet another bigger one. And so it's slowly made its way through of all our cosmic timescales into the Milky Way, into the outskirts of our galaxy where we see it today.

FLATOW: So we're in the stomach of some other galaxy.

FREBEL: Yeah. Well...

(SOUNDBITE OF LAUGHTER)

FREBEL: We have definitely eaten up some galaxies. This is actually still happening today. We have evidence of that, too. A huge star streams in the outskirts of the Milky Way. They look very pretty in photos, but it's actually quite a violent process.

(SOUNDBITE OF LAUGHTER)

FLATOW: Well, Dr. Frebel, this is quite fascinating. I think we all learned a lot about star stuff today. And I want to thank you for taking time to be with us and good luck in your work.

FREBEL: Thank you very much. Bye-bye.

FLATOW: And you can - bye-bye. Have a good weekend. Anna Frebel is the Clay fellow at the Harvard-Smithsonian Center for Astrophysics, a famous place in Cambridge, Massachusetts.

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Record - 2

DIALOG(R)

Nearby galaxy has twin black holes,

UPI Science News,

Friday, September 2, 2011

TEXT:

U.S. astronomers say they've discovered the first pair of supermassive black holes in a spiral galaxy similar to the Milky Way.

At about 160 million light years from Earth the pair, discovered with NASA's Chandra X-ray Observatory, is the nearest known example of such a phenomenon, a NASA release said Wednesday.

The black holes, located near the center of the spiral galaxy NGC 3393, are likely the remnant of a merger of two galaxies of unequal mass a billion or more years ago, astronomers said.

Previous observations had indicated a single supermassive black hole existed in the center of NGC 3393, but Chandra's X-ray observations were

able to discern two.

"If this galaxy wasn't so close, we'd have no chance of separating the two black holes the way we have," said Pepi Fabbiano of the Harvard-Smithsonian Center for Astrophysics in Cambridge, Mass.

"Since this galaxy was right under our noses by cosmic standards, it makes us wonder how many of these black hole pairs we've been missing."

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Record - 3

DIALOG(R)

NASA's Chandra identify nearest pair of super massive black holes,
Hindustan Times,
Thursday, September 1, 2011

TEXT:

London, Sept. 01 -- The first pair of super massive black holes in a spiral galaxy similar to the Milky Way has been discovered by astronomers using NASA's Chandra X-ray Observatory.

Approximately 160 million light-years from Earth, the pair is the nearest known such phenomenon.

The black holes are located near the centre of the spiral galaxy NGC 3393. Separated by only 490 light-years, the black holes are likely the remnant of a merger of two galaxies of unequal mass a billion or more years ago.

'If this galaxy weren't so close, we'd have no chance of separating the two black holes the way we have,' said Pepi Fabbiano of the Harvard-Smithsonian Center for Astrophysics (CfA) in Cambridge, Mass., who led the study. 'Since this galaxy was right under our noses by cosmic standards, it makes us wonder how many of these black hole pairs we've been missing,' added Fabbiano.

Previous observations in X-rays and at other wavelengths indicated that a single supermassive black hole existed in the centre of NGC 3393.

However, a long look by Chandra allowed the researchers to detect and separate the dual black holes. Both black holes are actively growing and emitting X-rays as gas falls towards them and becomes hotter.

Both of the supermassive black holes are heavily obscured by dust and gas, which makes them difficult to observe in optical light. Because X-rays are

more energetic, they can penetrate this obscuring material.

Chandra's X-ray spectra showed clear signatures of a pair of supermassive black holes.

The finding has been detailed in online issue of the journal Nature. Published by HT Syndication with permission from Asian News International. For any query with respect to this article or any other content requirement, please contact Editor at htsyndication@hindustantimes.com

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Record - 4

DIALOG(R)

Spiralgalaxie mit doppeltem schwarzen Loch entdeckt Ungleiches Paar liefert Hinweis auf Verschmelzung zweier Sternsysteme vor über einer Milliarde Jahren,

Kein Autor!

Berliner Zeitung, v2011, n205, p13,
Friday, September 2, 2011

TEXT:

Die Spiralgalaxie NGC 3393 enthält in ihrem Zentrum nicht nur ein, sondern gleich zwei supermassive schwarze Löcher. Das zeigen kombinierte Beobachtungen mit dem Weltraumteleskop Hubble und dem Röntgensatelliten Chandra.

Es ist das erste Mal, dass Astronomen ein Paar schwarzer Löcher in einer Spiralgalaxie ähnlich unserer Milchstraße gefunden haben. Mit einer Entfernung von 160 Millionen Lichtjahren ist es zugleich das der Erde am nächsten gelegene Duo schwarzer Löcher.

Die beiden supermassiven schwarzen Löcher umkreisen sich in einem Abstand von 490 Lichtjahren und sind vermutlich das Überbleibsel einer Galaxienverschmelzung vor über einer Milliarde Jahren, berichtet ein Team amerikanischer und italienischer Forscher in der Online-Ausgabe des Fachblatts Nature.

"Wenn uns diese Galaxie nicht so nah wäre, dann hätten wir keine Chance, die beiden schwarzen Löcher getrennt zu erkennen", erklärt Giuseppina Fabbiano vom Harvard-Smithsonian Center für Astrophysics in Cambridge im US-Bundesstaat Massachusetts. "Das wirft natürlich die Frage auf, wie viele solcher Paare wir übersehen."

Die Existenz eines schwarzen Lochs im Herzen von NGC 3393 ist seit Langem bekannt. Aber erst eine Langzeitaufnahme mit den empfindlichen Röntgendetektoren des Chandra-Satelliten zeigte das benachbarte zweite schwarze Loch. Die Röntgenstrahlung stammt von Gas, das in die schwarzen Locher hineinfällt und sich dabei extrem aufheizt.

Zusammenstöße und Verschmelzungen von Galaxien spielen eine wichtige Rolle in der Entwicklung der Sternsysteme. Da nahezu alle Galaxien ein schwarzes Loch in ihrem Zentrum besitzen, sind auch Paare schwarzer Locher keine Seltenheit. Bislang haben die Astronomen solche Paare jedoch nur in Sternsystemen gefunden, die noch deutliche Anzeichen der vorangegangenen Verschmelzung zeigen. NGC 3393 ist dagegen eine normale Spiralgalaxie wie unsere Milchstraße, die ebenfalls keinerlei Störung mehr aufweist. Für Fabbiano und ihre Kollegen war die Entdeckung eines zweiten schwarzen Lochs daher eine Überraschung. Ausserdem entstehen in Galaxien mit doppelten schwarzen Lochern auch viele neue Sterne in ihrer Zentralregion - ebenfalls eine Folge der Verschmelzung.

Im Herzen der Galaxis finden sich jedoch nur alte Sterne. Giuseppina Fabbiano und ihre Kollegen ziehen daraus den Schluss, dass es sich um eine "kleine Verschmelzung" gehandelt hat, um den Zusammenstoß einer grossen mit einer deutlich kleineren Galaxie. Dann sollten auch die schwarzen Locher deutlich unterschiedliche Massen haben. Das sollen nun weitere Beobachtungen zeigen - die bisherigen Daten liefern lediglich eine Massen-Untergrenze von jeweils einer Million Sonnenmassen für die beiden schwarzen Locher. (wsa)

DOI: 10.1038/nature10364

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Record - 5

DIALOG(R)

Astronomers find nearest pair of supermassive black holes,

Philippines News Agency,

Thursday, September 1, 2011

TEXT:

WASHINGTON, Sept. 1 (PNA/Xinhua) -- Astronomers using NASA's Chandra X-ray Observatory discovered the first pair of supermassive black holes in a spiral galaxy similar to the Milky Way, NASA announced Wednesday.

Approximately 160 million light years from Earth, the pair is the nearest known such phenomenon.

The black holes are located near the center of the spiral galaxy NGC 3393. Separated by only 490 light years, the black holes are likely the remnant of a merger of two galaxies of unequal mass a billion or more years ago.

Both of the supermassive black holes are heavily obscured by dust and gas, which makes them difficult to observe in optical light. Because X-rays are more energetic, they can penetrate this obscuring material. Chandra's X-ray spectra show clear signatures of a pair of supermassive black holes.

"If this galaxy weren't so close, we'd have no chance of separating the two black holes the way we have," said Pepi Fabbiano of the Harvard-Smithsonian Center for Astrophysics, who led the study that appeared Wednesday in on-line issue of the journal Nature. "Since this galaxy was right under our noses by cosmic standards, it makes us wonder how many of these black hole pairs we've been missing."

Previous observations in X-rays and at other wavelengths indicated that a single supermassive black hole existed in the center of NGC 3393. However, a long look by Chandra allowed the researchers to detect and separate the dual black holes. Both black holes are actively growing and emitting X-rays as gas falls towards them and becomes hotter.

When two equal-sized spiral galaxies merge, astronomers think it should result in the formation of a black hole pair and a galaxy with a disrupted appearance and intense star formation. A well-known example is the pair of supermassive black holes in NGC 6240, which is located about 330 million light years from Earth.

However, NGC 3393 is a well-organized spiral galaxy, and its central bulge is dominated by old stars. These are unusual properties for a galaxy containing a pair of black holes. (PNA/Xinhua)
(THROUGH ASIA PULSE)

01-09 2011

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Record - 6

DIALOG(R)

NASA'S CHANDRA FINDS NEAREST PAIR OF SUPERMASSIVE BLACK HOLES,
US Federal News,
Wednesday, August 31, 2011

TEXT:

WASHINGTON, Aug. 31 -- NASA issued the following press release:

Astronomers using NASA's Chandra X-ray Observatory discovered the first pair of supermassive black holes in a spiral galaxy similar to the Milky Way. Approximately 160 million light years from Earth, the pair is the nearest known such phenomenon.

The black holes are located near the center of the spiral galaxy NGC 3393. Separated by only 490 light years, the black holes are likely the remnant of a merger of two galaxies of unequal mass a billion or more years ago.

"If this galaxy weren't so close, we'd have no chance of separating the two black holes the way we have," said Pepi Fabbiano of the Harvard-Smithsonian Center for Astrophysics (CfA) in Cambridge, Mass., who led the study that appears in this week's online issue of the journal *Nature*. "Since this galaxy was right under our noses by cosmic standards, it makes us wonder how many of these black hole pairs we've been missing."

Previous observations in X-rays and at other wavelengths indicated that a single supermassive black hole existed in the center of NGC 3393. However, a long look by Chandra allowed the researchers to detect and separate the dual black holes. Both black holes are actively growing and emitting X-rays as gas falls towards them and becomes hotter.

When two equal-sized spiral galaxies merge, astronomers think it should result in the formation of a black hole pair and a galaxy with a disrupted appearance and intense star formation. A well-known example is the pair of supermassive black holes in NGC 6240, which is located about 330 million light years from Earth.

However, NGC 3393 is a well-organized spiral galaxy, and its central bulge is dominated by old stars. These are unusual properties for a galaxy containing a pair of black holes. Instead, NGC 3393 may be the first known instance where the merger of a large galaxy and a much smaller one, dubbed a "minor merger" by scientists, has resulted in the formation of a pair of supermassive black holes.

In fact, some theories say that minor mergers should be the most common way for black hole pairs to form, but good candidates have been difficult to find because the merged galaxy is expected to look so typical.

"The two galaxies have merged without a trace of the earlier collision, apart from the two black holes," said co-author Junfeng Wang, also from CfA. "If there were a mismatch in size between the two galaxies it wouldn't be a surprise for the bigger one to survive unscathed."

If this were a minor merger, the black hole in the smaller galaxy should have had a smaller mass than the other black hole before their host galaxies started to collide. Good estimates of the masses of both black holes are not yet available to test this idea, although the observations do show that both black holes are more massive than about a million suns. Assuming a minor merger occurred, the black holes should eventually merge after about a billion years.

Both of the supermassive black holes are heavily obscured by dust and gas, which makes them difficult to observe in optical light. Because X-rays are more energetic, they can penetrate this obscuring material. Chandra's X-ray spectra show clear signatures of a pair of supermassive black holes.

The NGC 3393 discovery has some similarities to a possible pair of supermassive black holes found recently by Julia Comerford of the University of Texas at Austin, also using Chandra data. Two X-ray sources, which may be due to supermassive black holes in a galaxy about two billion light years from Earth, are separated by about 6,500 light years.

As in NGC 3393, the host galaxy shows no signs of disturbance or extreme amounts of star formation. However, no structure of any sort, including spiral features, is seen in the galaxy. Also, one of the sources could be explained by a jet, implying only one supermassive black hole is located in the galaxy.

"Collisions and mergers are one of the most important ways for galaxies and black holes to grow," said co-author Guido Risaliti of CfA and the National Institute for Astrophysics in Florence, Italy. "Finding a black hole pair in a spiral galaxy is an important clue in our quest to learn how this happens."

NASA's Marshall Space Flight Center in Huntsville, Ala., manages the Chandra program for NASA's Science Mission Directorate in Washington. The Smithsonian Astrophysical Observatory controls Chandra's science and flight operations from Cambridge, Mass.

For more information about the Chandra mission and this result, including images and other multimedia, visit: <http://www.nasa.gov/chandra> and <http://chandra.si.edu> For any query with respect to this article or any other content requirement, please contact Editor at htsyndication@hindustantimes.com

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Record - 7

DIALOG(R)

Darkest known exoplanet: Alien world is blacker than coal,

Korea Times,

Monday, August 15, 2011

TEXT:

Astronomers have discovered the darkest known exoplanet - a distant, Jupiter-sized gas giant known as TrES-2b. Their measurements show that TrES-2b reflects less than one percent of the sunlight falling on it, making it blacker than coal or any planet or moon in our solar system, the Science Daily has reported.

The new work appears in a paper in the journal Monthly Notices of the Royal Astronomical Society.

"TrES-2b is considerably less reflective than black acrylic paint, so it's truly an alien world," said astronomer and lead author David Kipping of the Harvard-Smithsonian Center for Astrophysics (CfA).

In our solar system, Jupiter is swathed in bright clouds of ammonia that reflect more than a third of the sunlight reaching it. In contrast, TrES-2b (which was discovered in 2006 by the Trans-Atlantic Exoplanet Survey, or TrES) lacks reflective clouds due to its high temperature.

TrES-2b orbits its star at a distance of only five million kilometers. The star's intense light heats TrES-2b to a temperature of more than 1000 degrees Celsius - much too hot for ammonia clouds. Instead, its exotic atmosphere contains light-absorbing chemicals like vaporized sodium and potassium, or gaseous titanium oxide. Yet none of these chemicals fully explain the extreme blackness of TrES-2b.

"It's not clear what is responsible for making this planet so extraordinarily dark," stated co-author David Spiegel of Princeton University. "However, it's not completely pitch black. It's so hot that it emits a faint red glow, much like a burning ember or the coils on an electric stove."

Kipping and Spiegel determined the reflectivity of TrES-2b using data from NASA's Kepler spacecraft. Kepler is designed to measure the brightnesses of distant stars with extreme precision.

The team monitored the brightness of the TrES-2 system as the planet orbited its star. They detected a subtle dimming and brightening due to the planet's changing phase.

TrES-2b is believed to be tidally locked like our moon, so one side of the planet always faces the star. And like our moon, the planet shows changing phases as it orbits its star. This causes the total brightness of the star plus planet to vary slightly.

"By combining the impressive precision from Kepler with observations of over 50 orbits, we detected the smallest-ever change in brightness from an exoplanet: just 6 parts per million," said Kipping. "In other words, Kepler was able to directly detect visible light coming from the planet itself."

The extremely small fluctuations proved that TrES-2b is incredibly dark. A more reflective world would have shown larger brightness variations as its phase changed.

Kepler has located more than 1,200 planetary candidates in its field of view. Additional analysis will reveal whether any other unusually dark planets lurk in that data.

TrES-2b orbits the star GSC 03549-02811, which is located about 750 light-years away in the direction of the constellation Draco. (One light-year is about 10 million million kilometers.)

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Wolbach Library: CfA in the News ~ Week ending 11 September 2011

1. **DON'T BUY HYPE ABOUT GLOBAL WARMING**, Sun Sentinel, Fort Lauderdale, FL, Broward Metro ed, p5F, Sunday, September 11, 2011
2. **'Invisible' world discovered**, Korea Times, Friday, September 9, 2011
3. **NASA's Kepler spacecraft discovers 'invisible' world**, Hindustan Times, Friday, September 9, 2011
4. **Astronomers detect 'invisible' planet**, UPI Science News, Thursday, September 8, 2011
5. **New Astronomy Research from Harvard-Smithsonian Center for Astrophysics Described**, Science Letter, p141, Tuesday, September 13, 2011
6. **Milky Way Galaxy Might Hold Thousands of Ticking 'Time Bombs'**, Fars News Agency (Iran), Wednesday, September 7, 2011
7. **Our galaxy might hold thousands of ticking 'time bombs'**, ANI Asian News International, Wednesday, September 7, 2011
8. **Does galaxy hold thousands of ticking 'time bombs'?**, Indo-Asian News Service, Wednesday, September 7, 2011

Record - 1

DIALOG(R)

DON'T BUY HYPE ABOUT GLOBAL WARMING,
Sun Sentinel, Fort Lauderdale, FL, Broward Metro ed, p5F,
Sunday, September 11, 2011

TEXT:

The past couple of years have been a trying time for those who believe humans are primarily responsible for global warming.

The "Climategate" scandal in 2009 shook the foundations of the academic community by showing scientists aren't above suppressing research that contradicts their global warming claims. The "hockey stick" graph that supposedly demonstrates rapid and unprecedented warming linked to greenhouse gas emissions has received sharp criticism.

And, the western world's economy has hit the skids, which means people are more worried about their immediate economic future than their distant meteorological one.

As a result, the American public's inclination to accept the scientific claims that the world's in for a heap of trouble if humanity doesn't stop burning carbon-dioxide-producing fossil fuels has dropped substantially, from more than 70 percent four years ago to well under 50 percent today.

Fewer people are willing to kiss Al Gore's ring, which may explain his recent bizarre behavior. In early August at the Aspen Institute, Gore launched into a profanity-laced tirade against those who question global warming orthodoxy, and at the end of August in an Internet-TV interview, Gore even invoked the "R" word. To quote the Guru of Green: "One day, climate change skeptics will be seen in the same negative light as racists." What next? Will he be linking his critics to "Nazis?"

For the record, I'm not one who brands claims of anthropogenic, or human-induced global warming, as a "hoax." But I do question whether we've been too quick to accept the so-called scientific "consensus." And, as a skeptical journalist, I question the motives and objectivity of people such as Gore whose financial livelihoods and lavish lifestyles depend on selling worst-case global warming scenarios.

Since I don't genuflect before Gore, I decided to find out the names and credentials of some of the people he condemns in the same breath as racists. My source, by the way, is not the ExxonMobile website, but rather that democratic font of knowledge, Wikipedia:

Freeman Dyson, professor emeritus of the School of Natural Sciences in Princeton and a fellow of the Royal Society. Dyson is one of the most respected academics in the world, and though he objects to the characterization, his intellectual stamina has been likened to Einstein's.

Dyson writes: "Computer models are very good at solving the equations of fluid dynamics but very bad at describing the real world. The real world is full of things like clouds and vegetation and soil and dust which the models describe very poorly . . . the climate of the Earth is a very complicated system and nobody is close to understanding it."

Henrik Tennekes, retired director of Research, Royal Netherlands Meteorological Institute: "The blind adherence to the harebrained idea that climate models can generate 'realistic' simulations of climate is the principal reason why I remain a climate skeptic."

Khabibullo Abdusamatov, mathematician and astronomer, Russian Academy of

Sciences: "Global warming results not from the emission of greenhouse gases into the atmosphere, but from an unusually high level of solar radiation and a lengthy - almost throughout the last century - growth in its intensity."

Philip Stott, professor emeritus of biogeography at the University of London: "The myth is starting to implode . . . Serious new research at the Max Planck Society has indicated that the sun is a far more significant factor [than greenhouse gases]."

William Kininmonth, meteorologist and former Australian delegate to the World Meteorological Organization: "There has been a real climate change over the late 19th and 20th centuries that can be attributed to natural phenomenon. Natural variability of the climate system has been underestimated by the IPCC (Intergovernmental Panel on Climate Change) and has, to now, dominated human influences."

Sallie Baliunas, astronomer, Harvard-Smithsonian Center for Astrophysics: "Most of the increase in the air's concentration of greenhouse gases from human activities - over 80 percent - occurred after the 1940s. That means that the strong early 20th century warming must be largely, if not entirely, natural."

And that's just a small sampling of highly credentialed scientists who question the global warming orthodoxy.

It's one thing to link the skeptics to racists in front of a compliant Internet-TV interviewer, and something else again to do so face-to-face with Professor Dyson on worldwide television. Until Gore is ready to do the latter, he'd be well-advised to tone down the invective, lest he start resembling even more closely the buffoon caricature of him on Comedy Central's "South Park."

Kingsley Guy's column appears every other Sunday. Email him at harborlite3@bellsouth.net.

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Record - 2

DIALOG(R)

'Invisible' world discovered,

Korea Times,

Friday, September 9, 2011

TEXT:

NASA's Kepler spacecraft has spotted a planet that alternately runs late and early in its orbit because a second, "invisible" world is tugging on it, the Science Daily reported Thursday.

This is the first definite detection of a previously unknown planet using this method, the report said.

"This invisible planet makes itself known by its influence on the planet we can see," said astronomer Sarah Ballard of the Harvard-Smithsonian Center for Astrophysics (CfA), according to the Science Daily. Ballard is lead author on the study, which has been accepted for publication in the Astrophysical Journal.

Both the seen and unseen worlds orbit the Sun-like star Kepler-19, which is located 650 light-years from Earth in the constellation Lyra, the report said. The 12th-magnitude star is well placed for viewing by backyard telescopes on September evenings.

The Science Daily said the first planet, Kepler-19b, transits its star every 9 days and 7 hours. It orbits the star at a distance of 8.4 million miles, where it is heated to a temperature of about 900 degrees Fahrenheit. Kepler-19b has a diameter of 18,000 miles, making it slightly more than twice the size of Earth. It may resemble a "mini-Neptune," however its mass and composition remain unknown, it said.

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Record - 3

DIALOG(R)

NASA's Kepler spacecraft discovers 'invisible' world,
Hindustan Times,
Friday, September 9, 2011

TEXT:

Washington, Sept.9 -- Astronomers believe that they have found an invisible world after detecting a planet, which revolve around its orbit in irregular interval.

NASA's Kepler spacecraft has spotted a planet that alternately runs late and early in its orbit because a second, 'invisible' world is tugging on it.

This is the first definite detection of a previously unknown planet using this method.No other technique could have found the unseen companion.

'This invisible planet makes itself known by its influence on the planet we can see,' said astronomer Sarah Ballard of the Harvard-Smithsonian Centre for Astrophysics (CfA), who is the lead author on the study.

'It's like having someone play a prank on you by ringing your doorbell and running away.You know someone was there, even if you don't see anyone when you get outside,' she added.

Both the seen and unseen worlds orbit the Sun-like star Kepler-19, which is located 650 light-years from Earth in the constellation Lyra.

So far, astronomers don't know anything about the invisible worldKepler-19c, other than that it exists.

It weighs too little to gravitationally tug the star enough for them to measure its mass. And Kepler hasn't detected it transiting the star, suggesting that its orbit is tilted relative to Kepler-19b.

'Kepler-19c has multiple personalities consistent with our data.For instance, it could be a rocky planet on a circular 5-day orbit, or a gas-giant planet on an oblong 100-day orbit,' said co-author Daniel Fabrycky of the University of California, Santa Cruz (UCSC).

The study will be published in The Astrophysical Journal.Published by HT Syndication with permission from Asian News International.For any query with respect to this article or any other content requirement, please contact Editor at htsyndication@hindustantimes.com
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Record - 4

DIALOG(R)

Astronomers detect 'invisible' planet,

UPI Science News,

Thursday, September 8, 2011

TEXT:

U.S. researchers say they've detected a distant planet that alternately runs late and early in its orbit, proof that a second, "invisible" world tugs on it.

Astronomers say this is the first time an unseen planet has been detected in this fashion and that no other technique could have discovered the hidden world.

"This invisible planet makes itself known by its influence on the planet we can see," astronomer Sarah Ballard of the Harvard-Smithsonian Center for Astrophysics said.

"It's like having someone play a prank on you by ringing your doorbell and running away," she said. "You know someone was there, even if you don't see them when you get outside."

Both the visible and the invisible planets orbit a Sun-like star located 650 light-years from Earth in the constellation Lyra, a Harvard-Smithsonian release said Thursday.

Astronomers used NASA's Kepler space telescope to observe and record the variations in the orbital times of the visible planet that revealed the presence of its invisible neighbor.

"This method holds great promise for finding planets that can't be found otherwise," Harvard astronomer David Charbonneau said.

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Record – 5

DIALOG(R)

New Astronomy Research from Harvard-Smithsonian Center for Astrophysics Described,

Science Letter, p141,

Tuesday, September 13, 2011

TEXT:

According to the authors of a study from Cambridge, Massachusetts, "The two dominant features in the distribution of orbital parameters for close-in exoplanets are the prevalence of circular orbits for very short periods, and the observation that planets on closer orbits tend to be heavier. The first feature is interpreted as a signature of tidal evolution, while the origin of the second, a 'mass-period relation' for hot Jupiters, is not understood."

"In this paper we reconsider the ensemble properties of transiting exoplanets with well-measured parameters, focusing on orbital eccentricity

and the mass-period relation. We recalculate the constraints on eccentricity in a homogeneous way, using new radial velocity data, with particular attention to statistical biases. We find that planets on circular orbits gather in a well-defined region of the mass-period plane, close to the minimum period for any given mass. Exceptions to this pattern reported in the literature can be attributed to statistical biases. The ensemble data is compatible with classical tide theory with orbital circularization caused by tides raised on the planet, and suggest that tidal circularization and the stopping mechanisms for close-in planets are closely related to each other," wrote F. Pont and colleagues, Harvard-Smithsonian Center for Astrophysics (see also).

The researchers concluded: "The position mass-period relation is compatible with a relation between a planet's Hill radius and its present orbit."

Pont and colleagues published the results of their research in Monthly Notices of the Royal Astronomical Society (Determining eccentricities of transiting planets: a divide in the mass-period plane. Monthly Notices of the Royal Astronomical Society, 2011;414(2):1278-1284).

For additional information, contact F. Pont, Harvard Smithsonian Center Astrophysics, Cambridge, MA 02138, United States.

The publisher of the journal Monthly Notices of the Royal Astronomical Society can be contacted at: Wiley-Blackwell, Commerce Place, 350 Main St., Malden 02148, MA, USA.

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Record - 6

DIALOG(R)

Milky Way Galaxy Might Hold Thousands of Ticking 'Time Bombs',

Fars News Agency (Iran),

Wednesday, September 7, 2011

TEXT:

New research shows that some old stars might be held up by their rapid spins, and when they slow down, they explode as supernovae. Thousands of these "time bombs" could be scattered throughout our Galaxy.

"We haven't found one of these 'time bomb' stars yet in the Milky Way, but this research suggests that we've been looking for the wrong signs. Our work points to a new way of searching for supernova precursors," said astrophysicist Rosanne Di Stefano of the Harvard-Smithsonian Center for

Astrophysics (CfA).

The specific type of stellar explosion Di Stefano and her colleagues studied is called a Type Ia supernova. It occurs when an old, compact star known as a white dwarf destabilizes.

A white dwarf is a stellar remnant that has ceased nuclear fusion. It typically can weigh up to 1.4 times as much as our Sun -- a figure called the Chandrasekhar mass after the astronomer who first calculated it. Any heavier, and gravity overwhelms the forces supporting the white dwarf, compacting it and igniting runaway nuclear fusion that blows the star apart.

There are two possible ways for a white dwarf to exceed the Chandrasekhar mass and explode as a Type Ia supernova. It can accrete gas from a donor star, or two white dwarfs can collide. Most astronomers favor the first scenario as the more likely explanation. But we would expect to see certain signs if the theory is correct, and we don't for most Type Ia supernovae.

For example, we should detect small amounts of hydrogen and helium gas near the explosion, but we don't. That gas would come from matter that wasn't accreted by the white dwarf, or from the disruption of the companion star in the explosion. Astronomers also have looked for the donor star after the supernova faded from sight, without success.

Di Stefano and her colleagues suggest that white dwarf spin might solve this puzzle. A spin-up/spin-down process would introduce a long delay between the time of accretion and the explosion. As a white dwarf gains mass, it also gains angular momentum, which speeds up its spin. If the white dwarf rotates fast enough, its spin can help support it, allowing it to cross the 1.4-solar-mass barrier and become a super-Chandrasekhar-mass star.

Once accretion stops, the white dwarf will gradually slow down. Eventually, the spin isn't enough to counteract gravity, leading to a Type Ia supernova.

"Our work is new because we show that spin-up and spin-down of the white dwarf have important consequences. Astronomers therefore must take angular momentum of accreting white dwarfs seriously, even though it's very difficult science," explained Di Stefano.

The spin-down process could produce a time delay of up to a billion years between the end of accretion and the supernova explosion. This would allow the companion star to age and evolve into a second white dwarf, and any surrounding material to dissipate.

In our Galaxy, scientists estimate that there are three Type Ia supernovae every thousand years. If a typical super-Chandrasekhar-mass white dwarf takes millions of years to spin down and explode, then calculations suggest that there should be dozens of pre-explosion systems within a few thousand light-years of Earth.

Those supernova precursors will be difficult to detect. However, upcoming wide-field surveys conducted at facilities like Pan-STARRS and the Large Synoptic Survey Telescope should be able to spot them.

"We don't know of any super-Chandrasekhar-mass white dwarfs in the Milky Way yet, but we're looking forward to hunting them out," said co-author Rasmus Voss of Radboud University Nijmegen, The Netherlands. The research appears in the *Astrophysical Journal*.

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Record - 7

DIALOG(R)

Our galaxy might hold thousands of ticking 'time bombs',

ANI,

Asian News International,

Wednesday, September 7, 2011

TEXT:

Washington, Sept 7 (ANI): A new study has suggested that thousands of "time bombs" could be scattered throughout our galaxy.

Scientists have revealed that some old stars might be held up by their rapid spins, and when they slow down, they explode as supernovae.

"We haven't found one of these 'time bomb' stars yet in the Milky Way, but this research suggests that we've been looking for the wrong signs. Our work points to a new way of searching for supernova precursors," said astrophysicist Rosanne Di Stefano of the Harvard-Smithsonian Centre for Astrophysics.

The specific type of stellar explosion Di Stefano and her colleagues studied is called a Type Ia supernova. It occurs when an old, compact star known as a white dwarf destabilizes.

A white dwarf is a stellar remnant that has ceased nuclear fusion. It typically can weigh up to 1.4 times as much as our Sun - a figure called the Chandrasekhar mass after the astronomer who first calculated it.

Any heavier, and gravity overwhelms the forces supporting the white dwarf, compacting it and igniting runaway nuclear fusion that blows the star apart.

There are two possible ways for a white dwarf to exceed the Chandrasekhar mass and explode as a Type Ia supernova. It can accrete gas from a donor star, or two white dwarfs can collide. Most astronomers favour the first scenario as the more likely explanation.

Di Stefano and her colleagues suggest that white dwarf spin might solve this puzzle.

A spin-up/spin-down process would introduce a long delay between the time of accretion and the explosion.

As a white dwarf gains mass, it also gains angular momentum, which speeds up its spin. If the white dwarf rotates fast enough, its spin can help support it, allowing it to cross the 1.4-solar-mass barrier and become a super-Chandrasekhar-mass star.

Once accretion stops, the white dwarf will gradually slow down. Eventually, the spin isn't enough to counteract gravity, leading to a Type Ia supernova.

This research appeared in the Sept. 1 issue of The Astrophysical Journal Letters. (ANI)

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Record - 8

DIALOG(R)

Does galaxy hold thousands of ticking 'time bombs'?

Indo-Asian News Service,

Wednesday, September 7, 2011

TEXT:

Washington, Sep.7 -- In the blockbuster 'Speed', a bomb on a bus is triggered to detonate if the vehicle slows down below 50 miles an hour.

The premise, slow down and you explode, while making for a great action flick, also happens to have its cosmic equivalent.

New research shows that some old stars might be held up by their rapid spins. When they slow down, they explode as supernovae. Thousands of these "time bombs" may be scattered throughout our galaxy.

"We haven't found one of these 'time bomb' stars yet in the Milky Way, but this research suggests we've been looking for the wrong signs," says Rosanne Di Stefano of the Harvard-Smithsonian Centre for Astrophysics. The specific type of stellar explosion Di Stefano and her colleagues studied is called a Type Ia supernova.

It occurs when an old, compact star known as a white dwarf destabilizes, according to a Harvard-Smithsonian Centre statement.

A white dwarf is a stellar remnant that has ceased nuclear fusion. It typically can weigh up to 1.4 times as much as our Sun -- a figure called the Chandrasekhar mass after the astronomer who first calculated it.

"Any heavier, and gravity overwhelms the forces supporting the white dwarf, compacting it and igniting runaway nuclear fusion that blows the star apart.

"We don't know of any super-Chandrasekhar-mass white dwarfs in the Milky Way yet, but we're looking forward to hunting them out," said co-author Rasmus Voss of Radboud University Nijmegen, The Netherlands. Published by HT Syndication with permission from Indo-Asian News Service. For any query with respect to this article or any other content requirement, please contact Editor at htsyndication@hindustantimes.com

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Wolbach Library: CfA in the News ~ Week ending 18 September 2011

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2. **US astronomers find planet with two Suns**, Assa-Irada Newsfeed,
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5. **Searching for the Stars: Cosmic Views and Databases**, Mattison, David
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Saturday, September 17, 2011
7. **Planet find gives the science to film fiction**, The Australian, 1 - All-round Country ed, p3
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9. **La planete aux deux soleils de Luke Skywalker decouverte dans notre galaxie**,
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10. **Found, the Star Wars planet with two suns**, Times, The (UK), 01 ed,
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11. **Astronomers detect real-life Star Wars planet**,
Darren Osborne for ABC Science Online,
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12. **Astronomers discover planet straight out of Star Wars**,
Rob Hastings, Independent (UK), 1ST ed, p12
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13. **Una prueba espacial detecta un planeta con dos puestas de sol**,
AFX Espana ProFeed, Thursday, September 15, 2011
14. **Astronomers Find 50 New Exoplanets**,
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15. **Columbia man donates telescopes to USC, State Museum**,

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DENNIS OVERBYE, New York Times (NY), Late Edition - Final ed, p3
Tuesday, September 13, 2011

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Pete Spotts Staff writer, Christian Science Monitor (USA), ALL ed,
Monday, September 12, 2011

Record – 1

Talisman, university play down links to skeptics,
Mike De Souza,
Vancouver Sun (Canada), Final ed, pB4,
Saturday, September 17, 2011

TEXT:

While one American-based climate change skeptic walked away with a \$541 soapstone carving, Talisman Energy and other donors to "research" funds at the University of Calgary received tax receipts as a result of a public-relations campaign to cast doubt on global warming science, newly released records have revealed.

The revelations from hundreds of pages of invoices and accounting documents from an internal audit come as the university and Talisman, an Alberta-based energy company, move to distance themselves from the sophisticated international marketing and lobbying effort to discredit scientific evidence linking human activity to climate change. The "research" funds were set up at the university in 2004 by Barry Cooper, a political-science professor, in partnership with an anti-Kyoto Protocol group calling itself the Friends of Science, and public relations firms APCO Worldwide, Morten Paulsen Consulting and Fleishman-Hillard Canada -

where Paulsen worked as a senior vice-president before moving to his current job as a consultant for the university's school of public policy.

Talisman Energy attributed its \$175,000 donation to the fund in 2004 to its previous management, noting that its current position acknowledges that greenhouse gas emissions "pose a scientifically credible threat."

"Hydrocarbons are a major source of greenhouse gas emissions and Talisman looks for ways to leverage technology to improve energy efficiency and reduce our carbon footprint," said the company's president and chief executive John A. Manzoni in a newly released statement. "There is no question that technological evolution will be at the heart of solving the climate issues."

Talisman was not immediately able to say Friday whether it would revise its previous tax filings regarding the donation.

A total of \$507,975 flowed through the accounts before the university determined they were being used for political activities and shut down the funds in 2007 while severing ties to the Friends of Science. Some of the donations were also made through the deline Calgary Foundation, a registered charity that was able to issue tax receipts to donors and protect their anonymity.

"The University of Calgary recognizes that there was insufficient management and governance oversight and since that time has undertaken a number of comprehensive initiatives to improve business practices, including a significant internal control and business processes review and a Tri-Council Audit," the university said in a statement Thursday.

The university also said it was trying to ensure that management and governance processes would be in line with "those of world-class research institutions," but was not able to say whether it made attempts to recover thousands of dollars that were spent on public relations, lobbying, wining, dining, travel and other events and expenses incurred by the Friends of Science.

The "research" accounts, created to support production of a video examining the debate about climate change policies, were notably used to purchase advertising in Ontario and Quebec for the Friends of Science in the midst of the 2005-06 federal election campaign.

The accounting records, released to Postmedia News through provincial freedom of information legislation, reveal some confusion from auditors over expenses that included the \$541 soapstone carving, along with travel expenses for American astrophysicist Sallie Baliunas, who travelled from

Boston in March 2005 to speak at a Friends of Science luncheon in Calgary. The investigation also questioned whether the climate skeptics group was "double-billing" the university on some of its expenses.

"[The] Friends of Science Jan. 2007 Newsletter indicates that the annual luncheon is to take place May 27th," said one of the notes from auditors on accounting records. "Is this the luncheon we paid for or is this a duplicate of the '06 payment?"

One letter prepared by the university auditors also questioned whether the university had rules about receiving donations and paying societies.

"In this case, if funds are being provided to the society to make the expenditures then the university is simply a flow through," said the letter dated March 27, 2007, summarizing a meeting with the university's chief development officer, Gary Durbeniuk, regarding the investigation. "Donated funds were provided to the university and donors received a donation tax receipt."

Baliunas is known for publishing a controversial paper in 2003 that questioned global warming from the 20th century. The paper eventually prompted a journal editor to resign over doubts about its methodology. The research was co-written with Willie Soon, an astrophysicist at the Solar, Stellar and Planetary Sciences Division of the Harvard-Smithsonian Centre for Astrophysics, who has received more than \$1 million US in grants over the past decade from energy stakeholders such as Exxon-Mobil, the American Petroleum Institute and Koch Industries.

Soon has said these grants, unrelated to the University of Calgary accounts, did not influence his research. But Soon urged some colleagues in a 2003 email, uncovered by a Greenpeace USA investigation, to work "as a team" to "weaken the fourth assessment report" of the Intergovernmental Panel on Climate Change that would be drafted and released several years later.

Exxon, the world's largest oil company, acknowledged in 2008 that it had also given money to lobby groups questioning global warming science, which delayed action to address the problem. Science academies, such as the Royal Society in the United Kingdom, estimated the total lobbying money investments were nearly \$3 million in the year 2005 and had urged the company to stop its practices.

Oil and gas industry stakeholders, in partnership with the federal and Alberta governments, are now running a multimillion-dollar international white marketing and lobbying campaign to cast doubts on warnings about the environmental effect of oilsands & development and to weaken foreign lack

climate policies that could single out pollution from this sector.

Paulsen, who does communications work for the university's school of public policy, declined to comment on his work on the project. The director of the school of public policy also sits on the board of directors of Imperial Oil, a subsidiary of Exxon.

Tom Harris, who now teaches a global warming class at Carleton University in Ottawa, said in a letter to the Calgary Herald that he wrote the script of the video and participated in video production and distribution. Harris worked, at the time, for APCO Worldwide, which received more than \$120,000 to oversee the project in the absence of an open bidding process for the contract, which would have been required under the university's policies.

While former Talisman CEO C James Buckee said that Harris previously 209 0/100/34/51 VERSION "was used as PR help," the latter said he did not work with the oil industry Pantone executive while working on the video. Harris also said he was not "involved in co-ordinating the project's initial \$175,000 budget."

A detailed communications plan with the APCO Worldwide logo was released by the university with the accounting records, outlining the \$175,000 budget, production and strategy plans to promote the video in the mainstream media by pitching opinion articles and engaging print and broadcast reporters to write about it.

"If APCO was involved in co-ordinating the budget, it would have been at a management level in APCO, not at the technical specialist level at which I worked," Harris wrote in an email to Postmedia News.

His former supervisor at APCO Worldwide, Evan Zelikovitz, could not be reached for comment.

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Record - 2

DIALOG(R)

US astronomers find planet with two Suns,

Assa-Irada Newsfeed,

Friday, September 16, 2011

TEXT:

US astronomers said Thursday they have discovered the first planet that is

orbiting two Suns, much like the fictional home of Luke Skywalker featured in Star Wars, AFP reported. Skywalker's native planet of Tatooine was hot and desert-like, but this planet, called Kepler-16b, is a freezing cold world about the size of Saturn, orbiting two parent Suns in a near perfect circle about 200 light years away. The planet was glimpsed with the US space agency's Kepler space telescope, which monitors the brightness of 155,000 stars, according to the research published in the journal Science. "This discovery is stunning," said co-author Alan Boss of the Carnegie Institution for Science Department of Terrestrial Magnetism. "Once again, what used to be science fiction has turned into reality." While astronomers have previously glimpsed planets they believed were orbiting two stars, they had never before seen one actually passing in front of its two Suns so this discovery offers the first proof. "Kepler-16b is the first confirmed, unambiguous example of a circumbinary planet -- a planet orbiting not one, but two stars," said co-author Josh Carter of the Harvard-Smithsonian Center for Astrophysics. "Once again, we're finding that our solar system is only one example of the variety of planetary systems nature can create." If there were people on Kepler-16b, they could relax to the view of a double sunset, but such a scenario is highly unlikely due to the planet's extreme frigid surface temperature of -100 to -150 Fahrenheit (-73 to -101 Celsius). The chill is likely due to the fact that even though the planet has two Suns which it orbits every 229 days at a distance of 65 million miles (105 million kilometers), they are smaller and cooler than our single Sun. One of Kepler-16b's Suns is 20 percent as massive as ours, and the other is 69 percent as massive. While the planet orbits them, the two Suns dance with each other in an "eccentric 41-day orbit," the study said. The study was led by Kepler scientist Laurance Doyle of the California-based SETI (Search for Extraterrestrial Intelligence) Institute.

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Record - 3

DIALOG(R)

Two suns for Star Wars planet,

Townsville Eye (Australia), 1 - ed, p40,

Saturday, September 17, 2011

TEXT:

US astronomers say they have discovered a planet orbiting two suns, much like the fictional home of Luke Skywalker in Star Wars

Skywalker's native planet of Tatooine was hot and desert-like, but this planet, called Kepler-16b, is a freezing cold world about the size of

Saturn, orbiting two parent suns in a near-perfect circle about 200 light years away

The planet was glimpsed with the US space agency's Kepler space telescope, according to research published in Science journal

"This discovery is stunning," said co-author Alan Boss of the Carnegie Institution for Science Department of Terrestrial Magnetism

"Once again, what used to be science fiction has turned into reality."

Astronomers have previously glimpsed planets they believed were orbiting two stars, but this discovery offers the first proof

"Kepler-16b is the first confirmed, unambiguous example of a circumbinary planet a planet orbiting not one, but two stars," said co-author Josh Carter of the Harvard-Smithsonian Center for Astrophysics

"Once again, we're finding that our solar system is only one example of the variety of planetary systems nature can create." If there were people on Kepler-16b, they could relax to the view of a double sunset, but such a scenario is highly unlikely due to the planet's surface temperature of -73C to -101C

It orbits the suns every 229 days at a distance of 105 million km, but they are smaller and cooler than our single sun. One of Kepler-16b's suns is 20 per cent as massive as ours, and the other 69 per cent as massive

While the planet orbits them, the suns dance with each other in an "eccentric 41-day orbit", the study said

The study was led by Kepler scientist Laurance Doyle of the California-based Search for Extraterrestrial Intelligence Institute.
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Record - 4

DIALOG(R)

Planet with two suns found,

Korea Times,

Friday, September 16, 2011

TEXT:

U.S. astronomers have discovered the first planet that is orbiting two Suns, much like the fictional home of Luke Skywalker featured in Star Wars, the AFP reported Thursday.

Skywalker's native planet of Tatooine was hot and desert-like, but this planet, called Kepler-16b, is a freezing cold world about the size of Saturn, orbiting two parent Suns in a near perfect circle about 200 light years away.

The planet was glimpsed with the U.S. space agency's Kepler space telescope, which monitors the brightness of 155,000 stars, the news agency reported, quoting the research published in the journal Science.

"This discovery is stunning," said co-author Alan Boss of the Carnegie Institution for Science Department of Terrestrial Magnetism.

"Once again, what used to be science fiction has turned into reality."

While astronomers have previously glimpsed planets they believed were orbiting two stars, they had never before seen one actually passing in front of its two Suns so this discovery offers the first proof.

"Kepler-16b is the first confirmed, unambiguous example of a circumbinary planet a planet orbiting not one, but two stars," said co-author Josh Carter of the Harvard-Smithsonian Center for Astrophysics.

"Once again, we're finding that our solar system is only one example of the variety of planetary systems nature can create."

If there were people on Kepler-16b, they could relax to the view of a double sunset, but such a scenario is highly unlikely due to the planet's extreme frigid surface temperature of -100 to -150 Fahrenheit (-73 to -101 Celsius).

The chill is likely due to the fact that even though the planet has two Suns which it orbits every 229 days at a distance of 65 million miles (105 million kilometers), they are smaller and cooler than our single Sun. One of Kepler-16b's Suns is 20 percent as massive as ours, and the other is 69 percent as massive.

While the planet orbits them, the two Suns dance with each other in an "eccentric 41-day orbit," the study said.

The study was led by Kepler scientist Laurance Doyle of the California-based SETI (Search for Extraterrestrial Intelligence) Institute.

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Record - 5

DIALOG(R)

Searching for the Stars: Cosmic Views and Databases,

Mattison, David,

Searcher, v19, n7, p20,

Thursday, September 1, 2011

TEXT:

HEADNOTE

Although I don't own a telescope, I've been fascinated by outer space, astronomy, and the prospect of life on other worlds ever since I was a Boy Scout in Hawaii and camped out under the stars far away from the Honolulu city lights.

Astronomers have generated a wealth of data about our universe, including some on objects extending beyond visible light. The images seen from the Hubble Space Telescope and famous ground observatories such as the Keck on Mauna Kea, Hawaii, or the Palomar Observatory on Palomar Mountain, Calif., are indeed humbling. The beautiful images are frequently shared and marketed as part of education and outreach programs managed by various observatories and space agencies. This article has gathered the best, most authoritative astronomical image galleries and public databases available.

As remarkable as the achievements of the Space Age have been, the U.S. is still the only nation on Earth which has been able to place human beings on another planetary body and bring them home again. My article looks only at aspects of unmanned space flight that relate to astronomy. While the U.S. space shuttle fleet was used to launch and service the Hubble Space Telescope and other space-based observation instruments, such as the Chandra X-Ray Observatory, that era ended in July 2011 with the final flight of the Endeavour, the last of these remarkable crafts whose life cycles spanned 3 decades (NASA, Space Shuttle Era [http://www.nasa.gov/mission_pages/shuttle/flyout/index.html]). April 2011 marked the 50th anniversary of Soviet cosmonaut Yuri Gagarin's flight as the first human to orbit Earth. April 2011 saw Global Astronomy Month [<http://www.astronomerswithoutborders.org/global-astronomy-month-2011.html>], a program sponsored by Astronomers Without Borders [<http://www.astronomerswithoutborders.org>], being celebrated. The theme of 2011's World Space Week [<http://www.worldspaceweek.org>], celebrated between Oct. 4 and 10, is "50 Years of Human Spaceflight." From a photographic perspective, NASA's visual database The Gateway to Astronaut Photography of Earth [<http://eol.jsc.nasa.gov>] is

an incredible resource and tool.

While amateur astronomers continue to play an important role in the field and are supported by numerous clubs, associations, and their peers, I have primarily examined resources originating from government and academic research environments. To see what the amateurs can do, I suggest you search Google for "amateur astronomy" or look through the amateur astronomy sections of the Yahoo! Directory [http://dir.yahoo.com/science/astronomy/Amateur_Astronomy] and the Google Directory [<http://www.google.com/Top/Science/Astronomy/Amateur>]. You will find thousands of useful leads. One notable example provides a free service to amateur astronomers that lets them post their images. The Astronomical Image Data Archive (AIDA) [<http://aida.astroinfo.org>] contains more than 4,000 images. The host site, AstroInfo, is based in Switzerland.

From its historical roots through discoveries with optical (visible light) telescopes, today's scientific successors to Johannes Kepler, Tycho Brahe, and Galileo Galilei use ground and space observatories with instruments that detect and capture data right across the electromagnetic spectrum: radio, microwave, infrared, visible light, ultraviolet, X-rays, and gamma rays. Since our eyes can only see a small range within the spectrum, different kinds of data are often combined and manipulated through computer processing to provide new and unique perspectives and discoveries about the universe. The international astronomy community has also developed its own image file format called FITS (Flexible Image Transport System) [<http://fits.gsfc.nasa.gov> and <http://en.wikipedia.org/wiki/FITS>].
The Real Armchair World of Virtual Astronomy

The internet has helped shape and redefine the scope and nature of the research tools and data available to astronomers. In his article "Virtual Astronomy, Information Technology, and the New Scientific Methodology" (2005) [<http://www.astro.caltech.edu/~george/vo/VAITNSM.pdf>], S. G. Djorgovski described the Virtual Observatory as "an emerging, open, web-based, distributed research environment for astronomy with massive and complex data sets. It assembles data archives and services, as well as data exploration and analysis tools."

In terms of astronomical images, the international Virtual Astronomy Multimedia Project (VAMP) [<http://www.virtualastronomy.org>], according to its project description, "will allow observatories and others to ingest any future resource that conforms to the suggested standards and make them immediately searchable. The primary deliverable of VAMP is a database server that indexes, searches, and serves out standardized metadata and education/public outreach image file locations of the world's research observatories and telescopes. VAMP will utilize the International Virtual Observatory Alliance (IVOA) endorsed outreach metadata standard, Astronomical Visualization Metadata 1.0 (AVM) and help support observatories

in adopting and adhering to these standards" [<http://www.virtualastronomy.org/07-10-24VAMP.pdf>].

The U.S. Virtual Astronomical Observatory (VAO) [<http://www.usvao.org>], formerly the National Virtual Observatory (JNVO) [<http://www.us-vo.org>], is one of a network of several such tools that would not exist without the internet and the efforts of the International Virtual Observatory Alliance (IVOA) [<http://www.ivoa.net>]. The main purpose of these virtual observatories is to collate the massive amounts of data and images from multiple sources for any given point in the sky. Two prominent tools for this purpose are NASA's DataScope [<http://heasarc.gsfc.nasa.gov/cgi-bin/vo/datascope/init.pl>] and the Centre de Données astronomiques de Strasbourg's Aladin SkyAtlas [<http://aladin.u-strasbg.fr>]. The SkyView Virtual Observatory [<http://skyview.gsfc.nasa.gov>], somewhat similar to Aladin, includes a Non-Astronomer's Page on how best to utilize the many options on the Query Form page.

Launched in May 2008 in a public beta version, you can engage with Microsoft Research and NASA's Worldwide Telescope (WWT) [<http://www.worldwidetelescope.org>] in two ways: through its web interface or through Windows client software that you download and install on your PC. According to its About page, "WWT blends terabytes of images, information, and stories from multiple sources into a seamless, immersive, rich media experience delivered over the Internet" [<http://www.worldwidetelescope.org/WhatIs/WhatIsWWT.aspx>]. Perhaps one day you might become one of many WWT Ambassadors "trained to be experts in using WWT as a teaching tool" [<https://wwtambassadors.org/wwt>].

Created by Konstantin Lysenko and Sergei Goshko, based in Canada, and launched late in 2006, Sky-Map [<http://www.sky-map.org>], also known as WikiSky [<http://wikisky.org>], is a comparable tool to the WWT, though not as well-endowed financially. A major difference from WWT is that Sky-Map only references objects outside the solar system. Both Sky-Map and the WWT utilize the Sloan Digital Sky Survey as well as data from other sky surveys.

The cross-platform Google Earth software [<http://earth.google.com>] contains a separate Sky database based on content from, among other sources, the Sloan Digital Sky Survey, the Digitized Sky Survey, and the Space Telescope Science Institute (the Hubble). The Google service presents all the sources within the context of the constellations and other well-known individual stars and planets. Sky contains a number of other astronomy-related services, one of the most ambitious of which is the SLOOH Space Camera [<http://www.slooh.com>], a subscription-based ground observatory, through which members help document the universe and witness live astronomical events.

I tried out the Windows 0.10.6 version of the free, open source, cross-platform Stellarium planetarium software [<http://www.stellarium.org>]. According to the FAQ on the project wiki, Stellarium was started in 2001 by Fabien Chereau. The PDF manual alone is worth downloading for its explanation of astronomical concepts. The European Southern Observatory's VirGO software [<http://archive.eso.org/cms/tools-documentation/visual-archive-browser>] contains an earlier release of Stellarium packaged with the functionality to allow you to examine imagery and other data from the ESO and other observatories' archives.

Scientific Observatories

There are two basic classes of ground-based astronomical observatories, those that rely on optical telescopes and those that depend on nonoptical data such as radio and microwaves. Optical telescopes rely on a combination of mirrors, lenses, and sensing instruments to utilize various parts of the electromagnetic spectrum in order to see into deep space. Some observatories combine both types of technologies, while others, such as the famous Arecibo Observatory in Puerto Rico [<http://www.naic.edu>], are exclusively devoted to monitoring, radio waves, for example. Both kinds of observatories monitor our solar system as well as objects light-years distant.

In the U.S., optical ground observatories that operate at night are under the domain of the National Optical Astronomy Observatory (NOAO) [<http://www.noao.edu>], managed for the National Science Foundation (NSF) by the Association of Universities for Research in Astronomy. Among the well-known telescopes within the NOAO are the Kitt Peak National Observatory in Arizona [<http://www.noao.edu/kpno>], home to "the world's largest collection of optical telescopes" [<http://www.noao.edu/outreach/kp outreach.html>], and the twin, multinational Gemini Observatory telescopes in Hawaii and Chile [<http://www.gemini.edu>]. The umbrella of NOAO also covers the National Solar Observatory [<http://www.nso.edu>], devoted to the study of our own star and currently searching for a new headquarters. The NOAO Image Gallery [http://www.noao.edu/image_gallery], with a controlled vocabulary and free-text search engine geared to the general public, contains a few hundred contributions from all its telescopes as well as links to some of the other image galleries I've described.

The National Radio Astronomy Observatory [<http://www.nrao.edu>], a similar umbrella organization operated by the NSF, offers a small Image Gallery [<http://images.nrao.edu>] of around 200 items based on its observational technologies. Radio telescopes such as Arecibo consist of one or more dish-

shaped antenna assemblies. The newest such international radio telescope array, sited in Chile and still under construction as of spring 2011, is called ALMA (Atacama Large Millimeter/ submillimeter Array) [<http://www.almaobservatory.org>]. One of its main purposes is to reach back in time, as all deep space observatories do, to uncover clues about the formation of the universe through the currently accepted scientific model of the Big Bang.

The Australian Astronomical Observatory (AAO) has a fine collection of Astronomical Images [<http://www.aao.gov.au/images/index.html>], including more than 400 galaxies, galactic clusters, and nebulae. The page of 50 Favorite AAO Photographs [<http://www.aao.gov.au/images/general/favourites.html>] highlights some of the most extraordinary, beautiful, and recognizable starscapes out there such as the Horsehead and Crab nebulae. Most of these photographs were created through a process developed by David Malin, an astronomer who worked at the AAO until 2001 and subsequently established his own business.

The European Southern Observatory [<http://www.eso.org>] features an impressive gallery of imagery, not all of the sky and with some artist impressions, including a Picture of the Week [<http://www.eso.org/public/images/potw>] dating back to 2007, more than 1,400 zoomable images [<http://www.eso.org/public/images/archive/zoomable>], and more than 4,900 wallpaper images for your computer screen [<http://www.eso.org/public/images/archive/wallpapers>]. You may recognize the ESO's Paranal Observatory in Chile from the James Bond movie Quantum of Solace.

Image Collections From Space Telescopes

NASA's Hubble Space Telescope [<http://hubblesite.org>], launched in 1990 and the most well-known telescope operating beyond Earth's atmosphere, is not the only orbiting observatory. In addition to the science and imagery from this amazing instrument, HubbleSite also features useful astronomy reference resources and tools such as the gSky Browser [http://hubblesite.org/explore_astronomy/gsky]. This customized browser lets you use the Google Earth application [<http://earth.google.com>] to study the universe through Hubble's images. On May 15, 2011, the HubbleSite Gallery contained 1,209 images covering deep space objects and our solar system. Up to four image file resolution downloads may be available, along with links to all other images of the same object and to the NewsCenter's commentary about the image. The full spectrum of publicly released Hubble data is accessible through the Hubble Legacy Archive [<http://hla.stsci.edu>]; Data Release 5 occurred in March 2011. The successor to Hubble, the tennis- court- sized James Webb Space Telescope [<http://webbtelescope.org>], is scheduled to launch post-2015 and will be stationed a million miles from Earth. A ground-based optical and infrared

telescope which will complement the Webb space telescope, currently called the Thirty Meter Telescope [<http://www.tmt.org>], a joint American-Canadian university initiative, is scheduled to receive "first light" in 2017 or 2018 from its site atop the Mauna Kea volcano in Hawaii. It is expected to become "the most advanced and powerful optical telescope on Earth" [<http://www.tmt.org/about-tmt>].

Other orbiting telescopes and satellites with deep space image collections include the NASA Spitzer Space Telescope [<http://www.spitzer.caltech.edu/images>], launched in 2003 and also tasked in the search for exoplanets (planets outside our solar system) via infrared wavelength, its primary instrumentation. The NASA Kepler [<http://kepler.nasa.gov/media>], launched in March 2009, is also hunting for exoplanets, as is EPOCh [<http://epoxi.umd.edu/4gallery/index.shtml>], a repurposed 2005 Deep Impact satellite also known as EPOJXI. EPOCh, along with the Kepler, uses the transit method for the exoplanet search. CoRoT (Convection, Rotation and planetary Transits) [<http://smc.cnes.fr/COROT>], launched in December 2006 by France's CNES, is likewise looking for planets via the transit method. It made its first detection of Corot - Exo-1b (CoRoT-1 b) in 2007. The CoRoT Data Center at the Institut d'Astrophysique Spatiale (IAS) contains links to restricted and open access databases chiefly designed for the scientific community [<http://idoc-corot.ias.u-psud.fr>].

Three other NASA space telescopes are also observing in nonvisible light: the Compton Gamma-Ray Observatory (CGRO) [<http://heasarc.gsfc.nasa.gov/docs/cgro>], whose mission lasted between 1991 and 2000, and the Chandra X-Ray Observatory (CXO) [<http://chandra.harvard.edu>], launched in 1999. Chandra, operated for NASA by the Smithsonian Astrophysical Observatory (SAO), documents its many impressive observations through a Photo Album page [<http://chandra.harvard.edu/photo>]. It also features some interactive tools such as a 3D Wall, the Chandra Sky Map, and tutorials to further explore these unusual images. Some of the data gathered by Chandra has also been combined with those of other space observatories such as Spitzer. GALEX, the Galaxy Evolution Explorer [<http://www.galex.caltech.edu>], launched in 2003, is studying the evolution of galaxies utilizing ultraviolet radiation. One of its most spectacular discoveries from 2006 was the 13-light-year tail of the fast-moving red giant star Mira.

While I thought the debate had long been settled about the clarity of images between ground- and space-based optical telescopes (in favor of the latter), the multinational research institution consortium building the Giant Magellan Telescope [<http://www.gmto.org>] claims that its instrument, "primary mirror - far larger than any other telescope ever built... will produce images up to 10 times sharper than the Hubble Space Telescope."

You'll be able to check this yourself around 2018 when the telescope is completed on a peak at Las Campanas, Chile.

Space Images From Space Agencies

The world's space agencies maintain enormous collections of space imagery. In particular, NASA maintains still and video images at NASA Images [<http://www.nasaimages.org>]. The site is "a partnership between NASA and the Internet Archive ... to bring public access to NASA's image, video, and audio collections in a single, searchable resource" [<http://www.nasaimages.org/About.html>]. I searched all collections for the term "NASA" and retrieved 100,000 items, likely some kind of default maximum number of results. The primary search points are content category thumbnails and keyword search field. Once you've retrieved some results through either method, you can refine your search through four filters (What, Where, Who, When) or by selecting the Advanced Search link. You can also browse through category lists or "alphanumerically" (indexed keywords and numerical content such as dates). By registering for a free account, you can also create presentations and your own personalized content. For more current NASA imagery, visit NASA's main site [<http://www.nasa.gov>], where you will find a Multimedia link as well as an Image Gallery one [<http://www.nasa.gov/multimedia/imagegallery>].

NASA also dishes up the Astronomy Picture of the Day [<http://apod.nasa.gov/apod>; <http://apod.nasa.gov/apod/lib/aptree.html>] from its vast reservoir of imagery. Each image is accompanied by a commentary from a professional astronomer. You can keyword-search for images or simply consult a chronological list (the Calendar link) dating back to June 16, 1995.

NASA's National Space Science Data Center (NSSDC), "the permanent archive for NASA space science mission data" [http://nssdc.gsfc.nasa.gov/about/about_nssdc.html], is another nexus for NASA imagery. The primary access point is its Image Resources section [<http://nssdc.gsfc.nasa.gov/image>], from which you can jump to the NSSDC Photo Gallery [http://nssdc.gsfc.nasa.gov/photo_gallery] and its Catalog of Spaceborne Imaging: A Guide to NSSDC's Planetary Image Archives [<http://nssdc.gsfc.nasa.gov/imgcat>]. Since NSSDC is an archive, as you'd expect, the imagery comes from historic spaceflight, robotic, satellite, and space telescope observations. Another source for imagery from the various robotic and satellite craft sent to other planets in our solar system is the Planetary Data System (PDS) [<http://pds.jpl.nasa.gov>], which "archives and distributes scientific data from NASA planetary missions, astronomical observations, and laboratory measurements" [<http://pds.jpl.nasa.gov>]. You can search for images through the PDS Imaging Node [<http://pds-imaging.jpl.nasa.gov>]. Through a complementary site operated by

the U.S. Geological Survey, you can also Map-a-Planet [<http://www.mapaplanet.org>] using PDS data.

Another important NASA site for astronomical imagery, based on "extremely energetic phenomena, from black holes to the Big Bang," is the High Energy Astrophysics Science Archive Research Center (HEASARC) [<http://heasarc.gsfc.nasa.gov>], housed at the Goddard Space Flight Center in Maryland. HEASARC images are derived from NASA and other agency space telescopes with observations by X-ray, extremeultraviolet, and gamma-ray spectra made for more than 3 decades. HEASARC contains a large number of image-based resources for students and the public such as the HEASARC Picture of the Week [<http://heasarc.gsfc.nasa.gov/docs/objects/heapow>] and its archive [http://heasarc.gsfc.nasa.gov/docs/objects/heapow/archive/heapow_archive.html], an Image Archive [<http://heasarc.gsfc.nasa.gov/docs/objects>], and, to put things in perspective, a tutorial about The Cosmic Distance Scale [<http://heasarc.gsfc.nasa.gov/docs/cosmic>].

The Jet Propulsion Laboratory (JPL) at the California Institute of Technology provides a wealth of imagery through its Multimedia page [<http://www.jpl.nasa.gov/multimedia/index.cfm>], with links to other sites. The Photo journal [<http://photojournal.jpl.nasa.gov>] site, for example, also contains a flexible and friendly database to JPL and imagery gathered from other sources and jurisdictions. The imagery content of the Photojournal, arranged into galleries, consists of the solar system, the universe beyond our system, and spacecraft and telescopes. Each gallery may contain anywhere from a handful to a few hundred images.

By May 15, 2011, the European Space Agency (ESA) Multimedia Gallery [<http://www.esa.int/esa-mm/mmg/mmghome.pl>] featured more than 9,600 items, with about a third of that content consisting of satellite imagery of Earth and astronomical observations. Searches of the ESA image content is conducted through controlled vocabulary lists or keywords. The Advanced Search lets you combine a controlled vocabulary search with a keyword search. You'll also find a handy link to the National Galleries [<http://esamultimedia.esa.int/multimedia/nationalgallery/index.html>] of other European and Canadian national space agencies.

Like NASA, the ESA maintains dedicated sites to specific space telescopes, and content may not necessarily appear in both the dedicated site and the Multimedia Gallery. For example, the ESA site for its Herschel space telescope's images and videos yields 498 items [<http://sci.esa.int/science-e/www/area/index.cfm?fareaid=16>], while the Multimedia Gallery's Advanced Search for all content relating to the Herschel Mission retrieved less than half those items, or 210 results. You can access images and videos of all the ESA past, current, and planned

satellite and space observatory projects through the Missions link on its Science and Technology (Science Programme) site [<http://sci.esa.int/science-e/www/area/index.cfm?fareaid=1>].

If you're ever curious about what kinds of objects have been launched into space and what's happened to them, the United Nations Office for Outer Space Affairs (UNOOSA), established in 1958, maintains an Online Index of Objects Launched Into Outer Space [<http://www.unoosa.org/oosa/osoindex.html>]. It carries "information on satellites launched from 1957 to the present. Space debris and other non-functional objects are not included." The data comes from the "World Warning Agency for Satellites, Committee on Space Research (COSPAR), official press releases and media sources." Heavens Above [<http://www.heavens-above.com>], created and maintained by Chris Peat, is a somewhat comparable, privately operated site that covers astronomical events, objects, and ephemeris and provides predictive locations for orbiting satellites and the International Space Station.

Catalogs, Surveys, and Databases to the Heavens

Astronomers deal with such massive volumes of data that I'm not surprised they have well-developed systems for organizing and retrieving information about the objects they and their scientific ancestors have been observing for centuries. Individual celestial objects outside our solar system are documented in star catalogs; more than 9,000 such catalogs are available online through the Centre de Données astronomiques de Strasbourg's VizieR's service. Another systematic technique used by astronomers is sky surveys, which form the backdrop for some of the virtual astronomy applications.

The first systematic astronomical observation compilation of its kind, you'll find various versions of the Messier Catalog on the web, Named after its compiler, the 18th-century French astronomer Charles Messier (1730-1817), the thoroughly documented site covers his list of 110 nebulae and star clusters observed from Paris. The Messier Catalog was created by the Students for the Exploration and Development of Space (SEDS) [<http://www.seds.org/messier>]. The SEDS group has also created many other useful resources based on historical astronomical data.

In the century following Messier's work, other astronomers, such as England's William Herschel and Australia's James Dunlop, were influenced by his example. These astronomers created their own catalogs of deep sky objects. The culmination and standardization of all this work arrived in 1888 with the publication by Danish astronomer J.L.E. Dreyer (1852-1926) of New General Catalogue of Nebulae and Clusters of Stars. This title was abbreviated to NGC or NGCIIIC after the supplemental Index Catalogues he issued. At the time Dreyer was working at the Armagh Observatory in Ireland; he later undertook to publish the work of his scientific ancestor

Tycho Brahe (1546-1601).

The best web overview and resource on the NGC/IC, the aptly named The NGC/IC Project [<http://www.ngcicproject.org>], also includes its own version of the Messier Catalog and other historic observational lists, as well as more current catalogs submitted by other astronomers. The mission of The NGC/IC Project is "to correctly identify all of the original NGC and IC objects, starting with the original discoverer's notes and working forward in time to encompass the work of contemporary astronomers, both professional and amateur ..." [<http://www.ngcicproject.org/mission.htm>].

SEDS also maintains The Interactive NGC Catalog Online [<http://spider.seds.org/ngc/ngc.html>], based on NGC2000.0 by R. W Sinnott (Sky Publishing), with links to various other catalogs and databases, including the massive NASA/IPAC Extragalactic Database (NED) [<http://ned.ipac.caltech.edu>]. The latter "contains positions, basic data, and over 171 million names for 163 million extragalactic objects, as well as more than 6,100,000 bibliographic references to over 76,500 published papers, and 66,700 notes from catalogs and other publications" [<http://ned.ipac.caltech.edu/help/allfeats.html>]. Images are retrieved by either object name or through the NED Image Data Atlas [<http://irsa.ipac.caltech.edu/data/NED>].

The Centre de Données astronomiques de Strasbourg in France maintains three essential astronomy databases: SIMBAD [<http://simbad.u-strasbg.fr/simbad>], an "astronomical database [that] provides basic data, cross-identifications, bibliography and measurements for astronomical objects outside the solar system"; the Aladin Sky Atlas [<http://aladin.u-strasbg.fr>], a Java-based sky atlas linked to SIMBAD records which you can also download for local installation; and VMeR [<http://cdsarc.u-strasbg.fr/viz-bin/VizieR>], a bibliographic database of more than 9,000 online published astronomical catalogs and data, with individual entry points linked to Aladin content.

You can access archived data from ground and space optical and radio observatories through MAST, the Multimission Archive at STScI [<http://archive.stsci.edu>], "with a primary focus on scientifically related data sets in the optical, ultraviolet, and near-infrared parts of the spectrum." MAST offers a variety of search strategies, including cross-mission (crosscorrelation) as well as mission-specific searches. Selecting image types on the basic search page is as simple as checking a box. You can preview images as either a GIF or a FITS (Flexible Image Transport System) image.

The Sloan Digital Sky Survey [<http://www.sdss.org>], operating since 2000, calls itself "one of the most ambitious and influential surveys in the

history of astronomy. ... it obtained deep, multi-color images covering more than a quarter of the sky and created 3 -dimensional maps containing more than 930,000 galaxies and more than 120,000 quasars." Data, gathered from a telescope at the Apache Point Observatory, New Mexico, is released annually, and you can query or browse through the images using a variety of tools at the multilingual SDSS SkyServer sites (<http://cas.sdss.org> for the public and <http://cas.sdss.org/astro> for professional astronomers).

The Digitized Sky Survey [<http://stdu.stsci.edu/dss>], the first version of which appeared in 1994, is based on digitized photographic plates created by the Space Telescope Science Institute from observations at the California Institute of Technology's Palomar Observatory (Palomar Astronomical Images) [<http://www.astro.caltech.edu/palomar/astrophotos.html>] and the UK Schmidt Telescope in Australia. Data from these observatories was also used to create the first Guide Star Catalog for the Hubble Space Telescope. You'll find a link here to a few other DSS sites, each with its version, sometimes with additional data, of the source imagery. The DSS is also only one of several resources available for searching within the Multimission Archive at STScI or MAST [<http://stdu.stsci.edu>].

The 2MASS Atlas Image Gallery at IPAC [<http://www.ipac.caltech.edu/2mass/gallery>] contains processed images from the Two Micron All Sky Survey, a 1997-2001 joint project of the University of Massachusetts and the Infrared Processing and Analysis Center, California Institute of Technology, which mapped nearly all the Northern and Southern Hemisphere skies through ground-based observatories in infrared. The 2MASS images are one of the data sets at the NASA/IPAC Infrared Science Archive [<http://irsa.ipac.caltech.edu>], where you'll find various kinds of tools for querying. Cool Cosmos [<http://coolcosmos.ipac.caltech.edu>], an award-winning education and outreach site from the California Institute of Technology's Infrared Processing and Analysis Center (IPAC), features excellent image galleries on infrared and multi-wavelength astronomy. IPAC also maintains a Gallery of images [<http://www.ipac.caltech.edu/gallery>] from several space telescopes, such as Spitzer and Herschel.

I found the Hawaiian Astronomical Society's Constellations: Stories and a Deepsky Atlas [<http://www.hawast.soc.org/deepsky>] one of the more unusual and useful tools. It provided me with an easy way to use this "online atlas of the heavens, combined with photographs of significant objects, and their descriptions," that is, stories or myths and information about the constellations and other deep sky objects between 45 degrees latitude north of the equator and 45 degrees latitude south of the equator based on any month and time. You can print a version of any of the maps for field observation. Obviously this site has limited use for those of us living north or south of those latitudes.

SIDEBAR

The Planet Hunters

NASA's PlanetQuest: Exoplanet Exploration

[<http://planetquest.jpl.nasa.gov>], located at the Jet Propulsion Laboratory, California Institute of Technology, is among the best sources of information for the general public on the search for an Earth-like world. While I was researching and writing this article, the discovery by a Canadian space telescope of yet another "super-Earth" planet, called 55 Cancri e, was announced ("Tiny space telescope reveals 'super-Earth,'" Vancouver Sun, April 29, 2011 [<http://www.vancouversun.com/technology/Tiny-t-space+telescope+reveals+super-t-Earth/4694986/story.html>]).

Zooniverse offers a number of citizen science/crowdsourcing projects involving astronomical data such as this one, called Planethunters. You draw boxes around transients observed by the Kepler space telescope. Included among these truly far-out exoplanet detection, research, and dissemination efforts are the following:

* NStED [<http://nsted.ipac.caltech.edu>], the NASA/ IPAC/NExSci Star and Exoplanet Database, is the most reliable and comprehensive database for information on exoplanets. In between April 15 and May 15, 2011, the number of such planets went from 531 to 535, and the number of planet-hosting stars grew from 444 to 448. According to the Overview page, "All data in NStED are vetted by a team of astronomers and are linked back to the original literature reference. Data are searchable either for an individual star or by stellar and planetary properties. NStED also offers direct access to frequently accessed tables, including [a] list of all known planets [and a] list of all known planet-hosting stars" [<http://nsted.ipac.caltech.edu/NStED/docs/intro.html>].

* NExSci or the NASA Exoplanet Science Institute [<http://nexsci.caltech.edu>] at the California Institute of Technology is the command and control center for NASA's exoplanet research program. In addition to helping administer the NStED database, NExSci also manages NASA's time slice of the W.M. Keck Observatory [<http://www.keckobservatory.org>] on the summit of Mauna Kea, Hawaii.

* The Extrasolar Planets Encyclopaedia [<http://exoplanet.eu>], created in 1995 and currently maintained by Jean Schneider, CNRS-LUTH (Centre national de la recherche scientifique, Laboratoire Univers et Theories), Paris Observatory, offers through its interactive catalog a wealth of data and explanations about planets orbiting other stars which have been discovered by space observatories such as Kepler and CoRoT. I was impressed by the list

of ongoing and projected ground- and space-based searches for exoplanets.

* The University of California spearheads the California Planet Survey [<http://exoplanets.org/cps>]. Users can query and view data through its Exoplanet Data Explorer [<http://exoplanets.org/index.html>]. Since 1995, this research team has "discovered 115 Jupiter-like and Saturn-like planets orbiting nearby stars."

* The Anglo-Australian Planet Search [http://www.phys.unsw.edu.au/~cgt/planet/AAPS_Home.html] uses a telescope at Siding Spring, New South Wales, to search for gas-giant planets similar to Jupiter and Saturn and establishes their existence through a technique called "Doppler wobble." "The group announced its first exoplanet discovery in November 1999 and has more than 240 nearby sunlike stars to search. It claims to have achieved "the highest long-term precision demonstrated by any Southern Hemisphere planet search."

* As its name implies, the Exoplanet Transit Database (ETD) [<http://var.astro.cz/ETD>], operated by the Czech Astronomical Society's Variable Star and Exoplanet Section, is strictly devoted to planetary bodies discovered through the transit method. As of May 15, 2011, ETD documents 122 such observations, the earliest from 1997.

* A number of robotic telescopes specifically designed to hunt for transiting planets have been hard at work. One of the most recent to come online was TRAPPIST (TRAnsiting Planets and Planetesimals Small Telescope) in Chile, which released its first test observations in 2010; it is controlled from a station in Belgium as part of the European Southern Observatory [<http://www.eso.org>].

* Taking a page from the SETI@home (Search for Extraterrestrial Life) [<http://setiathome.berkeley.edu>] program and similar "citizen science" projects, PlanetHunters.org [<http://www.planethunters.org>] is a collaboration between Yale University and the Zooniverse [<http://www.zooniverse.org>]. It provides you and your computer with an opportunity to assist in the analysis of data from the Kepler space telescope. As of May 15, 2011, according to the Planetometer [<http://www.planethunters.org/planetometer>], 2,913,458 observations have been analyzed and 69 potential planets identified. Maybe you will find the next exoplanet!

A Constellation of Astronomy Organizations and Periodicals

Based in Paris, the International Astronomical Union (IAU) [<http://www.iau.org>] was created in 1919. Today, its "mission is to promote and safeguard the science of astronomy in all its aspects through

international cooperation." Members are professional astronomers with at least a Ph.D. As part of its promotional endeavors, the IAU site includes a section on Astronomy for the Public [<http://www.iau.org/public>] that covers trendy and enduring topics such as "Buying Stars and Star Names" (you'd be wasting your money) and "Careers in Astronomy." The IAU and the United Nations Educational, Scientific, and Cultural Organization (UNESCO) also co-sponsored the International Year of Astronomy 2009 [<http://www.astronomy2009.org>].

The American Astronomical Society (AAS) [<http://aas.org>] was established in 1899 and boasts around 7,000 members. The society publishes four journals. The Education Services section features a general introduction to astronomy, annotated resource links for educators and students, and general links. Among the several English-language publications devoted to astronomy, I found these to offer a wealth of online resources:

Astronomy [<http://www.astronomy.com>] features a Java applet called StarDome, which lets you track throughout the day and night the position of the sun, planets, and other astronomical objects. Magazine subscribers get a better version plus access to an interactive version of the magazine's Star Atlas. The News and Observing section provides an array of helpful information, such as The Sky This Week, The Sky This Month, a glossary, an introduction to astronomy, and tips for photographing the night sky.

Sky & Telescope [<http://www.skyandtelescope.com>] bills itself as the "essential magazine of astronomy." You'll find an Interactive Sky Chart here along with several other online tools to make the most of your viewing time.

Australian Sky & Telescope [<http://www.austskyandtel.com.au>] is the somewhat equivalent edition for stargazers Down Under.

Astronomy Wow [<http://www.astronomynow.com>] is a British publication with an Interactive Sky Chart, a weekly night sky guide, and a planetary calculator all keyed to the British Isles.

Sky at Night Magazine [<http://www.skyatnightmagazine.com>] is another British publication, this one produced by the BBC.

Terence Dickinson's SkyNews [<http://www.skynews.ca>] is named after the founding editor, who is still there, and described as "Canada's leading author of astronomy books for both adults and children." The Resources section focuses on amateur observing and public education about astronomy. If you'd like to know your chances of seeing an aurora, check out the Aurora Watch that's updated daily via the NOAA Space Weather Prediction Center [<http://www.swpc.noaa.gov>]. The Canadian government also maintains

its own Space Weather Canada watch [<http://www.spaceweather.gc.ca>].

Other magazines devoted to the amateur astronomer are the Amateur Astronomy Magazine [<http://www.amateurastronomy.com>], "written by amateur astronomers, for amateur astronomers" and published for nearly 2 decades; The Astronomer [<http://www.theastronomer.org>], marketed to the "advanced amateur" and published since May 1964; the more recent Practical Astronomer Magazine [<http://practicalastronomy.com>], a British publication founded in 2009 and distributed for free online.

SIDEBAR

The European Southern Observatory (ESO) features an impressive array of more than 4,500 astronomical imagery and photographs of its facilities and personnel, including more than 1,400 zoomable images.

SIDEBAR

The HubbleSite Gallery is designed for image-based public access and packed with stunning imagery from NASA's first space-based telescope.

Starburst Galaxy M82

Plumes of glowing hydrogen blast from the central nucleus of M82. The pale, starlike objects are clusters of tens to hundreds of thousands of stars.

SIDEBAR

The Sloan Digital Sky Survey Sky Server provides some outstanding tools and entry points such as Famous Places for making the most of these images that you can see as a backdrop in sites such as the Worldwide Telescope and Sky-Map.

AUTHOR_AFFILIATION

by David Mattison

Aloha Fact and Image Finders

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Record - 6

DIALOG(R) ,

Nasa finds planet with Star Wars sunset,

New Zealand Herald, pB003,
Saturday, September 17, 2011

TEXT:

In an iconic scene in Star Wars, Luke Skywalker gazes into the distance as two suns set on the horizon of his homeland, Tatooine.

Now Nasa has discovered that Kepler-16b, much like the fictional Tatooine, is a circumbinary planet _ a planet that orbits two parent stars _ as opposed to the Earth that orbits only the sun.

The planet, about 200 light years from Earth, was glimpsed with the Kepler space telescope, which monitors the brightness of 155,000 stars, according to research published in the journal Science.

While astronomers have previously glimpsed planets they believed were orbiting two stars, this discovery offers the first proof as they had never before seen one passing in front of its two suns.

"Kepler-16b is the first confirmed, unambiguous example of a circumbinary planet _ a planet orbiting not one, but two stars," said co-author Josh Carter of the Harvard-Smithsonian Centre for Astrophysics.

"This discovery is stunning," said co-author Alan Boss of the Carnegie Institution for Science Department of Terrestrial Magnetism. "Once again, what used to be science fiction has turned into reality."

However, the similarities end there. While Luke Skywalker's native planet was hot and desert-like, Saturn-sized Kepler-16b is freezing, with surface temperatures reaching chills of -73C to -101C.

Both stars are small in comparison with our sun, at about 69 and 20 per cent of the sun's mass.

Telegraph Group Ltd

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Record - 7

DIALOG(R)

Planet find gives the science to film fiction,

The Australian, 1 - All-round Country ed, p3,
Saturday, September 17, 2011

TEXT:

IT is one of the most memorable scenes in science fiction: when Luke Skywalker first appears in Star Wars, he gazes up at the magnificent double sunset of his home planet, Tatooine

A real planet that enjoys just such a double sunset has now been detected by astronomers. While Kepler-16b is a gas giant, not a rocky planet like Tatooine, it is the first that is known to orbit two stars

About 200 million light years from Earth in the constellations of Cygnus and Lyra, it has been identified by NASA's Kepler probe, an orbiting telescope searching for Earth-like planets orbiting different stars

Discovery team member Joshua Carter, of the Harvard-Smithsonian Centre for Astrophysics, said: "Kepler-16b is the first confirmed, unambiguous example of a circumbinary planet -- a planet orbiting not one, but two stars." Alan Boss, of the Carnegie Institution of Washington, said: "This discovery is stunning. Once again, what used to be science fiction has turned into reality." Details of the discovery were published yesterday in the journal Science.

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Record - 8

DIALOG(R)

Double-sun planet like Star Wars' Tatooine discovered,
Hindustan Times,
Friday, September 16, 2011

TEXT:

Washington, Sept.16 -- NASA's Kepler space telescope has discovered a Saturn-size world orbiting two stars ' what's called a circumbinary planet - just like Tatooine, Luke Skywalker's home world in the Star Wars films.

However, the newly discovered planet ' Kepler-16b ' is colder than a desert world.

Like Tatooine, Kepler-16b enjoys a double sunset as it circles a pair of stars approximately 200 light-years from Earth.It's not thought to harbor life, but its discovery demonstrates the diversity of planets in our galaxy.

'Kepler-16b is the first confirmed, unambiguous example of a circumbinary planet - a planet orbiting not one, but two stars,' said Josh Carter of the Harvard-Smithsonian Center for Astrophysics (CfA).

'Once again, we're finding that our solar system is only one example of the variety of planetary systems Nature can create.'

Kepler-16b weighs about a third as much as Jupiter and has a radius three-fourths that of Jupiter, making it similar to Saturn in both size and mass. It orbits its two parent stars every 229 days at a distance of 65 million miles - similar to Venus' 225-day orbit.

Both stars are smaller and cooler than our Sun. As a result, Kepler-16b is quite cold, with a surface temperature of around -100 to -150 Fahrenheit.

Though there have been past hints of the existence of other planets that circled double stars, scientists said this is the first confirmation.

'Much of what we know about the sizes of stars comes from such eclipsing binary systems, and most of what we know about the size of planets comes from transits,' said lead author and Kepler scientist Laurance Doyle of the SETI Institute. 'Kepler-16 combines the best of both worlds, with stellar eclipses and planetary transits in one system.'

The study was recently published in the journal Science. Published by HT Syndication with permission from Asian News International. For any query with respect to this article or any other content requirement, please contact Editor at htsyndication@hindustantimes.com

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Record - 9

DIALOG(R)

La planète aux deux soleils de Luke Skywalker découverte dans notre galaxie,

Le Monde,

Friday, September 16, 2011

TEXT:

Les astronomes américains ont découvert une planète à deux soleils comme celle de Luke Skywalker dans La Guerre des étoiles, selon des travaux publiés jeudi 15 septembre dans la revue américaine Science. Cette exoplanète (planète hors du système solaire), qui tourne autour de deux soleils et qui connaît donc deux couchers et deux levers de soleil, a été

baptisee Kepler-16b. Elle se situe a environ 200 annees-lumieres de la Terre.

Jusqu'alors, une telle planete, dite circumbinaire, n'existait que dans l'univers de l'epopee cinematographique de science-fiction La Guerre des etoiles avec la planete Tatooine, recouverte de deserts arides et peulee de quelques especes indigenes comme les Hommes des sables. Mais contrairement a cette derniere, Kepler-16b est froide et gazeuse, et les astronomes excluent la possibilite que la vie y existe.

"Kepler-16b est le premier exemple de planete circumbinaire dont l'existence est confirmee", affirme Josh Carter, un astronome du Harvard-Smithsonian Center for Astrophysics (CFA), un des auteurs de cette decouverte. "Une fois de plus, nous decouvrons que notre systeme solaire n'est qu'un exemple parmi la diversite des systemes planetaires que la nature peut creer", ajoute-t-il dans un communique.

Cette decouverte a ete faite avec le telescope americain Kepler qui detecte la presence d'une planete quand celle-ci passe devant son etoile et en reduit momentanement la luminosite. Mais dans le cas de Kepler-16b, cette observation a ete rendue compliquee par le fait que les deux etoiles s'eclipsent mutuellement, provoquant periodiquement une reduction totale de la luminosite. Les astronomes ont aussi observe que la luminosite diminuait egalement a des intervalles reguliers meme quand les deux etoiles ne formaient pas d'eclipse, indiquant la presence d'un troisieme objet tournant autour d'elles.

LEMONDE.FR avec AFP

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Record - 10

DIALOG(R)

Found, the Star Wars planet with two suns,

Times, The (UK), 01 ed,

Friday, September 16, 2011

TEXT:

It is one of the most memorable scenes in science fiction: when Luke Skywalker first appears in Star Wars, he gazes up at the magnificent double sunset of his home planet, Tatooine.

A real planet that enjoys just such a double sunset has now been detected by astronomers. While Kepler-16b is a gas giant, not a rocky planet like

Tatooine, it is the first that is known to orbit two stars.

About 200 million light years from Earth in the constellations of Cygnus and Lyra, it has been identified by Nasa's Kepler probe, an orbiting telescope dedicated to searching for Earthlike planets orbiting different stars. "Kepler-16b is the first confirmed, unambiguous example of a circumbinary planet a planet orbiting not one, but two stars," said Joshua Carter, of the Harvard-Smithsonian Centre for Astrophysics, a member of the discovery team. "Once again, we're finding that our solar system is only one example of the variety of planetary systems nature can create."

"This discovery is stunning," said Alan Boss, of the Carnegie Institution of Washington. "Once again, what used to be science fiction has turned into reality." Details of the discovery are published today in the journal Science.

Kepler-16b has about a third of the mass of Jupiter and about three quarters of its radius, making it similar in size to Saturn. It orbits its two central stars at a distance of 65 million miles, making a circuit once every 229 days, giving it a similar orbit to Venus.

The two central stars are both smaller and cooler than the Sun, so although Kepler-16b orbits closer in than Earth, it is considerably colder, with a surface temperature of about -70C to -100C (-100F to -150F).

While planets in binary star systems have been identified before, Kepler-16b is the first to be observed passing in front of both parent stars. This confirms that it orbits the two stars. According to the researchers, the planet transits both stars in view of the Kepler telescope and both stars also eclipse each other, which allows for very precise measurements.

The two stars are 20 per cent and 69 per cent of the size of the Sun and follow an eccentric 41-day orbit around each other. The scientists believe that the planet was formed the same disk of dust and gas that gave rise to both stars.

"Much of what we know about the sizes of stars comes from such eclipsing binary systems, and most of what we know about the size of planets comes from transits," said Laurance Doyle, of the SETI Institute, who led the research team.

"Kepler-16b combines the best of both worlds, with stellar eclipses and planetary transits in one system."

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Record - 11

DIALOG(R)

Astronomers detect real-life Star Wars planet,

Darren Osborne for ABC Science Online,

ABC Premium News,

Thursday, September 15, 2011

TEXT:

Friday, September 16, 2011 - In a case of science fiction turning into fact, astronomers have detected a planet orbiting two stars- and nicknamed it Tatooine after Luke Skywalker's home planet in the Star Wars films.

In a case of science fiction turning into fact, astronomers have detected a planet orbiting two stars- and nicknamed it Tatooine after Luke Skywalker's home planet in the Star Wars films.

The discovery, announced at the Extreme Solar Systems conference in Wyoming, was published in the journal Science.

"Once again, we're finding that our solar system is only one example of the variety of planetary systems nature can create," study co-author Dr Josh Carter from the Harvard-Smithsonian Centre for Astrophysics said.

Officially known as Kepler-16b, the planet is a gas giant similar in size to Saturn, orbiting at a distance of 105 million kilometres from its parent stars - similar to the distance from which Venus orbits the Sun.

However, both stars are smaller and cooler than the Sun, meaning the surface temperature of Kepler-16b is between minus 70 degrees Celsius and minus 100C.

The planet, which is 200 light years from Earth, was detected using NASA's Kepler space telescope as it passed between Earth and its parent star, a process known as a transit.

As the planet transits the star, it reduces the amount of light received by the telescope.

The amount, duration and frequency of this 'light dip' allows astronomers to determine the size of the planet and its distance from the star.

Calculating Kepler-16b's size and orbit proved to be slightly more difficult due to the two stars transiting each, causing additional changes

in brightness.
'Pretty unusual'

Dr Simon O'Toole, a research astronomer at the Australian Astronomical Observatory in Sydney, was not part of the study but is currently working on a project with amateur astronomers to detect planets orbiting binary stars using ground-based telescopes.

"We've had hints of this kind of thing before, but this is the first time you can say for sure it's a planet," he said.

"The other cases have been around very unusual binary stars, but these are stars much more like the Sun."

He says the concept of a planet with two suns, as depicted in the movie *Star Wars*, is a popular motif of science fiction writers.

"It's sort of long been hoped for, but now we've got confirmation."

Dr O'Toole says it could be possible other planets - including rocky Earth-like planets - are orbiting the stars, but they might be impossible to detect.

"The probability of all the objects lining up so that you can see these transits is quite low. If there are other rocky planets there we may not see them," he said.

Dr O'Toole believes this latest discovery highlights the diverse range of solar systems in the universe.

"Our solar system is looking a bit unusual. But so is this - this is pretty unusual," he laughed.

"The definition of a normal planetary system is becoming really hard to pin down. Just when we think we've got an idea, something comes along that surprises us."

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Record - 12

DIALOG(R)

Astronomers discover planet straight out of Star Wars,
Rob Hastings,

Independent (UK), 1ST ed, p12,
Friday, September 16, 2011

TEXT:

IT'S ENOUGH to make Luke Skywalker feel homesick. A planet has been discovered 200 million light years away that orbits two stars rather than one, enjoying a double sunset just like the fictional world the Star Wars hero hails from.

Unlike the imaginary desert planet Tatooine in George Lucas' 1977 sci-fi classic, Nasa says the new deep-space find, named Kepler-16b, is cold and gaseous, and similar in size to Saturn.

The double-sun effect was discovered by astronomers analysing the brightness of the two stars in their telescopes. They noticed the stars dimmed even when not eclipsing one another, signalling the presence of a planet passing in front of them.

Celebrating "the first confirmed, unambiguous example of a circumbinary planet", Josh Carter of the Harvard-Smithsonian Centre for Astrophysics said Kepler-16b highlighted the diversity of the universe.

The research was presented at the Extreme Solar Systems II conference in Jackson Hole, Wyoming, and is detailed in the journal Science.

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Record - 13

DIALOG(R)

Una prueba espacial detecta un planeta con dos puestas de sol,

AFX Espana ProFeed,

Thursday, September 15, 2011

TEXT:

Por Deborah Zabarenko

WASHINGTON, 15 sep (Reuters) - Cuando los días terminan en el planeta Kepler-16b hay una doble puesta de sol, según informaron el jueves varios científicos en la revista Science.

En un escenario con reminiscencias a la ciencia ficción, los investigadores, utilizando las observaciones de la nave Kepler de la NASA, han detectado un distante planeta que orbita dos estrellas, la primera vez que se confirma un suceso semejante.

'Realmente es una medicion de la Kepler sensacional', dijo Alan Boss de la Institucion Carnegie para la Ciencia y coautor del estudio. 'Lo verdaderamente emocionante es que hay un planeta ahi fuera que orbita esas dos estrellas'.

Ya se habian visto estrellas binarias, dos soles que orbitan entre ellos, y los astronomicos sospechaban que habia planetas entre ellas, pero las observaciones de la Kepler son las primeras en confirmarlo.

La fuerza gravitacional de dos estrellas, incluso de las relativamente pequenas en el corazon de su sistema, seria bastante distinta que la gravedad que pudiera generar una sola estrella, dijo Boss por telefono.

La mision de la Kepler es explorar nuestro sector de la Via Lactea en busca de los denominados 'planetas habitables' que no esten ni demasiado cerca ni demasiado lejos de las estrellas que orbitan.

?COMO EL HOGAR DE LUKE SKYWALKER?

La nave encuentra estrellas cuya luz se vuelve mas tenue periodicamente, lo que significa que hay un cuerpo astronomico en orbita (un planeta) pasando entre la estrella y el instrumental de la Kepler. Eso se conoce como planeta transitorio.

Lo que llamo la atencion fue que las estrellas se eclipsaron una a otra sucesivamente, y un tercer eclipse indico que el planeta era parte del sistema.

Si la nocion de un planeta con dos soles suena familiar, es porque ya se vio en la primera pelicula de 'La guerra de las galaxias' en el planeta ficticio de Tatooine, hogar de Luke Skywalker.

Tatooine era un planeta rocoso y desertico, pero Kepler-16b es un frio gigante gaseoso, segun afirmaron Boss y otros investigadores.

Como estos dos soles son mas pequenos y frios que el nuestro, Kepler-16b seria bastante mas frio, con una temperatura de superficie de entre -73 y -101 grados Celsius, segun afirmo el Centro de Astrofisica Harvard-Smithsonian en un comunicado. El centro Josh Carter es coautor del estudio.

Kepler-16b es similar a Jupiter en masa y tamano, un gigante frio gaseoso cuyos soles orbitan cada 229 dias a 104,6 millones de kilometros. Es practicamente la misma distancia que la orbita de Venus, en comparacion con la de 365 dias de la Tierra, cuyo Sol se encuentra a 149,7 millones de kilometros.

Este recién detectado planeta está a 200 años-luz de la Tierra y no se cree que pueda albergar vida. Un año luz son algo menos de 10 billones de kilómetros.

(Traducido por Jaime Ortiz en la Redacción de Madrid; + 34 915858341; Madrid.online@thomsonreuters.com)

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Record - 14

DIALOG(R)

Astronomers Find 50 New Exoplanets,

World News Connection,

Tuesday, September 13, 2011

TEXT:

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TEHRAN (FNA)- Astronomers have announced the discovery of more than 50 new exoplanets orbiting nearby stars, including sixteen super-Earths.

The HARPS spectrograph on the 3.6-metre telescope at ESO's La Silla Observatory in Chile is the world's most successful planet finder [1]. The HARPS team, led by Michel Mayor (University of Geneva, Switzerland), have announced the discovery of more than 50 new exoplanets orbiting nearby stars, including sixteen super-Earths [2]. This is the largest number of such planets ever announced at one time [3]. The new findings are being presented at a conference on Extreme Solar Systems where 350 exoplanet experts are meeting in Wyoming, USA.

"The harvest of discoveries from HARPS has exceeded all expectations and includes an exceptionally rich population of super-Earths and Neptune-type

planets hosted by stars very similar to our Sun. And even better -- the new results show that the pace of discovery is accelerating," says Mayor.

In the eight years since it started surveying stars like the Sun using the radial velocity technique HARPS has been used to discover more than 150 new planets. About two thirds of all the known exoplanets with masses less than that of Neptune [4] were discovered by HARPS. These exceptional results are the fruit of several hundred nights of HARPS observations [5].

Working with HARPS observations of 376 Sun-like stars, astronomers have now also much improved the estimate of how likely it is that a star like the Sun is host to low-mass planets (as opposed to gaseous giants). They find that about 40% of such stars have at least one planet less massive than Saturn. The majority of exoplanets of Neptune mass or less appear to be in systems with multiple planets.

With upgrades to both hardware and software systems in progress, HARPS is being pushed to the next level of stability and sensitivity to search for rocky planets that could support life. Ten nearby stars similar to the Sun were selected for a new survey. These stars had already been observed by HARPS and are known to be suitable for extremely precise radial velocity measurements. After two years of work, the team of astronomers has discovered five new planets with masses less than five times that of Earth. "These planets will be among the best targets for future space telescopes to look for signs of life in the planet's atmosphere by looking for chemical signatures such as evidence of oxygen," explains Francesco Pepe (Geneva Observatory, Switzerland), the lead author of one of the recent papers.

One of the recently announced newly discovered planets, HD 85512 b, is estimated to be only 3.6 times the mass of Earth [6] and is located at the edge of the habitable zone -- a narrow zone around a star in which water may be present in liquid form if conditions are right [7].

"This is the lowest-mass confirmed planet discovered by the radial velocity method that potentially lies in the habitable zone of its star, and the second low-mass planet discovered by HARPS inside the habitable zone," adds Lisa Kaltenegger (Max Planck Institute for Astronomy, Heidelberg, Germany and Harvard Smithsonian Center for Astrophysics, Boston, USA), who is an expert on the habitability of exoplanets.

The increasing precision of the new HARPS survey now allows the detection of planets under two Earth masses. HARPS is now so sensitive that it can detect radial velocity amplitudes of significantly less than 4 km/hour [8] -- less than walking speed.

"The detection of HD 85512 b is far from the limit of HARPS and demonstrates the possibility of discovering other super-Earths in the habitable zones around stars similar to the Sun," adds Mayor.

These results make astronomers confident that they are close to discovering other small rocky habitable planets around stars similar to our Sun. New instruments are planned to further this search. These include a copy of HARPS to be installed on the Telescopio Nazionale Galileo in the Canary Islands, to survey stars in the northern sky, as well as a new and more powerful planet-finder, called ESPRESSO, to be installed on ESO's Very Large Telescope in 2016 [9]. Looking further into the future also the CODEX instrument on the European Extremely Large Telescope (E-ELT) will push this technique to a higher level.

"In the coming ten to twenty years we should have the first list of potentially habitable planets in the Sun's neighborhood. Making such a list is essential before future experiments can search for possible spectroscopic signatures of life in the exoplanet atmospheres," concludes Michel Mayor, who discovered the first-ever exoplanet around a normal star in 1995.

Notes

[1] HARPS measures the radial velocity of a star with extraordinary precision. A planet in orbit around a star causes the star to regularly move towards and away from a distant observer on Earth. Due to the Doppler effect, this radial velocity change induces a shift of the star's spectrum towards longer wavelengths as it moves away (called a redshift) and a blueshift (towards shorter wavelengths) as it approaches. This tiny shift of the star's spectrum can be measured with a high-precision spectrograph such as HARPS and used to infer the presence of a planet.

[2] Planets with a mass between one and ten times that of Earth are called super-Earths. There are no such planets in our Solar System, but they appear to be very common around other stars. Discoveries of such planets in the habitable zones around their stars are very exciting because -- if the planet were rocky and had water, like Earth -- they could potentially be an abode of life.

[3] Currently the number of exoplanets stands at close to 600. In addition to exoplanets found using radial velocity techniques, more than 1200 exoplanet candidates have been found by NASA's Kepler mission using an alternative method -- searching for the slight drop in the brightness of a star as a planet passes in front of it (transits) and blocks some of the light. The majority of planets discovered by this transit method are very distant from us. But, in contrast, the planets found by HARPS are around stars close to the Sun. This makes them better targets for many kinds of

additional follow-up observations.

[4] Neptune has about seventeen times the mass of Earth.

[5] This huge observing program is led by Stephane Udry (Geneva Observatory, Switzerland).

[6] Using the radial velocity method, astronomers can only estimate a minimum mass for a planet as the mass estimate also depends on the tilt of the orbital plane relative to the line of sight, which is unknown. From a statistical point of view, this minimum mass is however often close to the real mass of the planet.

[7] So far, HARPS has found two super-Earths that may lie within the habitable zone. The first one, Gliese 581 d, was discovered in 2007 (eso0722). HARPS was also recently used to demonstrate that the other candidate super-Earth in the habitable zone around the star Gliese 581 (Gliese 581 g) does not exist.

[8] With large numbers of measurements, the detection sensitivity of HARPS is close to 100% for super-Earths of ten Earth-masses with orbital periods of up to one year, and even when considering planets of three Earth masses with a one-year orbit, the probability of detection remains close to 20%.

[9] ESPRESSO, the Echelle SPectrograph for Rocky Exoplanet and Stable Spectroscopic Observations, is to be installed on the ESO Very Large Telescope. Currently undergoing preliminary design, it is scheduled to start operating in 2016. ESPRESSO will feature radial velocity precision of 0.35 km/h or less. For comparison, Earth induces a 0.32 km/h radial velocity on the Sun. This resolution should thus enable ESPRESSO to discover Earth-mass planets in the habitable zone of low-mass stars.

[Description of Source: Tehran Fars News Agency in English -- hardline semi-official news agency, headed as of 24 July 2011 by Nezameddin Musavi, who will continue to hold his previous post as the managing editor of IRGC-related daily newspaper Javan; <http://www.english.farsnews.com>]

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Record - 15

DIALOG(R)

Columbia man donates telescopes to USC, State Museum,

JOEY HOLLEMAN,

Columbia State (SC),

Wednesday, September 14, 2011

TEXT:

Robert B. Ariail has an addiction, and that's good news for students, astronomy buffs and science historians.

Ariail can't resist old telescopes. The 79-year-old Columbia resident has spent most of his adult life finding, buying, restoring and looking through devices built by some of the most important telescope makers in history - Alvan Clark , Henry Fitz , Zeiss.

He also snapped up every old document related to astronomy he could find, including the first printed star atlas from 1540 and Isaac Newton's "Opticks" from 1718.

"Robert Ariail has put together a vintage collection of astonishing proportions, not only the finest assembly anywhere of early American telescopes, but a library to match," said Owen Gingerich , professor of astronomy and history of science at Harvard-Smithsonian Center for Astrophysics . "With respect to popular astronomy of the 19th century, his book collection rivals, and in critical areas exceeds, the Library of Congress itself."

Hoping for others to get enjoyment out of his passion, Ariail has donated his astronomy collection to the S.C. State Museum and the University of South Carolina . The museum gets 63 telescopes and about 200 other pieces of equipment. USC gets more than 5,200 rare books, star atlases, scientific journals and manuscripts.

The public gets limited access to what's being called the Robert B. Ariail Collection of Historical Astronomy.

Many of the telescopes, dating back to 1730, will be on display in the Palmetto Gallery on the museum's fourth floor. That's a temporary home. The museum has plans to expand with an observatory, planetarium and 4-D theater, which would seem like the ideal place for the collection. But the official line in the museum news release Tuesday about the donation is that the telescopes will end up "in a large, designated space being planned by the museum."

The books and documents will be housed in the Ernest F. Hollings Special Collections Library at USC . (It's connected to Thomas Cooper Library if you haven't been on campus in awhile). Some documents already are in display cases at the library. Others have been digitized and can be viewed online at library.sc.edu/ariail.

As part of the library collection, most of the books and documents are available for perusal in the building but can't be checked out.

Ariail said he didn't want to break up his collection by selling it piece by piece, and he wanted others to get a chance to enjoy the fruits of what he admits has been an obsession.

"It's a disease," Ariail said. "When you buy one and see what it does, you want another one. They're beautiful."

With shiny brass tubes and dark mahogany tripods, the telescopes on display at the museum could be considered works of art. They're also amazingly powerful tools.

"You'd be surprised how good the ancient telescopes are," said Ariail, who has viewed stars and planets through all of his pieces. "They were made by geniuses."

Museum visitors won't get a chance to look through the oldest telescopes, but some of Ariail's newer ones could be used in museum astronomy outreach programs, said Tom Falvey , director of education and curator of science and technology at the museum.

Officials declined to detail the value of the collection, simply calling it priceless. Ariail, a longtime member of the museum board, had donated several early telescopes to the museum through the years. Those alone prompted visits from antique astronomy buffs, Falvey said.

USC President Harris Pastides said the university is proud to help "share the greatness of this collection with the entire world."

Ariail grew interested in astronomy after doing a class project on the subject in third grade. A 1956 USC grad with a degree in English, he began collecting while in college. His passion grew until recent years, when he finally quit buying and decided to slim his home collection down to six to eight telescopes.

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Record - 16

DIALOG(R)

Scientists discover a planet reminiscent of Star Wars' world Empire of the Suns,

CLARE PEDDIE SCIENCE REPORTER,

Advertiser (Australia), 1 - State ed, p3,

Friday, September 16, 2011

TEXT:

SUNRISE and sunset on a planet far, far away would be twice as spectacular as here on Earth, astronomers say

NASA today will announce the discovery of a planet with two suns, like Tatooine in the movie Star Wars

The newly-found planet, Kepler-16b, is named after the NASA Kepler space telescope, which is on a mission to find Earth-sized planets capable of supporting life

While this planet is too cold, between -100C and -70C, scientists say it is a "treasure" worthy of further investigation

"Kepler-16b is the first confirmed, unambiguous example of a circumbinary planet - a planet orbiting not one, but two stars," Josh Carter, of the Harvard-Smithsonian Center for Astrophysics, says. "Again, we're finding our solar system is only one example of the variety of planetary systems nature can create." Commenting on the research, Dr Simon O'Toole from the Australian Astronomical Observatory says it's a "very, very cool" discovery

"If you could stand on the surface of the gas planet at dawn, the sight would be stunning," he said

"You would see one star rise and then the other star

"Every day would be slightly different . . . and the sunset - like in the first Star Wars movie, when Luke Skywalker is looking out over the sunset and there are two stars, that is the kind of thing that you would see - would be twice as spectacular as it is here on Earth." The paper published today in the journal Science describes a planet comparable with Saturn in mass and size. It is on a nearly circular 229-day orbit around its two parent stars

The stars are 20 and 69 per cent as massive as the Sun and have a 41-day orbit

Kepler is a 0.95m telescope that monitors the optical brightness of about

155,000 stars in the constellations Cygnus and Lyra

PAGE 69: Back to the future for space flight

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Record - 17

DIALOG(R)

50 new planets found,

Indo-Asian News Service,

Tuesday, September 13, 2011

TEXT:

London, Sep.13 -- Astronomers have discovered at least 50 new planets beyond the solar system, including 16 that are of a size similar to Earth, a media report said.

The biggest planet of the new batch is named "HD 85512 b".It is 3.6 times the mass of Earth and can be found 36 light years away in the Vela constellation, the Daily Mail reported Tuesday.

The discovery was made by the High Accuracy Radial Velocity Planet Searcher (HARPS), installed at the European Southern Observatory's La Silla Observatory in Chile.

The findings would be presented at a conference on Extreme Solar Systems to be held in Wyoming, US.

The discovery suggests that more than half of the stars like the sun possess planets.

"The detection of 'HD 85512 b' is far from the limit of HARPS, and demonstrates the possibility of discovering other super-Earths in habitable zones around stars similar to the sun," University of Geneva astronomer Michel Mayor was quoted as saying.

Team member Lisa Kaltenegger of the Max Planck Institute for Astronomy and the Harvard Smithsonian Centre for Astrophysics said the findings mark a new age in the search for habitable planets.Published by HT Syndication with permission from Indo-Asian News Service.For any query with respect to this article or any other content requirement, please contact Editor at htsyndication@hindustantimes.com

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Record - 18

DIALOG(R)

Space over time: human exploration is the most visible use of spaceflight, but business and defense satellites fill the sky.

Orcutt, Mike,

Technology Review (Cambridge, Mass.), v114, n5, p26(2),

Thursday, September 1, 2011

TEXT:

The retirement of the space shuttles marks the end of NASA's human spaceflight program, at least for now. But human missions funded by the U.S. government have represented only a small part of the action in space.

Of the 7,000 spacecraft that have been launched into orbit or beyond, more than half were defense satellites used for such purposes as communication, navigation, and imaging. (The Soviet Union sent up a huge number, partly because its satellites tended to be much shorter-lived than those from the United States.) In the 1970s, private companies began increasingly adding to the mix, launching satellites for telecommunications and broadcasting.

This graphic groups payloads by the nationality of the owner. A satellite, a capsule of cosmonauts, or a deep-space probe would each count as one payload. The data, which run through July 2011, were drawn from hundreds of sources, including space agency documents, academic journals, and interviews. They were compiled by Jonathan McDowell, an astrophysicist at the Harvard-Smithsonian Center for Astrophysics and author of Jonathan's Space Report, a newsletter that tracks launches.

[GRAPHIC OMITTED]

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Record - 19

DIALOG(R)

36 Light Years From Here, New Hope for an Earth-Like Planet,

DENNIS OVERBYE,

New York Times (NY), Late Edition - Final ed, p3,

Tuesday, September 13, 2011

TEXT:

European astronomers said Monday that they had found what might be the best candidate for a Goldilocks planet yet: a lump of something about 3.6 times as massive as the Earth, circling its star at the right distance for liquid water to exist on its surface -- and thus, perhaps, to host life, as we narrowly imagine it.

The planet, known as HD 85512b, is about 36 light years from here, in the constellation Vela. It orbits its star at about a quarter of the distance that Earth circles the Sun, taking 58 days to make a year. That distance would put it in the star's so-called habitable zone, if the planet is rocky and has some semblance of an atmosphere -- "if everything goes right and you have clouds to shelter you," as Lisa Kaltenegger of the Harvard-Smithsonian Center for Astrophysics and the Max Planck Institute for Astronomy in Heidelberg, Germany, summarized it.

Astronomers cautioned, however, that it would take years and observations from telescopes not yet built before those assumptions could be tested and a search for signs of life could be undertaken.

Neither humans nor their robot helpers are likely to be dispatched toward Vela anytime soon. But the finding did vault HD 85512b to the top of a list of the handful of Goldilocks candidates.

The Vela planet was part of a haul of more than 50 new exoplanets -- as planets around other stars are called -- discussed in a news conference on Monday hosted by the European Southern Observatory. They are the newest fruits of an eight-year observing program by astronomers based at the University of Geneva and led by Stephane Udry and Michel Mayor, working from a telescope at the European Southern Observatory in Chile. About 16 of them are so-called super-Earths, with masses less than 10 times the Earth, further encouraging astronomers that they are on the verge of finding planets like ours. A pair of papers -- one with Dr. Mayor as lead author and the other with Francesco Pepe, also of Geneva, as lead author -- have been submitted to *Astronomy and Astrophysics*, describing the planets.

The Geneva astronomers used a sensitive spectrograph known as Harps (an acronym for High Accuracy Radial velocity Planet Searcher) to detect wobble in the stars' motions as planets swung around them. The wobble technique, however, only reveals the masses of exoplanets. Without further information like the size -- which NASA's Kepler satellite, also in the exoplanet business, measures by seeing the shadows of planets as they cross in front of their stars -- or the composition, the astronomers cannot say for sure whether the Vela planet is made of rock, steam, iron, diamonds or something else. Nor can they tell what, if any, atmosphere it has. Kepler will be of no help because its gaze is fixed on a different swath of sky.

The star that the Vela planet circles is known as HD 85512, or Gliese 370, after Wilhelm Gliese, a German astronomer. The star is orange, about two-thirds as massive and about an eighth as luminous as our Sun.

A study led by Dr. Kaltenegger, Dr. Pepe and Dr. Udry concluded that HD 85512b was potentially habitable if it had more than a 50 percent cloud cover.

Dimitar Sasselov of the Center for Astrophysics, who has followed this work but is not part of the team, said that Dr. Kaltenegger and her colleagues made reasonable assumptions. He called the result "very solid" and "a major step in the right direction."

Others were less impressed by the case for habitability. Sara Seager of the Massachusetts Institute of Technology noted that Dr. Kaltenegger's model atmospheres were limited to water, carbon dioxide and nitrogen, like the Earth.

"A very terracentric view," she said in an e-mail.

Dr. Seager said, "Would I bet \$1 that this is a habitable planet? No. If I had a space telescope that could look at the atmosphere, would I point to the planet? Yes."

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Record - 20

DIALOG(R)

In search for life, more planet 'candidates' are found. Are any just right?,

Pete Spotts Staff writer,

Christian Science Monitor (USA), ALL ed,

Monday, September 12, 2011

TEXT:

If finding Earth-size planets orbiting other stars at distances hospitable for life is the holy grail for planet hunters, teams of astronomers are uncovering a lot of potential chalices.

One team, associated with NASA's Kepler mission, announced Monday that they have identified 1,781 planet "candidates" as they peer at a patch of sky covering more than 156,000 stars, in the constellation Cygnus.

Of those 121 appear to be orbiting in the habitable zones of their host stars a(euro)" a region of space around the star where a planet's temperature would allow liquid water to pool on the surface. Some of these habitable-zone objects appear to be so-called super Earths, which tip the scales at between roughly twice Earth's mass to 10 times the mass of the Earth.

The Kepler team calls the objects candidates because they still require confirmation from ground-based astronomers using other techniques for detecting them. The team announced the latest update to its planetary census at a conference in Moran, Wyo., near Grand Teton National Park.

Kepler, a spacecraft trailing behind Earth in the planet's orbit around the sun, stares at its target stars simultaneously. It uses the so-called transit method to find planets, looking for the telltale dimming as a planet passes in front of its host star. To confirm that the observed object is a planet, ground-based astronomers look at the impact of the planet's motion on the star's spectrum. Of the 1,781 candidates Kepler has detected, 27 have been confirmed as planets so far.

Although the detection method Kepler uses allows scientist to make some broad inferences about a planet's size, temperature, or whether the planet is rocky or a ball of gas, the planets are too far away to make direct measurements of any atmosphere they might have.

The stars Kepler looks at are roughly 600 to 3,000 light-years away.

That is why other teams are looking much closer to home.

A group using a planet-hunting spectrometer bolted to the back of a telescope at the European Southern Observatory's La Silla Observatory in Chile reported at the same conference finding a super Earth orbiting just inside the inner edge of the habitable zone of a star labeled HD 85512. It is in the constellation Vela some 6.2 light-years from the sun.

The planet, with 3.6 times Earth's mass, orbits the star once every 58 days. By comparison, Mercury orbits the sun once every 88 days.

The team detected the planet with a technique that uses the wobble in a star's spectrum to track the planet's gravitational tug on its sun. The discovery was part of a project to see if upgrades to the spectrometer they are using, dubbed HARP, was up to the task of detecting planets with masses comparable to Earth's in the habitable zones of near-by stars.

The planet has the lowest mass of any yet detected in a star's habitable zone, according to Lisa Kaltenegger, a planetary scientist who divides her time between the Max Planck Institute for Astronomy in Heidelberg, Germany,

and the Harvard-Smithsonian Center for Astrophysics in Cambridge, Mass.

The detection was one of 50 new confirmed planets a(euro)" including 16 super Earths a(euro)" HARP has added to the roster of what is now 645 planets astronomers around the world have discovered.

While the number of planets approaching Earth's mass and within a star's habitable zone is increasing, distance alone does not make for a comfy planet, researchers caution.

In August, Dr. Kaltenegger and Dimitar Sasselov, with the Harvard-Smithsonian Center for Astrophysics, published basic calculations that could be applied to the Kepler data to give a first-cut estimate of whether a planet candidate in a habitable zone could indeed be habitable.

The breadth of a star's habitable zone depends as much on the planet itself as it does on the star, the scientists point out.

Among the key factors they cite: the intensity, mix of wavelengths, and steadiness with which the star's light hits the planet; the amount of starlight the planet reflects; the concentration of heat-trapping greenhouse gases; and the range of geophysical processes, from volcanism to wind patterns, that move energy around.

Since most of those characteristics are not observable, researchers by necessity have to make some assumptions about the traits, especially those the planets display.

When the two applied their model to Kepler data, they found fewer desirable neighborhoods than initially estimated.

In February, the Kepler team announced that the latest update to its planetary census revealed 54 planet candidates falling within their stars' habitable zones.

But based on the traits Kaltenegger and Dr. Sasselov identified, the duo estimated that many of the 54 planets actually fall outside of the habitable zones. Of the six likely rocky planets in that sample, four fell within the zone, with two others on the inside fringe. Think Venus.

Close, but no microbe.

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Wolbach Library: CfA in the News ~ Week ending 25 September 2011

1. **6-ton satellite falls to Earth, just don't ask NASA where,**
Seth Borenstein, Star-Ledger, The (Newark, NJ), Update ed, p003,
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2. **Satellite likely in ocean, but pieces may have come down in Northwest,**
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3. **Satellite slows down, Earth strike delayed,**
MARCIA DUNN Associated Press,
Tulsa World, Final ed, pA12,
Saturday, September 24, 2011
4. **RCMP denies dead satellite hit Alberta,** Seth Borenstein Associated Press,
Toronto Star, v2011092517474128, ONT ed, pA15,
Sunday, September 25, 2011
5. **Chute du satellite: la GRC nie que des debris soient tombes en Alberta,**
La Presse Canadienne, Saturday, September 24, 2011
6. **RCMP calls reports of satellite debris falling in Alberta 'hoax',**
Canadian Press, Saturday, September 24, 2011
7. **Satellite likely in ocean, but may have hit U.S.,**
The Associated Press, Merrillville Post-Tribune, p34,
Sunday, September 25, 2011
8. **SATELLITE FALLS SAFELY,** James McNamara,
People (UK), Eire ed, p2, Sunday, September 25, 2011
9. **NASA: Satelite cae a Tierra; se desconoce su ubicacion,**
AP, El Nuevo Herald, Saturday, September 24, 2011
10. **Satellite likely in ocean, but may have hit US,**
SETH BORENSTEIN and KELLI KENNEDY,
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11. **Satellite skips beat in plunge to Earth Much of craft likely to burn in re-entry,** Marcia Dunn, Star-Ledger, The (Newark, NJ), Essex ed, p002,

Saturday, September 24, 2011

12. **NASA: 6-ton satellite hits Earth; location unknown**,
SETH BORENSTEIN,
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Saturday, September 24, 2011

13. **Doomed satellite slows its descent**, Winnipeg Free Press (Manitoba, CA), pA27,
Saturday, September 24, 2011

14. **Dead NASA satellite clings to orbit**, The Associated Press,
Merrillville Post-Tribune, p23, Saturday, September 24, 2011

15. **Derelict NASA satellite could hit North America**,
Marcia Dunn, Waterloo Region Record, v2011092417462668, First ed, pA4,
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16. **Le vieux satellite de la NASA ralentit sa course vers la Terre**, MARCIA DUNN,
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17. **SATELLITE TO TUMBLE TO EARTH TODAY**,
Associated Press, Augusta Chronicle, The (GA), All ed, pB7
Friday, September 23, 2011

18. **DEATHS ELSEWHERE: Dr. Michael Drake** ,
Augusta Chronicle, The (GA), All ed, pB5,
Friday, September 23, 2011

19. **NASA warns that Canada, Africa are potential crosshairs for a falling 6-ton satellite**, Al Arabiya, Saturday, September 24, 2011

20. **Satellite slow to make its plunge**, Wichita Eagle (KS)
Saturday, September 24, 2011

21. **CHANCE FALLING SATELLITE HITS YOU: 1 IN 21 TRILLION**,
Marcia Dunn, Associated Press,
San Jose Mercury News (CA), Valley Final ed, p5A,
Wednesday, September 21, 2011

22. **Falling satellite causes concern**, MARCIA DUNN
The Huntsville Times (Huntsville, AL), 02 ed, p07A,
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23. **NASA gives 1-hour window for falling satellite**,
MARCIA DUNN, AP Alert - Defense,
Saturday, September 24, 2011

24. **Falling satellite slows down, Earth strike delayed**, MARCIA DUNN,

AP Alert - Defense, Saturday, September 24, 2011

25. **World Briefly: Defunct NASA satellite slows down in plunge to Earth, US no longer out of woods**, AP DataStream, Friday, September 23, 2011

26. **AP News in Brief** at 5:58 p.m. EDT, AP DataStream, Friday, September 23, 2011

27. **Planet expert Michael Drake dies**, Burlington County Times, pB7, Friday, September 23, 2011

28. **Defunct NASA satellite to fall back to Earth on Friday; chances of seeing re-entry slim**, ALICIA CHANG, Canadian Press, Thursday, September 22, 2011

29. **NASA satellite expected to tumble to Earth today**, The Associated Press, ALICIA CHANG, Merrillville Post-Tribune, p39, Friday, September 23, 2011

30. **Satellite coming down**, Gold Coast Bulletin (Australia), B - Main ed, p22, Friday, September 23, 2011

31. **Old NASA satellite to tumble to Earth on Friday**, ALICIA CHANG, AP DataStream, Friday, September 23, 2011

32. **Univ. of Arizona planet expert Michael Drake dies**, AP Alert - Arizona, Thursday, September 22, 2011

33. **Earth to satellite: When will you hit - and where?**, Bismarck Tribune, The (ND), pA1, Wednesday, September 21, 2011

34. **Keeping an eye on the sky**, MARCIA DUNN Associated Press, Tulsa World, Final ed, pA6, Wednesday, September 21, 2011

35. **NASA doesn't know where satellite will fall**, MARCIA DUNN Associated Press, Press of Atlantic City, The, All ed, pA1, Wednesday, September 21, 2011

36. **life: science Satellite strike zone NASA scientists are doing their best to tell us where a plummeting 5.4-tonne piece of space debris will fall**, Townsville Eye (Australia), 1 - ed, p27, Thursday, September 22, 2011

37. **Satellite plunges toward Earth Debris has 1-in-3,200 chance of hitting someone**, THE ASSOCIATED PRESS, Charleston Daily Mail (WV), pP3A Wednesday, September 21, 2011

38. **Earth in crosshairs of plummeting NASA satellite -- Where space debris strikes later this week is anybody's guess**,

Marcia Dunn Associated Press,
Memphis Commercial Appeal (TN), Final ed, pA1,
Wednesday, September 21, 2011

39. **Derelict satellite to fall to Earth**, Marcia Dunn,
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40. **The sky's not falling . . . but a satellite is**, Marcia Dunn,
Guelph Mercury, v2011092117428664, First ed, pB10,
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41. **NASA scientists wonder when, where hurtling satellite will fall this week**,
Marcia Dunn, Times, The (Trenton, NJ), Trenton Full Run ed, pA07,
Wednesday, September 21, 2011

42. **Experts: Yes, huge satellite is falling; no, don't sweat it**, Marcia Dunn,
Star-Ledger, The (Newark, NJ), State/ROP ed, p002,
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43. **When - and where - will satellite hit earth?**,
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Wednesday, September 21, 2011

44. **SATELLITE'S FINAL PLUNGE UNCERTAIN**,
Marcia Dunn, The Associated Press,
Pittsburgh Post-Gazette (PA), SOONER ed, pA-6,
Wednesday, September 21, 2011

45. **The sky's not falling, but a satellite is; pieces could hit as early as Thursday - but where?**, MARCIA DUNN,
Canadian Press, Wednesday, September 21, 2011

46. **Update:APNewsNow**. For global distribution.
MARCIA DUNN, Canadian Press - Broadcast wire,
Tuesday, September 20, 2011

47. **Satelite a punto de caer a tierra**,
MARCIA DUNN, El Nuevo Herald,
Tuesday, September 20, 2011

48. **Latest Alabama news, sports, business and entertainment**,
AP Alert: **FALLING SATELLITE** - Alabama, Tuesday, September 20, 2011

49. **Restos de satelite por caer a tierra; La NASA no sabe donde**,
Por MARCIA DUNN, AP Online Regional - Latin America/Caribbean,
Tuesday, September 20, 2011

50. FROM STAR WARS TO SCIENCE FACT: TATOOINE-LIKE PLANET DISCOVERED,
US Federal News, Friday, September 16, 2011

Record - 1

DIALOG(R)

6-ton satellite falls to Earth, just don't ask NASA where,
Seth Borenstein,
Star-Ledger, The (Newark, NJ), Update ed, p003,
Sunday, September 25, 2011

TEXT:

WASHINGTON - It's as big as a bus and weighs 6 tons, but officials probably will never be able to pinpoint exactly where a massive NASA satellite plummeted to Earth.

NASA space junk scientists believe that all -- or nearly all -- of the parts of their 20-year-old dead satellite safely plunged into the Pacific Ocean, likely missing land. But if their estimates are off, by only five minutes or so, fiery pieces could have fallen on parts of northwestern North America.

No injuries or damage have been reported on land, which NASA officials said was a good indication the satellite went into the ocean.

That doesn't necessarily mean it all fell into the sea. Some debris could have fallen over areas such as Portland, Ore.; Seattle; Calgary, Alberta; and Saskatoon, Saskatchewan, said Jonathan McDowell of the Harvard-Smithsonian Center for Astrophysics.

"Pieces are falling off of this flaming fireball, and some of it has enough momentum to go hundreds of miles," he said.

Speculation was rampant on sites such as Twitter. There were no credible reports of debris on the ground, said Nick Johnson, NASA's chief scientist for orbital debris. But if the satellite fell even five minutes later than estimated, some of it could have hit land, he said.

"We don't know where the re-entry point exactly was. We don't exactly know where the debris field is," Johnson said.

NASA's earlier calculations had predicted that the former climate research satellite would fall over a 500-mile swath and could include land. Officials said the 35-foot satellite fell sometime between 11:23 p.m. Friday and 1:09 a.m. yesterday.

Much of the speculation focused on unconfirmed reports and even video of debris from the Upper Atmosphere Research Satellite over Alberta, Canada. NASA spokesman Steve Cole said that was possible because the last track for the satellite included Canada, starting north of Seattle and then in a large arc north, then south. From there, the track continued through the Atlantic south toward Africa, but it was unlikely the satellite got that far if it started falling over the Pacific.

Some 26 pieces of the satellite representing 1,200 pounds of heavy metal had been expected to rain down somewhere. The biggest surviving chunk should be no more than 300 pounds.

NASA urges anyone who thinks they've found satellite debris to call police. It's government property and illegal to keep it or try to sell it. The debris has no toxic contamination, but there could be sharp edges, NASA officials have said.

UARS is the biggest NASA spacecraft to crash back to Earth, uncontrolled, since the post-Apollo 75-ton Skylab space station and the more than 10-ton Pegasus 2 satellite, both in 1979.

Russia's 135-ton Mir space station slammed through the atmosphere in 2001, but it was a controlled dive into the Pacific.

Before UARS fell, no one had ever been hit by falling space junk and NASA expected that not to change.

NASA put the chances that somebody somewhere on Earth would get hurt at 1-in-3,200. But any one person's odds of being struck were estimated at 1-in-22 trillion, given there are 7 billion people on the planet.

The satellite ran out of fuel and died in 2005. UARS was built and launched before NASA and other nations started new programs that prevent uncontrolled crashes of satellites.

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Record - 2

DIALOG(R)

Satellite likely in ocean, but pieces may have come down in Northwest,

Seth Borenstein,

Times, The (Trenton, NJ), Trenton Full Run ed, pA08,

Sunday, September 25, 2011

TEXT:

WASHINGTON - It's as big as a bus and weighs 6 tons, but officials probably will never be able to pinpoint exactly where a massive NASA satellite plummeted to Earth.

NASA space junk scientists believe that all -- or nearly all -- of the parts of their 20-year-old dead satellite safely plunged into the Pacific Ocean, likely missing land. But if their estimates are off, by only five minutes or so, fiery pieces could have fallen on parts of northwestern North America.

No injuries or damage have been reported on land, which NASA officials said was a good indication the satellite went into the ocean.

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From there, the track continued through the Atlantic south toward Africa, but it was unlikely the satellite got that far if it started falling over the Pacific.

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should be no more than 300 pounds.

NASA urges anyone who thinks they've found satellite debris to call police. It's government property and illegal to keep it or try to sell it. The debris has no toxic contamination, but there could be sharp edges, NASA officials have said.

The satellite ran out of fuel and died in 2005. UARS was built and launched before NASA and other nations started new programs that prevent this type of uncontrolled crashes of satellite.

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Record - 3

DIALOG(R)

Satellite slows down, Earth strike delayed,

MARCIA DUNN, Associated Press,
Tulsa World, Final ed, pA12,
Saturday, September 24, 2011

TEXT:

CAPE CANAVERAL, Fla. - A 6-ton NASA satellite on a collision course with Earth clung to space Friday, apparently flipping position in its ever-lower orbit and stalling its death plunge.

The old research spacecraft was targeted to crash through the atmosphere sometime Friday night or early Saturday, putting the U.S. back in the potential crosshairs, although most of the satellite should burn up during re-entry.

"It just doesn't want to come down," said Jonathan McDowell of the Harvard-Smithsonian Center for Astrophysics.

McDowell said the satellite's delayed demise demonstrates how unreliable predictions can be. That said, "the best guess is that

it will still splash in the ocean, just because there's more ocean out there."

Until Friday, increased solar activity was causing the atmosphere to expand and the 35-foot, bus-size satellite to free fall more quickly. But late Friday morning, NASA said the sun was no longer the major factor in the rate of descent and that the satellite's position, shape or both had changed by the time it slipped down to a 100-mile orbit.

"In the last 24 hours, something has happened to the spacecraft," said NASA orbital debris scientist Mark Matney.

NASA cautioned there was now a slim chance any surviving debris would land in the United States. Earlier this week, the space agency said North

America would be in the clear.

"It is still too early to predict the time and location of re-entry with any certainty," NASA said in a statement.

The Aerospace Corp., which tracks space debris, estimates the strike will happen sometime between about 8 p.m. and 2 a.m. CDT, which would make a huge difference in where the debris falls. Those late-night, early morning passes show the satellite flying over parts of the United States.

Any surviving wreckage is expected to be limited to a 500-mile swath.

The Upper Atmosphere Research Satellite, or UARS, will be the biggest NASA spacecraft to crash back to Earth, uncontrolled, since the post-Apollo 75-ton Skylab space station and the more than 10-ton Pegasus 2 satellite, both in 1979.

Russia's 135-ton Mir space station slammed through the atmosphere in 2001, but it was a controlled dive into the Pacific.

Some 26 pieces of the UARS satellite - representing 1,200 pounds of heavy metal - are expected to rain down somewhere. The biggest surviving chunk should be no more than 300 pounds.

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Record - 4

DIALOG(R)

RCMP denies dead satellite hit Alberta,

Seth Borenstein, Associated Press,
Toronto Star, v2011092517474128, ONT ed, pA15,
Sunday, September 25, 2011

TEXT:

CALGARY - Officials in the U.S. and Canada are trying to determine where debris from an American satellite have landed, but the RCMP is shooting down reports that some pieces fell in an Alberta community.

More than 15 hours after the spacecraft plunged over the north Pacific Ocean early Saturday, U.S. space officials didn't know just where it crashed.

No injuries or damage were reported, leading NASA to conclude there's a good likelihood most of the space junk dropped safely into the sea.

The spacecraft entered the atmosphere around 12:15 a.m. ET over the coast of Washington state, said Jonathan McDowell of the Harvard-Smithsonian Center for Astrophysics. He said the ocean was the likeliest crash pad, but debris may have made it to Calgary, Saskatoon, Portland, Ore., and Seattle.

Those locations were possible because the last track for the satellite included Canada, starting north of Seattle and then making a large arc north and then south, said NASA spokesman Steve Cole.

NASA has received no credible reports of debris on the ground.

Phil Langill, director of the Rothney Astrophysics Observatory at the University of Calgary, said figuring out where the 26 pieces rained down is difficult because the re-entry track was unpredictable.

"Having no solid predictions means that it's just luck of the draw," he said. "And if it happened to be cloudy - worst of all if it happened to be daytime when this thing came down - most people would have missed it even if they knew where to look."

A YouTube video and comments on Twitter triggered speculation that debris hit Okotoks, a town south of Calgary. But the RCMP said it had found no evidence.

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Record - 5

DIALOG(R)

Chute du satellite: la GRC nie que des debris soient tombes en Alberta,
La Presse Canadienne,
Saturday, September 24, 2011

TEXT:

CALGARY _ Les autorites americaines et canadiennes tentent toujours de determiner l'endroit precis ou ont atterri les debris d'un vieux satellite americain, mais la Gendarmerie royale du Canada (GRC) a balaye du revers de la main samedi les rumeurs voulant que des pieces soient tombees dans un village de l'Alberta.

Plus de dix heures apres la descente du satellite quelque part au-dessus du Pacifique-Nord, des representants americains ont fait savoir qu'ils ignoraient l'endroit exact ou l'engin s'etait ecrase.

Jonathan McDowell, qui travaille pour le centre d'astrophysique Harvard-Smithsonian, a indique que le satellite de six tonnes et de 11 metres de long etait retombe sur Terre aux environs de 00 h 15 samedi, quelque part au-dessus de la cote de l'Etat de Washington. Il a ajoute que beaucoup de debris du satellite avaient plonge dans l'ocean

Pacifique, tandis que certains ont été projetés jusque dans le nord de l'Alberta, et peut-être même aussi loin que la baie d'Hudson.

Une vidéo mise en ligne sur YouTube, de même que des commentaires sur Twitter, ont déclenché les spéculations selon lesquelles des débris seraient tombés à Okotoks, au sud de Calgary. La GRC a toutefois affirmé que rien ne laissait croire qu'un tel scénario ait pu se produire.

Le sergent Patrick Webb a soutenu que la vidéo était probablement un leurre, ajoutant que la police n'avait pas eu vent que des débris soient tombés dans la région.

"Si ce vidéo existe, je vous paie un café", a-t-il lancé en entrevue avec La Presse Canadienne.

Les discussions des vidéastes amateurs sont entendues pendant le tournage. L'une des personnes mentionne ainsi se trouver à Oklahoma City, aux États-Unis, et souligne qu'en observant vers le sud, les débris peuvent être vus en train de tomber.

M. McDowell a de son côté mentionné qu'il serait surpris d'apprendre que des personnes aient pu être blessées, puisque les débris semblent être retombés dans des zones très isolées.

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Record - 6

DIALOG(R)

RCMP calls reports of satellite debris falling in Alberta 'hoax',
Canadian Press,
Saturday, September 24, 2011

TEXT:

CALGARY _ Officials in the U.S. and Canada are trying to determine where debris from an American satellite have landed, but the RCMP is shooting down reports that some pieces fell in an Alberta community.

More than 15 hours after the spacecraft plunged over the north Pacific Ocean early Saturday, U.S. space officials didn't know just where it crashed.

No injuries or damage were reported, leading NASA to conclude there's a good likelihood most of the space junk dropped safely into the sea.

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of Washington state, said Jonathan McDowell of the Harvard-Smithsonian Center for Astrophysics.

He said while the ocean was the likeliest crash pad, some debris may have made it to Canada, such as Calgary or Saskatoon, Sask. Portland, Ore. and Seattle also might have been hit.

Those locations were possible because the last track for the satellite included Canada, starting north of Seattle and then making a large arc north and then south, said NASA spokesman Steve Cole.

NASA has received no credible reports of debris on the ground.

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“Having no solid predictions means that it's just luck of the draw,” he said. “And if it happened to be cloudy _ worse of all if it happened to be daytime when this thing came down _ most people would have missed it even if they knew where to look.”

A YouTube video and comments on Twitter triggered speculation that debris may have hit Okotoks, a town south of Calgary. But the RCMP said it found no evidence support that.

RCMP Sgt. Patrick Webb said the video is likely a hoax, adding police have heard nothing about falling debris in the area.

“If that video is real, I will buy you a cup of coffee,” Webb said in an interview.

On the video, the videographers talk throughout the footage and at one point, a person says _ “I am Oklahoma City, looking southeast and... the debris pieces keep on coming.”

The video was titled “Okotoks, Canada - UARS Fiery Footage” and the Oklahoma City reference was not immediately clear.

Speculation spiralled wildly on Twitter over where the pieces made landfall. Some users posted more obviously fake videos that at first sounded like they could be real in attempts to generate views.

“It's pretty goofy,” Langill said with a chuckle. “What does that say about people and getting attention? It's more of a psychological and sociological experiment than a scientific experiment.”

He said that if conditions were ideal, there could have been a spectacular light show similar to a meteor flashing through the sky, but the display would be brighter as the pieces burned up and stayed illuminated longer. ``It would have had a nice long tail and would have initially been one bright spot and then broken up into two or three bright spots," he said.

Were anyone to find any debris on the ground, most would be smaller than a baseball and look like melted metal blobs, Langill said. However, NASA said it expected the biggest surviving chunk could weigh as much as 136 kilograms.

High above the earth, the satellite weighed six tons.

McDowell said he'd be surprised if anyone was hurt by the debris because it appears to have fallen in such remote areas.

``I do think people saw lights in the sky and fireballs and may well be bits of UARS falling down," he said.

All the buzz surrounding the satellite's descent amused Langill, who said objects fall from the sky more frequently than the public realizes.

``The only thing that was really different about this one is that there may be a chance that some of the larger, denser pieces could make it down to the ground," he said. ``I think that's what made the story more interesting for everyone."

He added that expressions of concern from some people the projectiles could do damage were unfounded.

``This one had no potential to explode, there were no volatiles on board, it was just going to be a nice pretty little light show," he said. ``Other than that, there was nothing to worry about."

The bus-sized Upper Atmospheric Research Satellite was NASA's biggest spacecraft to tumble out of orbit, uncontrolled, in 32 years.

It was launched aboard space shuttle Discovery in 1991.

NASA decommissioned the satellite in 2005, after moving it into a lower orbit that cut its life short by two decades.

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DIALOG(R)

Satellite likely in ocean, but may have hit U.S.,

The Associated Press,
Merrillville Post-Tribune, p34,
Sunday, September 25, 2011

TEXT:

WASHINGTON - It's as big as a bus and weighs 6 tons, but officials probably will never be able to pinpoint exactly where a massive NASA satellite plummeted to Earth.

NASA space junk scientists believe that all - or nearly all - of the parts of their 20-year-old dead satellite safely plunged into the Pacific Ocean, likely missing land. But if their estimates are off, by only five minutes or so, fiery pieces could have fallen on parts of northwestern North America.

No injuries or damage have been reported on land, which NASA officials said was a good indication the satellite went into the ocean.

That doesn't necessarily mean it all fell into the sea. Some debris could have fallen over areas such as Portland, Ore.; Seattle; Calgary, Alberta; and Saskatoon, Saskatchewan, said Jonathan McDowell of the Harvard-Smithsonian Center for Astrophysics.

"Pieces are falling off of this flaming fire ball, and some of it has enough momentum to go hundreds of miles," he said.

Speculation was rampant on sites such as Twitter. There were no credible reports of debris on the ground, said Nick Johnson, NASA's chief scientist for orbital debris. But if the satellite fell even five minutes later than estimated, some of it could have hit land, he said.

"We don't know where the re-entry point exactly was. We don't exactly know where the debris field is," Johnson said.

NASA's earlier calculations had predicted that the former climate research satellite would fall over a 500-mile swath and could include land.

Officials said the 35-foot satellite fell sometime between 11:23 p.m. EDT Friday and 1:09 a.m. EDT Saturday.

Much of the speculation focused on unconfirmed reports and even video of debris from the Upper Atmosphere Research Satellite over Alberta, Canada. NASA spokesman Steve Cole said that was possible because the last track for the satellite included Canada, starting north of Seattle and then in a large arc north then south. From there, the track continued through the Atlantic south toward Africa, but it was unlikely the satellite got that

far if it started falling over the Pacific.

Some 26 pieces of the satellite representing 1,200 pounds of heavy metal had been expected to rain down somewhere. The biggest surviving chunk should be no more than 300 pounds.

NASA urges anyone who thinks they've found satellite debris to call police. It's government property and illegal to keep it or try to sell it. The debris has no toxic contamination, but there could be sharp edges, NASA officials have said.

UARS is the biggest NASA spacecraft to crash back to Earth, uncontrolled, since the post-Apollo 75-ton Skylab space station and the more than 10-ton Pegasus 2 satellite, both in 1979.

Russia's 135-ton Mir space station slammed through the atmosphere in 2001, but it was a controlled dive into the Pacific.

Before UARS fell, no one had ever been hit by falling space junk and NASA expected that not to change.

NASA put the chances that somebody somewhere on Earth would get hurt at 1-in-3,200. But any one person's odds of being struck were estimated at 1-in-22 trillion, given there are 7 billion people on the planet.

The satellite ran out of fuel and died in 2005. UARS was built and launched before NASA and other nations started new programs that prevent this type of uncontrolled crashes of satellite.

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Record - 8

DIALOG(R)

SATELLITE FALLS SAFELY,

James McNamara,

People (UK), Eire ed, p2,

Sunday, September 25, 2011

TEXT:

nASA's defunct six-ton satellite fell from the sky without incident, officials said last night.

There had been fears that pieces of the Upper Atmospheric Research Satellite could pose a risk to life and property as it dropped from space.

but the agency posted on its website that the majority of the craft burned up as it crashed through the atmosphere early yesterday somewhere over the north Pacific ocean.

However, Jonathan McDowell of the Harvard-Smithsonian center for Astrophysics said some debris could have fallen over more heavily populated areas in the US and Canada.

"Pieces were falling off of this flaming fire ball and some of it had enough momentum to go hundreds of miles," he said.

Cole said NASA was now hoping for more details from the US Air Force, which was responsible for tracking debris.

But given where the satellite may have fallen, officials may never quite know precisely.

"Most space debris is in the ocean. It'll be hard to confirm," Cole added.

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Record - 9

DIALOG(R)

NASA: Satellite cae a Tierra; se desconoce su ubicacion,

AP,

El Nuevo Herald,

Saturday, September 24, 2011

TEXT:

Es tan grande como un autobus y pesa seis toneladas, pero las autoridades probablemente nunca seran capaces de determinar exactamente donde cayo a la Tierra un enorme satellite de la NASA que se precipito el sabado.

Los cientificos de la NASA que estudian la basura espacial creen que todas o casi la totalidad de las partes del obsoleto satellite se hundieron en el Oceano Pacifico, y probablemente esquivaron tierra firme. Pero si sus calculos estan errados por solo unos cinco minutos, las piezas candentes podrian haber caido en partes del noroeste de America del Norte .

No se han reportado heridos o danos en tierra, lo que funcionarios de la NASA consideraron una buena senal de que el satellite cayo en el oceano. Pero esto no necesariamente significa que todas sus partes cayeron al mar. Algunos restos podrian haber caido sobre areas como Portland (estado de Oregon) o Seattle, en Estados Unidos, o en las inmediaciones de Calgary o

Saskatoon, en Canada, dijo Jonathan McDowell , del Centro de Astrofisica Harvard-Smithsonian.

"Las piezas se desprenden de esta bola de fuego en llamas, y algunas tienen suficiente impulso para recorrer cientos de kilometros", dijo.

El aparato penetro la atmosfera terrestre en algun lugar sobre el Oceano Pacifico, de acuerdo con la NASA y el Centro de Operaciones Espaciales Conjuntas de la Fuerza Aerea.

La NASA habia calculado previamente que el satelite de investigacion climatica de 20 anos de antiguedad caeria en una franja de 800 kilometros (500 millas) de largo que podria incluir tierra. Funcionarios dijeron que el satelite de 11 metros (35 pies) de largo cayo entre las 0323 y las 0509 GMT del sabado.

Antes se habian intensificado en Twitter y otros destinos de internet las conjeturas: numerosas versiones sin confirmar daban cuenta de que restos del Satelite de Investigacion de la Atmosfera Superior (UARS por sus siglas en ingles) se habian precipitado sobre Alberta, Canada. Incluso se difundieron supuestas evidencias en video.

El portavoz de la NASA Steve Cole dijo que era posible debido a que el ultimo rastro del satelite incluyo Canada, comenzando al norte de Seattle y describiendo un gran arco hacia el norte y luego al sur. A partir de ahi, las huellas continuan a traves del Atlantico Sur hacia Africa, pero era poco probable que el satelite hubiera llegado tan lejos si empezo a caer sobre el Pacifico.

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Record - 10

DIALOG(R)

Satellite likely in ocean, but may have hit US,
SETH BORENSTEIN and KELLI KENNEDY,
AP Alert – HiTech,
Saturday, September 24, 2011

TEXT:

WASHINGTON_It's as big as a bus and weighs 6 tons, but officials probably will never be able to pinpoint exactly where a massive NASA satellite plummeted to Earth.

NASA space junk scientists believe that all _ or nearly all _ of the parts of their 20-year-old dead satellite safely plunged into the Pacific Ocean,

likely missing land. But if their estimates are off, by only five minutes or so, fiery pieces could have fallen on parts of northwestern North America.

No injuries or damage have been reported on land, which NASA officials said was a good indication the satellite went into the ocean.

That doesn't necessarily mean it all fell into the sea. Some debris could have fallen over areas such as Portland, Oregon; Seattle; Calgary, Alberta; and Saskatoon, Saskatchewan, said Jonathan McDowell of the Harvard-Smithsonian Center for Astrophysics.

"Pieces are falling off of this flaming fire ball, and some of it has enough momentum to go hundreds of miles," he said.

Speculation was rampant on sites such as Twitter. There were no credible reports of debris on the ground, said Nick Johnson, NASA's chief scientist for orbital debris. But if the satellite fell even five minutes later than estimated, some of it could have hit land, he said.

"We don't know where the re-entry point exactly was. We don't exactly know where the debris field is," Johnson said.

NASA's earlier calculations had predicted that the former climate research satellite would fall over a 500-mile (800-kilometer) swath and could include land. Officials said the 35-foot (11-meter) satellite fell sometime between 11:23 p.m. EDT Friday (0323 GMT Saturday) and 1:09 a.m. EDT (0509 GMT) Saturday.

Much of the speculation focused on unconfirmed reports and even video of debris from the Upper Atmosphere Research Satellite over Alberta, Canada. NASA spokesman Steve Cole said that was possible because the last track for the satellite included Canada, starting north of Seattle and then in a large arc north then south. From there, the track continued through the Atlantic south toward Africa, but it was unlikely the satellite got that far if it started falling over the Pacific.

Some 26 pieces of the satellite representing 1,200 pounds (544 kilograms) of heavy metal had been expected to rain down somewhere. The biggest surviving chunk should be no more than 300 pounds (136 kilograms).

NASA urges anyone who thinks they've found satellite debris to call police. It's government property and illegal to keep it or try to sell it. The debris has no toxic contamination, but there could be sharp edges, NASA officials have said.

UARS is the biggest NASA spacecraft to crash back to Earth, uncontrolled,

since the post-Apollo 75-ton Skylab space station and the more than 10-ton Pegasus 2 satellite, both in 1979.

Russia's 135-ton Mir space station slammed through the atmosphere in 2001, but it was a controlled dive into the Pacific.

Before UARS fell, no one had ever been hit by falling space junk and NASA expected that not to change.

NASA put the chances that somebody somewhere on Earth would get hurt at 1-in-3,200. But any one person's odds of being struck were estimated at 1-in-22 trillion, given there are 7 billion people on the planet.

The satellite ran out of fuel and died in 2005. UARS was built and launched before NASA and other nations started new programs that prevent this type of uncontrolled crashes of satellite.

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Kennedy reported from Miami.

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Online:

NASA: http://www.nasa.gov/mission_pages/uars/index.html

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Record - 11

DIALOG(R)

Satellite skips beat in plunge to Earth Much of craft likely to burn in re-entry,

Marcia Dunn,

Star-Ledger, The (Newark, NJ), Essex ed, p002,

Saturday, September 24, 2011

TEXT:

A 6-ton NASA satellite on a collision course with Earth clung to space yesterday, apparently flipping position in its ever-lower orbit and stalling its death plunge.

The old research spacecraft was targeted to crash through the atmosphere sometime last night or early today, putting Canada, Africa and Australia in

the potential crosshairs, although most of the satellite should burn up during re-entry. The United States wasn't entirely out of the woods; the possible strike zone skirted Washington state. "It just doesn't want to come down," said Jonathan McDowell of the Harvard-Smithsonian Center for Astrophysics.

McDowell said the satellite's delayed demise demonstrates how unreliable predictions can be. That said, "the best guess is that it will still splash in the ocean, just because there's more ocean out there."

Until yesterday, increased solar activity was causing the atmosphere to expand and the 35-foot, bus-size satellite to free fall more quickly. But late yesterday morning, NASA said the sun was no longer the major factor in the rate of descent and that the satellite's position, shape or both had changed by the time it slipped down to a 100-mile orbit.

"In the last 24 hours, something has happened to the spacecraft," said NASA orbital debris scientist Mark Matney.

Last night, NASA said it expected the satellite to come crashing down between 11 p.m. and 3 a.m. EDT. It was to be passing over the Atlantic, Pacific and Indian oceans at that time, as well as Canada, Africa and Australia. "The risk to public safety is very remote," NASA said in a statement.

The Aerospace Corp., which tracks space debris, estimated the strike would happen sometime between about 9 p.m. and 3 a.m. EDT, which would make a huge difference in where the debris falls.

NASA put the chances that somebody somewhere on Earth would get hurt at 1-in-3,200. But any one person's odds of being struck were estimated at 1-in-22 trillion, given there are 7 billion people on the planet.

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Record - 12

DIALOG(R)

NASA: 6-ton satellite hits Earth; location unknown,

SETH BORENSTEIN,

AP Alert – Science,

Saturday, September 24, 2011

TEXT:

WASHINGTON_NASA's dead 6-ton satellite plunged to Earth early Saturday, but

more than eight hours later, U.S. space officials didn't know just where it hit. They thought the fiery fall was largely over water and the debris probably hurt no one.

The agency did not give a more specific location in a midday update on its website, which also said officials were not aware of any reports of injuries or property damage. Most of the spacecraft was believed to have burned up.

The bus-sized satellite first penetrated Earth's atmosphere somewhere over the Pacific Ocean, according to NASA and the U.S. Air Force's Joint Space Operations Center. But that doesn't necessarily mean it all fell into the sea.

NASA's earlier calculations had predicted that the 20-year-old former climate research satellite would fall over a 500-mile (800-kilometer) swath and could include land.

Because the plummet began over the ocean and given the lack of any reports of people being hit, that "gives us a good feeling that no one was hurt," but officials didn't know for certain, NASA spokesman Steve Cole told The Associated Press.

The two government agencies said the 35-foot (11-meter) satellite fell sometime between 11:23 p.m. EDT Friday (0323 GMT Saturday) and 1:09 a.m. EDT (0509 GMT) Saturday, but with no precise time or location.

There was rampant speculation on the Internet and Twitter, much of it focusing on unconfirmed reports and even video of debris from the Upper Atmosphere Research Satellite over Alberta, Canada.

Jonathan McDowell of the Harvard-Smithsonian Center for Astrophysics said the spacecraft entered the atmosphere around 12:15 a.m. EDT (1615 GMT) over the coast of Washington state. He said much of the debris likely fell over the Pacific Ocean, though its trajectory suggests some of it could have fallen over more heavily populated areas in the U.S. and Canada, including Portland, Oregon; Seattle; Calgary, Alberta; and Saskatoon, Saskatchewan.

"Pieces are falling off of this flaming fire ball, and some of it has enough momentum to go hundreds of miles," he said.

Cole said that was possible because the last track for the satellite included Canada, starting north of Seattle and then in a large arc north then south. From there, the track continued through the Atlantic south toward Africa, but it was unlikely the satellite got that far if it started falling over the Pacific.

Cole said NASA was hoping for more details from the Air Force, which was responsible for tracking debris.

But given where the satellite may have fallen, officials may never quite know precisely.

"Most space debris is in the ocean. It'll be hard to confirm," Cole said.

Some 26 pieces of the satellite representing 1,200 pounds (544 kilograms) of heavy metal had been expected to rain down somewhere. The biggest surviving chunk should be no more than 300 pounds (136 kilograms).

UARS is the biggest NASA spacecraft to crash back to Earth, uncontrolled, since the post-Apollo 75-ton Skylab space station and the more than 10-ton Pegasus 2 satellite, both in 1979.

Russia's 135-ton Mir space station slammed through the atmosphere in 2001, but it was a controlled dive into the Pacific.

Before UARS fell, no one had ever been hit by falling space junk and NASA expected that not to change.

NASA put the chances that somebody somewhere on Earth would get hurt at 1-in-3,200. But any one person's odds of being struck were estimated at 1-in-22 trillion, given there are 7 billion people on the planet.

The satellite ran out of fuel and died in 2005. UARS was built and launched before NASA and other nations started new programs that prevent this type of uncontrolled crashes of satellite.

Associated Press Writer Kelli Kennedy contributed to this report from Miami.

Online:

NASA: http://www.nasa.gov/mission_pages/uars/index.html

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DIALOG(R)

Doomed satellite slows its descent,

Winnipeg Free Press (Manitoba, CA), pA27,
Saturday, September 24, 2011

TEXT:

CAPE CANAVERAL, Fla. -- A six-tonne NASA satellite on a collision course with Earth clung to space Friday, apparently flipping position in its ever-lower orbit and stalling its death plunge.

The old research spacecraft was targeted to crash through the atmosphere sometime Friday night or early this morning, putting the U.S. back in the potential crosshairs, although most of the satellite should burn up during re-entry.

"It just doesn't want to come down," said Jonathan McDowell of the Harvard-Smithsonian Center for Astrophysics.

McDowell said the satellite's delayed demise demonstrates how unreliable predictions can be. That said, "The best guess is that it will still splash in the ocean, just because there's more ocean out there."

Until Friday, increased solar activity was causing the atmosphere to expand and the 11-metre satellite to free-fall more quickly. But late Friday morning, NASA said the sun was no longer the major factor in the rate of descent and the satellite's position, shape or both had changed by the time it slipped down to a 160-kilometre orbit.

"In the last 24 hours, something has happened to the spacecraft," said NASA orbital debris scientist Mark Matney.

NASA cautioned there was now a slim chance any surviving debris would land in the United States. Earlier this week, NASA said North America would be in the clear.

"It is still too early to predict the time and location of re-entry with any certainty," NASA said in a statement.

The Aerospace Corp., which tracks space debris, estimates the strike will happen sometime between about 5 p.m. and 3 a.m. CDT.

-- The Associated Press

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Record - 14

DIALOG(R)

Dead NASA satellite clings to orbit,

The Associated Press,
Merrillville Post-Tribune, p23,
Saturday, September 24, 2011

TEXT:

CAPE CANAVERAL, Fla. - A 6-ton NASA satellite on a collision course with Earth clung to space Friday, apparently flipping position in its ever-lower orbit and stalling its death plunge.

The old research spacecraft was targeted to crash through the atmosphere sometime Friday night or early Saturday, putting Canada and Africa in the potential crosshairs, although most of the satellite should burn up during re-entry. The United States wasn't entirely out of the woods; the possible strike zone skirted Washington state.

"It just doesn't want to come down," said Jonathan McDowell of the Harvard-Smithsonian Center for Astrophysics.

McDowell said the satellite's delayed demise demonstrates how unreliable predictions can be. That said, "the best guess is that it will still splash in the ocean, just because there's more ocean out there."

Until Friday, increased solar activity was causing the atmosphere to expand and the 35-foot, bus-size satellite to free fall more quickly. But late Friday morning, NASA said the sun was no longer the major factor in the rate of descent and that the satellite's position, shape or both had changed by the time it slipped down to a 100-mile orbit.

"In the last 24 hours, something has happened to the spacecraft," said NASA orbital debris scientist Mark Matney.

On Friday night, NASA said it expected the satellite to come crashing down between 11:45 p.m. and 12:45 a.m. EDT Saturday. It was going to be passing over the Atlantic, Pacific and Indian oceans at that time, as well as Canada and Africa.

"The risk to public safety is very remote," NASA said in a statement.

Any surviving wreckage is expected to be limited to a 500-mile swath.

The Upper Atmosphere Research Satellite, or UARS, will be the biggest NASA

spacecraft to crash back to Earth, uncontrolled, since the post-Apollo 75-ton Skylab space station and the more than 10-ton Pegasus 2 satellite, both in 1979.

Russia's 135-ton Mir space station slammed through the atmosphere in 2001, but it was a controlled dive into the Pacific.

Some 26 pieces of the UARS satellite - representing 1,200 pounds of heavy metal - are expected to rain down somewhere. The biggest surviving chunk should be no more than 300 pounds.

Earthlings can take comfort in the fact that no one has ever been hurt by falling space junk - to anyone's knowledge - and there has been no serious property damage. NASA put the chances that somebody somewhere on Earth would get hurt at 1-in-3,200. But any one person's odds of being struck were estimated at 1-in-22 trillion, given there are 7 billion people on the planet.

"Keep in mind that we have bits of debris re-entering the atmosphere every single day," Matney said in brief remarks broadcast on NASA TV.

In any case, finders definitely aren't keepers.

Any surviving wreckage belongs to NASA, and it is against the law to keep or sell even the smallest piece. There are no toxic chemicals on board, but sharp edges could be dangerous, so the space agency is warning the public to keep hands off and call police.

The \$740 million UARS was launched in 1991 from space shuttle Discovery to study the atmosphere and the ozone layer. At the time, the rules weren't as firm for safe satellite disposal; now a spacecraft must be built to burn up upon re-entry or have a motor to propel it into a much higher, long-term orbit.

NASA shut UARS down in 2005 after lowering its orbit to hurry its end. A potential satellite-retrieval mission was ruled out following the 2003 shuttle Columbia disaster, and NASA did not want the satellite hanging around orbit posing a debris hazard.

Space junk is a growing problem in low-Earth orbit. More than 20,000 pieces of debris, at least 4 inches in diameter, are being tracked on a daily basis. These objects pose a serious threat to the International Space Station.

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Record - 15

DIALOG(R)

Derelict NASA satellite could hit North America,

Marcia Dunn,

Waterloo Region Record, v2011092417462668, First ed, pA4,
Saturday, September 24, 2011

TEXT:

CAPE CANAVERAL, Fla. - A six-tonne NASA satellite on a collision course with Earth clung to space Friday, apparently flipping position in its ever-lower orbit and stalling its death plunge.

The old research spacecraft was expected to crash through the atmosphere sometime Friday night or early Saturday morning, putting much of North America back in the potential crosshairs, although most of the satellite should burn up during re-entry.

"It just doesn't want to come down," said Jonathan McDowell of the Harvard-Smithsonian Center for Astrophysics.

McDowell said the satellite's delayed demise demonstrates how unreliable predictions can be. That said, "the best guess is that it will still splash in the ocean, just because there's more ocean out there."

Until Friday, increased solar activity was causing the atmosphere to expand and the 11-metre satellite to free fall more quickly. But late Friday morning, NASA said the sun was no longer the major factor in the rate of descent and that the satellite's position, shape or both had changed by the time it slipped down to a 160 kilometre orbit.

"In the last 24 hours, something has happened to the spacecraft," said NASA orbital debris scientist Mark Matney.

NASA cautioned there was now a slim chance any surviving debris would land in the United States. Earlier this week, NASA said North America would be in the clear.

"It is still too early to predict the time and location of re-entry with any certainty," NASA said in a statement.

The Aerospace Corp., which tracks space debris, estimates the strike will happen sometime between about 6 p.m. and 4 a.m. EDT (2200 and 0800 GMT), which would make a huge difference in where the debris might wind up. Those

late-night, early morning passes show the satellite flying over parts of the United States, although earlier NASA information suggested that northern landing sites could include areas up to 57 degrees north of the equator, which would include communities as far north as Fort McMurray, Alta.

Any surviving wreckage is expected to be limited to an 800-kilometre swath.

The Upper Atmosphere Research Satellite, or UARS, will be the biggest NASA spacecraft to crash back to Earth, uncontrolled, since the post-Apollo 75-tonne Skylab space station and the more than 10-tonne Pegasus 2 satellite, both in 1979.

Russia's 137-tonne Mir space station slammed through the atmosphere in 2001, but it was a controlled dive into the Pacific.

Some 26 pieces of the UARS satellite - representing 550 kilograms of heavy metal - are expected to rain down somewhere. The biggest surviving chunk should be no more than 140 kilograms.

Earthlings can take comfort in the fact that no one has ever been hurt by falling space junk - to anyone's knowledge - and there has been no serious property damage.

NASA put the chances that somebody somewhere on Earth would get hurt at 1-in-3,200. But any one person's odds of being struck were estimated at 1-in-22 trillion, given there are 7 billion people on the planet.

"Keep in mind that we have bits of debris re-entering the atmosphere every single day," Matney said in brief remarks broadcast on NASA TV.

In any case, finders definitely aren't keepers.

Any surviving wreckage belongs to NASA, and it is against the law to keep or sell even the smallest piece. There are no toxic chemicals on board, but sharp edges could be dangerous, so the space agency is warning the public to keep hands off and call police.

The \$740 million UARS was launched in 1991 from space shuttle Discovery to study the atmosphere and the ozone layer. At the time, the rules weren't as firm for safe satellite disposal; now a spacecraft must be built to burn up upon re-entry or have a motor to propel it into a much higher, long-term orbit.

NASA shut UARS down in 2005 after lowering its orbit to hurry its end. A potential satellite-retrieval mission was ruled out following the 2003

shuttle Columbia disaster, and NASA did not want the satellite hanging around orbit posing a debris hazard.

The Associated Press

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Record - 16

DIALOG(R)

Le vieux satellite de la NASA ralentit sa course vers la Terre

MARCIA DUNN,

La Presse Canadienne,

Friday, September 23, 2011

TEXT:

CAP CANAVERAL, Fla. _ Un vieux satellite de la NASA qui doit s'ecraser sur la Terre s'est immobilise dans l'espace vendredi, changeant apparemment de position en orbite et suspendant sa plongee dans l'atmosphere.

L'agence spatiale americaine a annonce que le vieux satellite de recherche de six tonnes devrait entrer dans l'atmosphere vendredi soir ou tot samedi matin, avec le Canada, l'Afrique et l'Australie dans sa trajectoire potentielle, meme si la majeure partie du satellite devrait prendre feu pendant son entree dans l'atmosphere.

Mais le satellite ne semble plus vouloir descendre sur Terre, a dit Jonathan McDowell, un expert du Harvard-Smithsonian Center for Astrophysics, ce qui montre a quel point les predictions peuvent etre imprecises.

Selon lui, l'hypothese la plus probable est que le satellite tombera dans l'oceane, puisque la majorite de la surface de la Terre est recouverte d'eau.

Jusqu'a vendredi, une activite solaire accrue causait une expansion de l'atmosphere et le satellite devait tomber plus rapidement. Mais en fin de matinee, la NASA a indique que le Soleil n'etait plus le facteur majeur dans le calcul de la vitesse de descente du satellite et que la position de l'engin ou sa forme avaient change.

Vendredi soir, la NASA a dit s'attendre a ce que le satellite atteigne la Terre entre 23 h et 3 h, heure de l'Est. Durant cette periode, le satellite passera au-dessus des oceans Atlantique, Pacifique et Indien, de meme qu'au-dessus du Canada, de l'Afrique et de l'Australie.

"Le risque pour la securite publique est vraiment infime", a assure la NASA dans un communique.

Selon les predictions de la NASA, la majorite du territoire des Etats-Unis sera epargne par la chute du satellite, a l'exception de l'Etat de Washington, dans l'Ouest.

Environ 26 pieces du satellite, qui representent plus de 545 kilos de metaux lourds, devraient tomber quelque part sur Terre. Le morceau le plus gros ne devrait pas peser plus de 136 kilos.

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Record - 17

DIALOG(R)

SATELLITE TO TUMBLE TO EARTH TODAY,

Associated Press,

Augusta Chronicle, The (GA), All ed, pB7,

Friday, September 23, 2011

TEXT:

LOS ANGELES - While North America appears to be off the hook, scientists are scrambling to pinpoint exactly where and when a dead NASA climate satellite will plummet back to Earth today.

The 6-ton, bus-sized satellite is expected to break into more than a hundred pieces as it plunges through the atmosphere, most of it burning up.

But if you're hoping for a glimpse, the odds are slim. Most sightings occur by chance because the re-entry path can't be predicted early enough to alert people, said Canadian Ted Molczan, who tracks satellites for a hobby.

The best guess so far is that the 20-year-old Upper Atmosphere Research Satellite will hit sometime this afternoon. The latest calculations indicate that it will not be over the United States, Canada and Mexico during that time.

Until Thursday, every continent but Antarctica was a potential target. Predicting where and when the freefalling satellite will land is an imprecise science, but officials should be able to narrow it down a few hours ahead.

While most of the satellite pieces will disintegrate, 26 metal chunks - the largest about 300 pounds - are expected to survive.

If the re-entry is visible, "it'll look like a long-lived meteor," said Jonathan McDowell, of the Harvard-Smithsonian Center for Astrophysics in Cambridge, Mass.

Since the dawn of the Space Age, no one has been injured by falling space debris. The only confirmed case of a person being hit by space junk was in 1997 when Lottie Williams, of Tulsa, Okla., was grazed in the shoulder by a small bit of debris from a discarded piece of a Delta rocket.

NASA has warned people not to touch any satellite part they might chance upon. There are no hazardous chemicals on board, but people can get hurt by sharp edges, the space agency said.
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Record - 18

DIALOG(R)

DEATHS ELSEWHERE : Dr. Michael Drake,
Augusta Chronicle, The (GA), All ed, pB5,
Friday, September 23, 2011

TEXT:

Dr. Michael Drake

TUCSON, Ariz. -- A University of Arizona planet expert who played a key role in a number of high-profile space projects, including the Cassini mission to explore Saturn, has died, the university announced Thursday.

Dr. Michael Drake also worked on the Gamma-Ray Spectrometer onboard NASA's Mars Odyssey Orbiter, the HiRISE camera onboard NASA's Mars Reconnaissance Orbiter and the Phoenix Mars Lander. He was 65.

A native of Bristol, England, Drake graduated with a degree in geology from Victoria University in Manchester. He completed a doctoral program in geology at the University of Oregon in 1972. Drake moved to Arizona after a postdoctoral program at the Smithsonian Astrophysical Observatory.
- Associated Press

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Record - 19

DIALOG(R)

NASA warns that Canada, Africa are potential crosshairs for a falling 6-ton

Satellite,

Al Arabiya,

Saturday, September 24, 2011

TEXT:

A 6-ton NASA satellite on a collision course with Earth clung to space Friday, apparently flipping position in its ever-lower orbit and stalling its death plunge.

The old research spacecraft was targeted to crash through the atmosphere sometime Friday night or early Saturday, putting Canada and Africa in the potential crosshairs, although most of the satellite should burn up during re-entry. The United States wasn't entirely out of the woods; the possible strike zone skirted Washington state.

"It just doesn't want to come down," said Jonathan McDowell of the Harvard-Smithsonian Center for Astrophysics. McDowell said the satellite's delayed demise demonstrates how unreliable predictions can be. That said, "the best guess is that it will still splash in the ocean, just because there's more ocean out there."

Until Friday, increased solar activity was causing the atmosphere to expand and the 35-foot, bus-size satellite to free fall more quickly. But late Friday morning, NASA said the sun was no longer the major factor in the rate of descent and that the satellite's position, shape or both had changed by the time it slipped down to a 100-mile orbit.

"In the last 24 hours, something has happened to the spacecraft," said NASA orbital debris scientist Mark Matney.

On Friday night, NASA said it expected the satellite to come crashing down between 11:45 p.m. and 12:45 a.m. EDT Saturday. It was going to be passing over the Atlantic, Pacific and Indian oceans at that time, as well as Canada and Africa.

"The risk to public safety is very remote," NASA said in a statement.

Any surviving wreckage is expected to be limited to a 500-mile swath.

The Upper Atmosphere Research Satellite, or UARS, will be the biggest NASA spacecraft to crash back to Earth, uncontrolled, since the post-Apollo 75-ton Skylab space station and the more than 10-ton Pegasus 2 satellite, both in 1979.

Russia's 135-ton Mir space station slammed through the atmosphere in 2001, but it was a controlled dive into the Pacific.

Some 26 pieces of the UARS satellite - representing 1,200 pounds of heavy metal - are expected to rain down somewhere. The biggest surviving chunk should be no more than 300 pounds (136 kilograms).

Earthlings can take comfort in the fact that no one has ever been hurt by falling space junk - to anyone's knowledge - and there has been no serious property damage. NASA put the chances that somebody somewhere on Earth would get hurt at 1-in-3,200. But any one person's odds of being struck were estimated at 1-in-22 trillion, given there are 7 billion people on the planet.

"Keep in mind that we have bits of debris re-entering the atmosphere every single day," Matney said in brief remarks broadcast on NASA TV.

In any case, finders definitely aren't keepers.

Any surviving wreckage belongs to NASA, and it is against the law to keep or sell even the smallest piece. There are no toxic chemicals on board, but sharp edges could be dangerous, so the space agency is warning the public to keep hands off and call police.

The \$740 million UARS was launched in 1991 from space shuttle Discovery to study the atmosphere and the ozone layer. At the time, the rules weren't as firm for safe satellite disposal; now a spacecraft must be built to burn up upon re-entry or have a motor to propel it into a much higher, long-term orbit.

NASA shut UARS down in 2005 after lowering its orbit to hurry its end. A potential satellite-retrieval mission was ruled out following the 2003 shuttle Columbia disaster, and NASA did not want the satellite hanging around orbit posing a debris hazard.

Space junk is a growing problem in low-Earth orbit. More than 20,000 pieces of debris, at least 4 inches in diameter, are being tracked on a daily basis. These objects pose a serious threat to the International Space Station.

Online:

Satellite updates: www.nasa.gov/uars

Aerospace Corp: <http://reentrynews.aero.org/1991063b.html>

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Record - 20

DIALOG(R)

Satellite slow to make its plunge,

Wichita Eagle (KS),

Saturday, September 24, 2011

TEXT:

CAPE CANAVERAL, Fla. -A 6-ton NASA satellite on a collision course with Earth clung to space Friday, apparently flipping position in its ever-lower orbit and stalling its death plunge.

The old research spacecraft was targeted to crash through the atmosphere sometime Friday night or early Saturday, putting the U.S. back in the potential crosshairs, although most of the satellite should burn up during re-entry.

"It just doesn't want to come down," said Jonathan McDowell of the Harvard-Smithsonian Center for Astrophysics .

Casey Anthony gets bigger bill from judge

ORLANDO, Fla. -A Florida judge on Friday increased the reimbursement costs Casey Anthony must pay to investigators for searching for her missing 2-year-old daughter three years ago.

Judge Belvin Perry added another \$119,000 to the bill she owes four law enforcement agencies in central Florida, bringing the total to more than \$217,000.

The additional amount comes from the Orange County Sheriff's Office providing the judge with more details about their costs.

Solar company execs refuse to testify

WASHINGTON - Top executives of Solyndra, the shuttered solar company that received a half-billion federal loan before going bankrupt, refused to answer questions from lawmakers Friday, instead invoking their rights against self-incrimination.

Furious Republican lawmakers described a the loan as a "taxpayer ripoff" - and pledged to continue probing whether the firm misled the government and whether the Obama administration failed to properly vet the company.

Record - 21

DIALOG(R)

CHANCE FALLING SATELLITE HITS YOU: 1 IN 21 TRILLION,

Marcia Dunn, Associated Press,
San Jose Mercury News (CA), Valley Final ed, p5A,
Wednesday, September 21, 2011

TEXT:

CAPE CANAVERAL, Fla. -- NASA scientists are doing their best to tell us where a plummeting six-ton satellite will fall later this week. It's just that if they're off a little bit, it could mean the difference between hitting Florida or landing on New York. Or, say, Iran or India.

Pinpointing where and when hurtling space debris will strike is an imprecise science. For now, scientists predict the earliest it will hit is Thursday U.S. time, the latest Saturday. The strike zone covers most of Earth.

Not that citizens need to take cover. The satellite will break into pieces, and NASA put the chances that somebody somewhere on Earth will get injured at 1 in 3,200. But any one person's odds of being struck have been estimated at 1 in 21 trillion.

As far as anyone knows, falling space debris has never injured anyone. Nor has significant property damage been reported. That's because most of the planet is covered in water and there are vast regions of empty land.

If you do come across what you suspect is a satellite piece, NASA doesn't want you to pick it up. The space agency says there are no toxic chemicals present, but there could be sharp edges. Also, it's government property. It's against the law to keep it as a souvenir or sell it on eBay. NASA's advice is to report it to the police.

The 20-year-old research satellite is expected to break into more than 100 pieces as it enters the atmosphere, most of it burning up. Twenty-six of the heaviest metal parts are expected to reach Earth, the biggest chunk weighing about 300 pounds. The debris could be scattered over an area about 500 miles long.

Jonathan McDowell, for one, isn't worried. He is in the potential strike zone -- along with most of the world's 7 billion citizens. McDowell is with

the Harvard-Smithsonian Center for Astrophysics in Cambridge, Mass.

"There's stuff that's heavy that falls out of the sky almost every year," McDowell said. So far this year, he noted, two massive Russian rocket stages have taken the plunge.

As for the odds of the satellite hitting someone, "it's a small chance. We take much bigger chances all the time in our lives," McDowell said. "So I'm not putting my tin helmet on or hiding under a rock."

All told, 1,200 pounds of wreckage is expected to smack down -- the heaviest pieces made of titanium, stainless steel or beryllium. That represents just one-tenth the mass of the satellite, which stretches 35 feet long and 15 feet in diameter.

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Record - 22

DIALOG(R)

Falling satellite causes concern,

MARCIA DUNN,

The Huntsville Times (Huntsville, AL), 02 ed, p07A,

Wednesday, September 21, 2011

TEXT:

Falling satellite causes concern

NASA unsure when it will hit or where

By MARCIA DUNN

AP Aerospace Writer

CAPE CANAVERAL, Fla. - NASA scientists are doing their best to tell us where a plummeting 6-ton satellite will fall later this week. It's just that if they're off a little bit, it could mean the difference between hitting Florida or landing on New York. Or, say, Iran or India.

Pinpointing where and when hurtling space debris will strike is an imprecise science. For now, scientists predict the earliest it will hit is Thursday U.S. time, the latest Saturday. The strike zone covers most of Earth.

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Jonathan McDowell, for one, isn't worried. He is in the potential strike zone - along with most of the world's 7 billion citizens. McDowell is with the Harvard-Smithsonian Center for Astrophysics in Cambridge, Mass.

"There's stuff that's heavy that falls out of the sky almost every year," McDowell says. So far this year, he noted, two massive Russian rocket stages have taken the plunge.

As for the odds of the satellite hitting someone, "it's a small chance. We take much bigger chances all the time in our lives," McDowell says. "So I'm not putting my tin helmet on or hiding under a rock."

All told, 1,200 pounds of wreckage is expected to smack down - the heaviest pieces made of titanium, stainless steel or beryllium. That represents just one-tenth the mass of the satellite, which stretches 35 feet long and 15 feet in diameter.

The strike zone straddles all points between latitudes 57 degrees north and 57 degrees south. That's as far north as Edmonton and Alberta, Canada, and Aberdeen, Scotland, and as far south as Cape Horn, the southernmost tip of South America. Every continent but Antarctica is in the crosshairs. Back when UARS, the Upper Atmosphere Research Satellite, was launched to study the ozone layer in 1991, NASA didn't always pay attention to the "what goes up must come down" rule. Nowadays, satellites must be designed either to burn up on re-entering the atmosphere or to have enough fuel to be steered into a watery grave or up into a higher, long-term orbit.

The International Space Station - the largest manmade structure ever to orbit the planet - is no exception. NASA has a plan to bring it down safely sometime after 2020.

CUTLINES:

AP, NASA

This screen grab image shows UARS attached to the robotic arm of the space shuttle Discovery during mission STS-48 in 1991, when UARS was deployed.

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Record - 23

DIALOG(R)

NASA gives 1-hour window for falling satellite,

MARCIA DUNN,

AP Alert – Defense,

Saturday, September 24, 2011

TEXT:

CAPE CANAVERAL, Florida_A 6-ton NASA satellite on a collision course with Earth clung to space Friday, apparently flipping position in its ever-lower orbit and stalling its death plunge.

The old research spacecraft was targeted to crash through the atmosphere sometime Friday night or early Saturday, putting Canada and Africa in the potential crosshairs, although most of the satellite should burn up during re-entry. The United States wasn't entirely out of the woods; the possible strike zone skirted Washington state.

"It just doesn't want to come down," said Jonathan McDowell of the Harvard-Smithsonian Center for Astrophysics.

McDowell said the satellite's delayed demise demonstrates how unreliable predictions can be. That said, "the best guess is that it will still splash in the ocean, just because there's more ocean out there."

Until Friday, increased solar activity was causing the atmosphere to expand and the 35-foot, bus-size satellite to free fall more quickly. But late Friday morning, NASA said the sun was no longer the major factor in the rate of descent and that the satellite's position, shape or both had changed by the time it slipped down to a 100-mile orbit.

"In the last 24 hours, something has happened to the spacecraft," said NASA

orbital debris scientist Mark Matney.

On Friday night, NASA said it expected the satellite to come crashing down between 11:45 p.m. and 12:45 a.m. EDT Saturday. It was going to be passing over the Atlantic, Pacific and Indian oceans at that time, as well as Canada and Africa.

"The risk to public safety is very remote," NASA said in a statement.

Any surviving wreckage is expected to be limited to a 500-mile swath.

The Upper Atmosphere Research Satellite, or UARS, will be the biggest NASA spacecraft to crash back to Earth, uncontrolled, since the post-Apollo 75-ton Skylab space station and the more than 10-ton Pegasus 2 satellite, both in 1979.

Russia's 135-ton Mir space station slammed through the atmosphere in 2001, but it was a controlled dive into the Pacific.

Some 26 pieces of the UARS satellite _ representing 1,200 pounds of heavy metal _ are expected to rain down somewhere. The biggest surviving chunk should be no more than 300 pounds (136 kilograms).

Earthlings can take comfort in the fact that no one has ever been hurt by falling space junk _ to anyone's knowledge _ and there has been no serious property damage. NASA put the chances that somebody somewhere on Earth would get hurt at 1-in-3,200. But any one person's odds of being struck were estimated at 1-in-22 trillion, given there are 7 billion people on the planet.

"Keep in mind that we have bits of debris re-entering the atmosphere every single day," Matney said in brief remarks broadcast on NASA TV.

In any case, finders definitely aren't keepers.

Any surviving wreckage belongs to NASA, and it is against the law to keep or sell even the smallest piece. There are no toxic chemicals on board, but sharp edges could be dangerous, so the space agency is warning the public to keep hands off and call police.

The \$740 million UARS was launched in 1991 from space shuttle Discovery to study the atmosphere and the ozone layer. At the time, the rules weren't as firm for safe satellite disposal; now a spacecraft must be built to burn up upon re-entry or have a motor to propel it into a much higher, long-term orbit.

NASA shut UARS down in 2005 after lowering its orbit to hurry its end. A potential satellite-retrieval mission was ruled out following the 2003 shuttle Columbia disaster, and NASA did not want the satellite hanging around orbit posing a debris hazard.

Space junk is a growing problem in low-Earth orbit. More than 20,000 pieces of debris, at least 4 inches in diameter, are being tracked on a daily basis. These objects pose a serious threat to the International Space Station.

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Online:

Satellite updates: <http://www.nasa.gov/uars>

Aerospace Corp: <http://reentrynews.aero.org/1991063b.html>

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Record - 24

DIALOG(R)

Falling satellite slows down, Earth strike delayed,

MARCIA DUNN,

AP Alert – Defense,

Saturday, September 24, 2011

TEXT:

CAPE CANAVERAL, Florida_A 6-ton NASA satellite on a collision course with Earth clung to space Friday, apparently flipping position in its ever-lower orbit and stalling its death plunge.

The old research spacecraft was targeted to crash through the atmosphere sometime Friday night or early Saturday, putting Canada, Africa and Australia in the potential crosshairs, although most of the satellite should burn up during re-entry. The United States wasn't entirely out of the woods; the possible strike zone skirted Washington state.

"It just doesn't want to come down," said Jonathan McDowell of the Harvard-Smithsonian Center for Astrophysics.

McDowell said the satellite's delayed demise demonstrates how unreliable predictions can be. That said, "the best guess is that it will still splash in the ocean, just because there's more ocean out there."

Until Friday, increased solar activity was causing the atmosphere to expand and the 35-foot (10-meter), bus-size satellite to free fall more quickly. But late Friday morning, NASA said the sun was no longer the major factor in the rate of descent and that the satellite's position, shape or both had changed by the time it slipped down to a 100-mile (160-kilometer) orbit.

"In the last 24 hours, something has happened to the spacecraft," said NASA orbital debris scientist Mark Matney.

On Friday night, NASA said it expected the satellite to come crashing down between 11 p.m. and 3 a.m. EDT. It was going to be passing over the Atlantic, Pacific and Indian oceans at that time, as well as Canada, Africa and Australia.

"The risk to public safety is very remote," NASA said in a statement.

The Aerospace Corp., which tracks space debris, also estimated the strike would happen sometime between about 11 p.m. and 3 a.m. EDT, which would make a huge difference in where the debris falls. Its projections also put almost all of the U.S. in the clear _ with Washington state the lone holdout.

Any surviving wreckage is expected to be limited to a 500-mile (805-kilometer) swath.

The Upper Atmosphere Research Satellite, or UARS, will be the biggest NASA spacecraft to crash back to Earth, uncontrolled, since the post-Apollo 75-ton Skylab space station and the more than 10-ton Pegasus 2 satellite, both in 1979.

Russia's 135-ton Mir space station slammed through the atmosphere in 2001, but it was a controlled dive into the Pacific.

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NASA shut UARS down in 2005 after lowering its orbit to hurry its end. A potential satellite-retrieval mission was ruled out following the 2003 shuttle Columbia disaster, and NASA did not want the satellite hanging around orbit posing a debris hazard.

Space junk is a growing problem in low-Earth orbit. More than 20,000 pieces of debris, at least 4 inches (10 centimeters) in diameter, are being tracked on a daily basis. These objects pose a serious threat to the International Space Station.

Online:

Satellite updates: <http://www.nasa.gov/uars>

Aerospace Corp: <http://reentrynews.aero.org/1991063b.html>

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Record - 25

DIALOG(R)

World Briefly: Defunct NASA satellite slows down in plunge to Earth, US no longer out of Woods,

AP DataStream,

Friday, September 23, 2011

TEXT:

Defunct NASA satellite slows down in plunge to Earth, US no longer out of woods

CAPE CANAVERAL, Fla. (AP) _ A 6-ton NASA satellite on a collision course with Earth clung to space Friday, apparently flipping position in its ever-lower orbit and stalling its death plunge.

The old research spacecraft was targeted to crash through the atmosphere sometime Friday night or early Saturday morning, putting the U.S. back in the potential crosshairs, although most of the satellite should burn up during re-entry.

"It just doesn't want to come down," said Jonathan McDowell of the Harvard-Smithsonian Center for Astrophysics.

McDowell said the satellite's delayed demise demonstrates how unreliable predictions can be. That said, "the best guess is that it will still splash in the ocean, just because there's more ocean out there."

Until Friday, increased solar activity was causing the atmosphere to expand and the 35-foot satellite to free fall more quickly. But late Friday morning, NASA said the sun was no longer the major factor in the rate of descent and that the satellite's position, shape or both had changed by the time it slipped down to a 100-mile orbit.

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Record - 26

DIALOG(R)

AP News in Brief at 5:58 p.m. EDT,
AP DataStream,
Friday, September 23, 2011

TEXT:

CAPE CANAVERAL, Fla. (AP) _ A 6-ton NASA satellite on a collision course with Earth clung to space Friday, apparently flipping position in its ever-lower orbit and stalling its death plunge.

The old research spacecraft was targeted to crash through the atmosphere sometime Friday night or early Saturday morning, putting the U.S. back in the potential crosshairs, although most of the satellite should burn up during re-entry.

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Record - 27

DIALOG(R)

Planet expert Michael Drake dies,
Burlington County Times, pB7,
Friday, September 23, 2011

TEXT:

TUCSON, Ariz. (AP) - A University of Arizona planet expert who played a key role in a number of high-profile space projects, including the Cassini mission to explore Saturn, has died, the university announced Thursday.

Dr. Michael Drake also worked on the Gamma-Ray Spectrometer onboard NASA's Mars Odyssey Orbiter, the HiRISE camera onboard NASA's Mars Reconnaissance Orbiter and the Phoenix Mars Lander. He was 65.

Peter Smith, the principal investigator for the Phoenix Mars Lander mission, said he began working with Drake when Smith was building the camera for the 1997 Mars Pathfinder. He called Drake's handling of the complexities of proposal development "masterful."

"We would meet monthly to review progress and plan strategy," Smith said. "Mike always encouraged excellence and made sure that the university was providing full support to our programs."

Drake joined the University of Arizona's planetary sciences faculty in 1973 and was named the head of the planetary sciences department in 1994. He also led the university's Lunar and Planetary Laboratory and was the principal investigator of the school's most ambitious project to date - an \$800 million mission designed to retrieve a sample of an asteroid and return it to Earth.

"Mike thought and spoke clearly so you always knew where he stood on an issue," said Professor Peter Strittmatter, who recently retired as director of the university's Steward Observatory and head of the astronomy department.

A native of Bristol, England, Drake graduated with a degree in geology from Victoria University in Manchester. He completed a doctoral program in geology at the University of Oregon in 1972.

Drake moved to Arizona after a postdoctoral program at the Smithsonian Astrophysical Observatory.

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Record - 28

DIALOG(R)

Defunct NASA satellite to fall back to Earth on Friday; chances of seeing re-entry slim,

ALICIA CHANG,

Canadian Press,

Thursday, September 22, 2011

TEXT:

LOS ANGELES _ While North America appears to be off the hook, scientists are scrambling to pinpoint exactly where and when a dead NASA climate satellite will plummet back to Earth on Friday.

The 6-ton, bus-sized satellite is expected to break into more than a hundred pieces as it plunges through the atmosphere, most of it burning up.

But if you're hoping for a glimpse, the odds are slim. Most sightings occur by chance because the re-entry path can't be predicted early enough to alert people, said Canadian Ted Molczan, who tracks satellites for a hobby.

In all his years of monitoring, Molczan has witnessed only one tumble back to Earth _ the 2004 return of a Russian communications satellite.

It ``looked like a brilliant star with a long glowing tail," he said in an email.

The best guess so far is that the 20-year-old Upper Atmosphere Research Satellite will hit sometime Friday afternoon or early evening, Eastern time. The latest calculations indicate it will not be over the United

States, Canada and Mexico during that time.

Until Thursday, every continent but Antarctica was a potential target. Predicting where and when the freefalling satellite will land is an imprecise science, but officials should be able to narrow it down a few hours ahead.

While most of the satellite pieces will disintegrate, 26 large metal chunks _ the largest about 300 pounds _ are expected to survive, hit and scatter somewhere on the planet. With nearly three-quarters of the world covered in water, chances are that it will be a splashdown.

If the re-entry is visible, ``it'll look like a long-lived meteor," said Jonathan McDowell of the Harvard-Smithsonian Center for Astrophysics in Cambridge, Mass.

Since the dawn of the Space Age, no one has been injured by falling space debris. The only confirmed case of a person being hit by space junk was in 1997 when Lottie Williams of Tulsa, Okla., was grazed in the shoulder by a small bit of debris from a discarded piece of a Delta rocket.

The odds of someone somewhere on Earth getting struck by the NASA satellite are 1 in 3,200. But any one person's odds are astronomically lower _ 1 in 21 trillion.

``You're way more likely to be hit by lightning" than by the satellite, McDowell said.

NASA has warned people not to touch any satellite part they might chance upon. There are no hazardous chemicals on board, but people can get hurt by sharp edges, the space agency said.

The U.S. tracks the roughly 22,000 pieces of satellites, rockets and other junk orbiting the Earth. Nowadays, the world is more eco-conscious about what it puts up in space. Modern satellites must be designed to disintegrate upon re-entry or have enough fuel to be nudged into a higher orbit or steered into the ocean.

The satellite was launched in 1991 aboard the space shuttle Discovery to study the ozone layer, and back then there was no such rule. NASA used up the remaining fuel to put it into a lower orbit in 2005, setting the stage for its uncontrolled return. It will be the biggest NASA spacecraft to fall uncontrolled from the sky in 32 years.

It's not unusual for space debris to dive back to Earth. NASA's Orbital Debris Program Office estimates that medium-sized junk falls back once a week. Debris the size of the satellite due back Friday occurs less

frequently, about once a year.

Harvard's McDowell noted that two massive Russian rocket stages have plunged back this year with little notice.

“The only reason this is getting attention is because NASA, as a matter of due diligence, put out a press release,” he said.

Online:

Satellite updates: www.nasa.gov/uars

Aerospace Corp: <http://reentrynews.aero.org/1991063b.html>

Follow Alicia Chang's coverage at <http://twitter.com/SciWriAlicia>

Record - 29

DIALOG(R)

NASA satellite expected to tumble to Earth today,

The Associated Press,

ALICIA CHANG,

Merrillville Post-Tribune, p39,

Friday, September 23, 2011

TEXT:

LOS ANGELES - While North America appears to be off the hook, scientists are scrambling to pinpoint exactly where and when a dead NASA climate satellite will plummet back to Earth on Friday.

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"The only reason this is getting attention is because NASA, as a matter of due diligence, put out a press release," he said.

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Record - 30

DIALOG(R)

Satellite coming down,

Gold Coast Bulletin (Australia), B - Main ed, p22,
Friday, September 23, 2011

TEXT:

NASA scientists are doing their best to tell us where a plummeting 5.4 tonne satellite will fall

It's just that if they're off a little bit, it could mean the difference between hitting Florida or landing on New York. Or, say, Iran or India

Pinpointing where and when hurtling space debris will strike is an imprecise science

For now, scientists predict the earliest it would hit is today, the latest on Sunday. The strike zone covers most of Earth

Not that citizens need to take cover. The satellite will break into pieces, and NASA put the chances that somebody somewhere will get hurt at just one-in-3200

As far as anyone knows, falling space debris has never injured anyone. Nor has significant property damage been reported. That's because most of the planet is covered in water and there are vast regions of empty land

If you do come across what you suspect is a satellite piece, NASA doesn't want you to pick it up

The space agency says there are no toxic chemicals present but there could be sharp edges. Also, it's government property. It's against the law to

keep it as a souvenir or sell it on eBay. NASA's advice is to report it to the police

The 20-year-old research satellite is expected to break into more than 100 pieces as it enters the atmosphere, most of it burning up

Twenty-six of the heaviest metal parts are expected to reach Earth, the biggest chunk weighing about 136kg. The debris could be scattered over an area about 800km long

Jonathan McDowell, for one, isn't worried. He is in the potential strike zone - along with most of the world's seven billion citizens
McDowell is with the Harvard-Smithsonian Center for Astrophysics in Cambridge, Massachusetts

"There's stuff that's heavy that falls out of the sky almost every year," McDowell said

So far this year, he noted, two massive Russian rocket stages had taken the plunge

As for the odds of the satellite hitting someone, "it's a small chance"

"We take much bigger chances all the time in our lives," McDowell said. "So I'm not putting my tin helmet on or hiding under a rock." All told, 544kg of wreckage is expected to smack down, the heaviest pieces made of titanium, stainless steel or beryllium. That represents just one-tenth the mass of the satellite, which stretches 10.7m long and 4.6m in diameter

The strike zone straddles all points between latitudes 57 degrees north and 57 degrees south. That's as far north as Edmonton and Alberta, Canada, and Aberdeen, Scotland, and as far south as Cape Horn, the southernmost tip of South America. Every continent but Antarctica is in the crosshairs

Predicting where the satellite will strike is a little like predicting the weather several days out, said NASA orbital debris scientist Mark Matney. Although experts expected to have a good idea of when and where UARS might fall, Matney said, they would not be able to pinpoint the exact time

But they should be able to narrow it to a few hours

Given the spacecraft's orbital speed of 28,162 km/h, or 8km per second, a prediction that is off by just a few minutes could mean a 1609km error

It probably won't be clear where it fell until afterwards, Matney said

If it happens in darkness, it should be visible

"If someone is lucky enough to be near the re-entry at night-time, they'll get quite a show," said Matney, who works at Johnson Space Center in Houston, also in the potential strike zone

Space junk, in general, is on the rise, much of it destroyed or broken satellites and chunks of used rockets. More than 20,000 man-made objects, at least 10.2cm in diameter, are being tracked in orbit

It's more a threat to astronauts in space, rather than people on Earth

In June, the six residents of the International Space Station took shelter in their docked Soyuz lifeboats because of passing debris
The unidentified object came within 335.2m of the complex, the closest call yet.

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Record - 31

DIALOG(R)

Old NASA satellite to tumble to Earth on Friday,

ALICIA CHANG,

AP DataStream,

Friday, September 23, 2011

TEXT:

LOS ANGELES_While North America appears to be off the hook, scientists are scrambling to pinpoint exactly where and when a dead NASA climate satellite will plummet back to Earth on Friday.

The 6-ton, bus-sized satellite is expected to break into more than a hundred pieces as it plunges through the atmosphere, most of it burning up.

But if you're hoping for a glimpse, the odds are slim. Most sightings occur by chance because the re-entry path can't be predicted early enough to alert people, said Canadian Ted Molczan, who tracks satellites for a hobby.

In all his years of monitoring, Molczan has witnessed only one tumble back to Earth _ the 2004 return of a Russian communications satellite.
It "looked like a brilliant star with a long glowing tail," he said in an email.

The best guess so far is that the 20-year-old Upper Atmosphere Research

Satellite will hit sometime Friday afternoon or early evening, Eastern time. The latest calculations indicate it will not be over the United States, Canada and Mexico during that time.

Until Thursday, every continent but Antarctic was a potential target. Predicting where and when the freefalling satellite will land is an imprecise science, but officials should be able to narrow it down a few hours ahead.

While most of the satellite pieces will disintegrate, 26 large metal chunks _ the largest about 300 pounds _ are expected to survive, hit and scatter somewhere on the planet. With nearly three-quarters of the world covered in water, chances are that it will be a splashdown.

If the re-entry is visible, "it'll look like a long-lived meteor," said Jonathan McDowell of the Harvard-Smithsonian Center for Astrophysics in Cambridge, Mass.

Since the dawn of the Space Age, no one has been injured by falling space debris. The only confirmed case of a person being hit by space junk was in 1997 when Lottie Williams of Tulsa, Okla., was grazed in the shoulder by a small bit of debris from a discarded piece of a Delta rocket.

The odds of someone somewhere on Earth getting struck by the NASA satellite are 1 in 3,200. But any one person's odds are astronomically lower _ 1 in 21 trillion.

"You're way more likely to be hit by lightning" than by the satellite, McDowell said.

NASA has warned people not to touch any satellite part they might chance upon. There are no hazardous chemicals on board, but people can get hurt by sharp edges, the space agency said.

The U.S. tracks the roughly 22,000 pieces of satellites, rockets and other junk orbiting the Earth. Nowadays, the world is more eco-conscious about what it puts up in space. Modern satellites must be designed to disintegrate upon re-entry or have enough fuel to be nudged into a higher orbit or steered into the ocean.

The satellite was launched in 1991 aboard the space shuttle Discovery to study the ozone layer, and back then there was no such rule. NASA used up the remaining fuel to put it into a lower orbit in 2005, setting the stage for its uncontrolled return. It will be the biggest NASA spacecraft to fall uncontrolled from the sky in 32 years.

It's not unusual for space debris to dive back to Earth. NASA's Orbital Debris Program Office estimates that medium-sized junk falls back once a week. Debris the size of the satellite due back Friday occurs less frequently, about once a year.

Harvard's McDowell noted that two massive Russian rocket stages have plunged back this year with little notice.

"The only reason this is getting attention is because NASA, as a matter of due diligence, put out a press release," he said.

Online:

Satellite updates: <http://www.nasa.gov/uars>

Aerospace Corp: <http://reentrynews.aero.org/1991063b.html>

Follow Alicia Chang's coverage at <http://twitter.com/SciWriAlicia>
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Record - 32

DIALOG(R)

Univ. of Arizona planet expert Michael Drake dies,
AP Alert – Arizona,
Thursday, September 22, 2011

TEXT:

TUCSON, Ariz._A University of Arizona planet expert who played a key role in a number of high-profile space projects, including the Cassini mission to explore Saturn, has died, the university announced Thursday.

Dr. Michael Drake also worked on the Gamma-Ray Spectrometer onboard NASA's Mars Odyssey Orbiter, the HiRISE camera onboard NASA's Mars Reconnaissance Orbiter and the Phoenix Mars Lander. He was 65.

Peter Smith, the principal investigator for the Phoenix Mars Lander mission, said he began working with Drake when Smith was building the camera for the 1997 Mars Pathfinder. He called Drake's handling of the complexities of proposal development "masterful."

"We would meet monthly to review progress and plan strategy," Smith said. "Mike always encouraged excellence and made sure that the university was providing full support to our programs."

Drake joined the University of Arizona's planetary sciences faculty in 1973 and was named the head of the planetary sciences department in 1994. He also led the university's Lunar and Planetary Laboratory and was the principal investigator of the school's most ambitious project to date _ an \$800 million mission designed to retrieve a sample of an asteroid and return it to Earth.

"Mike thought and spoke clearly so you always knew where he stood on an issue," said Professor Peter Strittmatter, who recently retired as director of the university's Steward Observatory and head of the astronomy department.

A native of Bristol, England, Drake graduated with a degree in geology from Victoria University in Manchester. He completed a doctoral program in geology at the University of Oregon in 1972.

Drake moved to Arizona after a postdoctoral program at the Smithsonian Astrophysical Observatory.

Online:

<http://www.lpl.arizona.edu>

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Record - 33

DIALOG(R)

Earth to satellite: When will you hit - and where?

Bismarck Tribune, The (ND), pA1,
Wednesday, September 21, 2011

TEXT:

CAPE CANAVERAL, Fla. - NASA scientists are doing their best to tell us where a plummeting six-ton satellite will fall later this week. It's just that if they're off a little bit, it could mean the difference between hitting Florida or landing on New York. Or, say, Iran or India.

Pinpointing where and when hurtling space debris will strike is an imprecise science. For now, scientists predict the earliest it will hit is Thursday U.S. time, the latest Saturday. The strike zone covers most of Earth.

Not that citizens need to take cover. The satellite will break into pieces, and NASA put the chances that somebody somewhere will get hurt at just 1 in 3,200.

As far as anyone knows, falling space debris has never injured anyone. Nor has significant property damage been reported. That's because most of the planet is covered in water and there are vast regions of empty land.

If you do come across what you suspect is a satellite piece, NASA doesn't want you to pick it up. The space agency says there are no toxic chemicals present, but there could be sharp edges. Also, it's government property. It's against the law to keep it as a souvenir or sell it on eBay. NASA's advice is to report it to the police.

The 20-year-old research satellite is expected to break into more than 100 pieces as it enters the atmosphere, most of it burning up. Twenty-six of the heaviest metal parts are expected to reach Earth, the biggest chunk weighing about 300 pounds. The debris could be scattered over an area about 500 miles long.

Jonathan McDowell, for one, isn't worried. He is in the potential strike zone - along with most of the world's 7 billion citizens. McDowell is with the Harvard-Smithsonian Center for Astrophysics in Cambridge, Mass.

"There's stuff that's heavy that falls out of the sky almost every year," McDowell says. So far this year, he noted, two massive Russian rocket stages have taken the plunge.

As for the odds of the satellite hitting someone, "it's a small chance. We take much bigger chances all the time in our lives," McDowell says. "So I'm not putting my tin helmet on or hiding under a rock."

All told, 1,200 pounds of wreckage is expected to smack down - the heaviest pieces made of titanium, stainless steel or beryllium. That represents just one-tenth the mass of the satellite, which stretches 35 feet long and 15 feet in diameter.

The strike zone straddles all points between latitudes 57 degrees north and 57 degrees south. That's as far north as Edmonton and Alberta, Canada, and Aberdeen, Scotland, and as far south as Cape Horn, the southernmost tip of South America. Every continent but Antarctica is in the crosshairs.

Back when UARS, the Upper Atmosphere Research Satellite, was launched to

study the ozone layer in 1991, NASA didn't always pay attention to the "what goes up must come down" rule. Nowadays, satellites must be designed either to burn up on re-entering the atmosphere or to have enough fuel to be steered into a watery grave or up into a higher, long-term orbit.

The International Space Station - the largest manmade structure ever to orbit the planet - is no exception. NASA has a plan to bring it down safely sometime after 2020.

Russia's old Mir station came down over the Pacific, in a controlled re-entry, in 2001. But one of its predecessors, Salyut 7, fell uncontrolled through the atmosphere in 1991. The most recent uncontrolled return of a large NASA satellite was in 2002.

The most sensational case of all was Skylab, the early U.S. space station whose impending demise three decades ago alarmed people around the world and touched off a guessing game as to where it might land. It plummeted harmlessly into the Indian Ocean and onto remote parts of Australia in July 1979.

The \$740 million UARS was decommissioned in 2005, after NASA lowered its orbit with the little remaining fuel on board.

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Record - 34

DIALOG(R)

Keeping an eye on the sky,
MARCIA DUNN Associated Press,
Tulsa World, Final ed, pA6,
Wednesday, September 21, 2011

TEXT:

NASA scientists are doing their best to tell us where a plummeting 6-ton satellite will fall later this week. It's just that if they're off a little bit, it could mean the difference between hitting Florida or landing on New York. Or, say, Iran or India.

Pinpointing where and when hurtling space debris will strike is an imprecise science. For now, scientists predict the earliest it will hit is Thursday U.S. time, the latest Saturday. The strike zone covers most of Earth.

Not that citizens need to take cover. The satellite will break into pieces, and NASA put the chances that somebody somewhere will get hurt at just 1-in-3,200.

As far as anyone knows, falling space debris has never injured anyone. Nor has significant property damage been reported. That's because most of the planet is covered in water and there are vast regions of empty land.

If you do come across what you suspect is a satellite piece, NASA doesn't want you to pick it up. The space agency says there are no toxic chemicals present, but there could be sharp edges. Also, it's government property. It's against the law to keep it as a souvenir or sell it on eBay. NASA's advice is to report it to the police.

The 20-year-old research satellite is expected to break into more than 100 pieces as it enters the atmosphere, most of it burning up. Twenty-six of the heaviest metal parts are expected to reach Earth, the biggest chunk weighing about 300 pounds. The debris could be scattered over an area about 500 miles long.

Jonathan McDowell, for one, isn't worried. He is in the potential strike zone - along with most of the world's 7 billion citizens. McDowell is with the Harvard-Smithsonian Center for Astrophysics in Cambridge, Mass. "There's stuff that's heavy that falls out of the sky almost every year," McDowell says. So far this year, he noted, two massive Russian rocket stages have taken the plunge.

As for the odds of the satellite hitting someone, "it's a small chance. We take much bigger chances all the time in our lives," McDowell says. "So I'm not putting my tin helmet on or hiding under a rock."

All told, 1,200 pounds of wreckage is expected to smack down - the heaviest pieces made of titanium, stainless steel or beryllium. That represents just one-tenth the mass of the satellite, which stretches 35 feet long and 15 feet in diameter.

The strike zone straddles all points between latitudes 57 degrees north and 57 degrees south. That's as far north as Edmonton and Alberta, Canada, and Aberdeen, Scotland, and as far south as Cape Horn, the southernmost tip of South America.

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Record - 35

DIALOG(R)

NASA doesn't know where satellite will fall,

MARCIA DUNN Associated Press,
Press of Atlantic City, The, All ed, pA1,
Wednesday, September 21, 2011

TEXT:

There is a 1 in 3,200 chance someone will be hit, but a 1 in 21 trillion shot it will be you.

NASA scientists are doing their best to tell us where a plummeting, 6-ton satellite will fall later this week. It's just that if they're off a little bit, it could mean the difference between hitting Florida or landing on New York. Or, say, Iran or India.

Pinpointing where and when hurtling space debris will strike is an imprecise science. For now, scientists predict the earliest it will hit is Thursday U.S. time, the latest Saturday. The strike zone covers most of Earth.

Not that citizens need to take cover. The satellite will break into pieces, and NASA put the chances that somebody somewhere on Earth will get hurt at 1 in 3,200. But any one person's odds of being struck have been estimated at 1 in 21 trillion.

As far as anyone knows, falling space debris has never injured anyone. Nor has significant property damage been reported. That's because most of the planet is covered in water and there are vast regions of empty land.

If you do come across what you suspect is a satellite piece, NASA doesn't want you to pick it up. The space agency says there are no toxic chemicals present, but there could be sharp edges. Also, it's government property. It's against the law to keep it as a souvenir or sell it on eBay. NASA's advice is to report it to the police.

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Back when UARS, the Upper Atmosphere Research Satellite, was launched to study the ozone layer in 1991, NASA did not always pay attention to the "what goes up must come down" rule. Nowadays, satellites must be designed either to burn up on re-entering the atmosphere or to have enough fuel to be steered into a watery grave or up into a higher, long-term orbit. The International Space Station -- the largest manmade structure ever to orbit the planet -- is no exception. NASA has a plan to bring it down safely sometime after 2020.

Russia's old Mir station came down over the Pacific, in a controlled re-entry, in 2001. But one of its predecessors, Salyut 7, fell uncontrolled through the atmosphere in 1991. The most recent uncontrolled return of a large NASA satellite was in 2002.

The most sensational case of all was Skylab, the early U.S. space station whose impending demise three decades ago alarmed people around the world and touched off a guessing game as to where it might land. It plummeted harmlessly into the Indian Ocean and onto remote parts of Australia in July 1979.

The \$740 million UARS was decommissioned in 2005, after NASA lowered its orbit with the little remaining fuel on board. NASA did not want to keep it up longer than necessary, for fear of a collision or an exploding fuel tank, either of which would have left a lot of space litter.

Predicting where the satellite will strike is a little like predicting the weather several days out, said NASA orbital debris scientist Mark Matney.

Experts expect to have a good idea by Thursday of when and where UARS might fall, Matney said. They won't be able to pinpoint the exact time, but they should be able to narrow it to a few hours.

Given the spacecraft's orbital speed of 17,500 mph, or 5 miles per second, a prediction that is off by just a few minutes could mean a 1,000-mile error. It probably won't be clear where it fell until afterward, Matney said.

If it happens in darkness, it should be visible.

"If someone is lucky enough to be near the re-entry at nighttime, they'll

get quite a show," said Matney, who works at Johnson Space Center in Houston, also in the potential strike zone.

Space junk in general is on the rise, much of it destroyed or broken satellites and chunks of used rockets. More than 20,000 manmade objects at least 4 inches in diameter are being tracked in orbit.

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Record - 36

DIALOG(R)

life: science Satellite strike zone NASA scientists are doing their best to tell us where a plummeting 5.4-tonne piece of space debris will fall,
Townsville Eye (Australia), 1 - ed, p27,
Thursday, September 22, 2011

TEXT:

PINPOINTING where and when hurtling space debris will strike is an imprecise science

For now, scientists predict the earliest the Upper Atmosphere Research Satellite will hit is today, the latest Saturday

The strike zone covers most of Earth. Not that citizens need to take cover

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Record - 37

DIALOG(R)

Satellite plunges toward Earth Debris has 1-in-3,200 chance of hitting Someone,

THE ASSOCIATED PRESS,
Charleston Daily Mail (WV), pP3A,
Wednesday, September 21, 2011

TEXT:

CAPE CANAVERAL, Fla. - NASA scientists are doing their best to tell us where a plummeting six-ton satellite will fall later this week. It's just that if they're off a little bit, it could mean the difference between hitting Florida or landing on New York. Or, say, Iran or India.

Pinpointing where and when hurtling space debris will strike is an imprecise science. For now, scientists predict the earliest it will hit is Thursday U.S. time, the latest Saturday. The strike zone covers most of Earth.

Not that citizens need to take cover. The satellite will break into pieces, and scientists put the odds of it hitting someone at 1-in-3,200. As far as anyone knows, falling space debris has never injured anyone. Nor has significant property damage been reported. That's because most of the planet is covered in water and there are vast regions of empty land.

The 20-year-old research satellite is expected to break into more than 100 pieces as it enters the atmosphere, most of it burning up. Twenty-six of the heaviest metal parts are expected to reach Earth, the biggest chunk weighing about 300 pounds. The debris could be scattered over an area about 500 miles long.

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As for the odds of the satellite hitting someone, "it's a small chance. We take much bigger chances all the time in our lives," McDowell says. "So I'm not putting my tin helmet on or hiding under a rock."

All told, 1,200 pounds of wreckage is expected to smack down - the heaviest pieces made of titanium, stainless steel or beryllium. That represents just one-tenth the mass of the satellite, which stretches 35 feet long and 15 feet in diameter.

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THE ASSOCIATED PRESS

The satellite is shown attached to the robotic arm of the space shuttle Discovery during mission STS-48 in 1991.

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Record - 38

DIALOG(R)

Earth in crosshairs of plummeting NASA satellite -- Where space debris

strikes later this week is anybody's guess,

Marcia Dunn Associated Press,
Memphis Commercial Appeal (TN), Final ed, pA1,
Wednesday, September 21, 2011

TEXT:

CAPE CANAVERAL, Fla. - NASA scientists are doing their best to tell us where a plummeting six-ton satellite will fall later this week. It's just that if they're off a little bit, it could mean the difference between hitting Florida or landing on New York. Or, say, Iran or India.

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Predicting where the decommissioned \$740 million UARS satellite will strike is a little like predicting the weather several days out, says NASA orbital debris scientist Mark Matney.

Experts expect to have a good idea by Thursday of when and where UARS might fall, Matney says. They won't be able to pinpoint the exact time, but they should be able to narrow it to a few hours.

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Record - 39

DIALOG(R)

Derelict satellite to fall to Earth,

Marcia Dunn,

Waterloo Region Record, v2011092117427922, First ed, pD8,

Wednesday, September 21, 2011

TEXT:

CAPE CANAVERAL, Fla. - NASA scientists are doing their best to tell us

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The 20-year-old research satellite is expected to break into more than 100 pieces as it enters the atmosphere, most of it burning up. Twenty-six of the heaviest metal parts are expected to reach Earth, the biggest chunk weighing about 136 kilograms. The debris could be scattered over an area about 800 kilometres long.

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All told, 544 kilograms of wreckage is expected to smack down - the heaviest pieces made of titanium, stainless steel or beryllium. That represents just one-tenth the mass of the satellite, which stretches about 10.6 metres long and 4.6 metres in diameter.

The strike zone straddles all points between latitudes 57 degrees north and 57 degrees south. That's as far north as Edmonton and Aberdeen, Scotland, and as far south as Cape Horn, the southernmost tip of South America. Every

continent but Antarctica is in the crosshairs. Back when UARS, the Upper Atmosphere Research Satellite, was launched to study the ozone layer in 1991, NASA didn't always pay attention to the "what goes up must come down" rule. Nowadays, satellites must be designed either to burn up on re-entering the atmosphere or to have enough fuel to be steered into a watery grave or up into a higher, long-term orbit.

The Associated Press

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Record - 40

DIALOG(R)

The sky's not falling . . . but a satellite is,

Marcia Dunn,

Guelph Mercury, v2011092117428664, First ed, pB10,

Wednesday, September 21, 2011

TEXT:

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The \$740 million UARS was decommissioned in 2005.

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Record - 41

DIALOG(R)

NASA scientists wonder when, where hurtling satellite will fall this week,

Marcia Dunn,

Times, The (Trenton, NJ), Trenton Full Run ed, pA07,

Wednesday, September 21, 2011

TEXT:

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Experts expect to have a good idea by Thursday of when and where UARS might fall, Matney says. They won't be able to pinpoint the exact time, but they should be able to narrow it to a few hours.

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If it happens in darkness, it should be visible.

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It's mostly a threat to astronauts in space, rather than people on Earth. In June, the six residents of the International Space Station took shelter in their docked Soyuz lifeboats because of passing debris. The unidentified object came within 1,100 feet of the complex, the closest call yet.

Online:

NASA: <http://www.nasa.gov/mission--pages/uars/index.html>

AP-WF-09-20-11 2058GMT

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Record - 42

DIALOG(R)

Experts: Yes, huge satellite is falling; no, don't sweat it,

Marcia Dunn,

Star-Ledger, The (Newark, NJ), State/ROP ed, p002,

Wednesday, September 21, 2011

TEXT:

CAPE CANAVERAL, Fla. - NASA scientists are doing their best to tell us where a plummeting 6-ton satellite will fall later this week. It's just that if they're off a little bit, it could mean the difference between hitting Florida or landing on New York. Or, say, Iran or India.

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Record - 43

DIALOG(R)

When - and where - will satellite hit earth?

Virginia Pilot and Ledger-Star (Norfolk, VA), VP - The Virginian-Pilot ed, p3, Wednesday, September 21, 2011

TEXT:

By Marcia Dunn

The Associated Press

CAPE CANAVERAL, Fla.

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what's going down?

Upper Atmosphere Research Satellite, above, is expected to break up in the atmosphere, scattering 1,200 pounds of wreckage over a 500-mile-long area. Copyright (c) 2011 The Virginian-Pilot, Inc.

Record - 44

DIALOG(R)

SATELLITE'S FINAL PLUNGE UNCERTAIN,

Marcia Dunn, The Associated Press,
Pittsburgh Post-Gazette (PA), SOONER ed, pA-6,
Wednesday, September 21, 2011

TEXT:

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Record - 45

DIALOG(R)

The sky's not falling, but a satellite is; pieces could hit as early as Thursday - but where?

MARCIA DUNN,
Canadian Press,
Wednesday, September 21, 2011

TEXT:

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Online:

NASA: http://www.nasa.gov/mission_pages/uars/index.html

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Record - 46

DIALOG(R)

Update:APNewsNow. For global distribution.

MARCIA DUNN,

Canadian Press - Broadcast wire, The,

Tuesday, September 20, 2011

TEXT:

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Pinpointing where and when hurtling space debris will strike is an imprecise science. For now, scientists predict the earliest it will hit is Thursday U.S. time, while the latest is Saturday.

Over the years, space debris has fallen into the ocean or empty spaces. This satellite will break into pieces, and scientists put the odds of it hitting someone at 1-in-3,200.

Jonathan McDowell of the Harvard-Smithsonian Center for Astrophysics says he is not worried because heavy space debris falls almost every year.

(The Associated Press)

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Record - 47

DIALOG(R)

Satelite a punto de caer a tierra,

MARCIA DUNN,

El Nuevo Herald,

Tuesday, September 20, 2011

TEXT:

Los científicos de la NASA están estrujándose los sesos para determinar donde caerá un satélite de seis toneladas en los próximos días.

Ocurre que si los cálculos están apenas equivocados, la diferencia del lugar de impacto podría ser tan amplia como entre Miami y Nueva York o entre India e Irán.

Localizar donde y cuando caerán los desechos espaciales es una ciencia imprecisa. Por ahora, los científicos pronostican que caerá entre el jueves y el sábado, pero la zona de impacto abarca casi todo el planeta.

No es necesario ponerse a cubierto. El satélite se desintegrará en pedazos y los científicos calculan que las probabilidades de que le caigan en la cabeza a alguien son demasiado bajas.

Según se sabe, los desechos espaciales nunca han herido a nadie. Ni tampoco se han reportado daños materiales significativos. Eso se debe a que la mayoría de la superficie terrestre está cubierta por agua y hay vastos espacios vacíos.

Si alguien se topa con lo que supone es la pieza de un satélite, la NASA

pide que no se toque: La agencia espacial dice que aunque no contendra sustancias toxicas, podria tener bordes afilados. Ademas es propiedad del gobierno estadounidense, por lo que es ilegal conservarlo como recuerdo o venderlo por eBay. La NASA aconseja que se reporte a la policia.

El satelite de investigacion lanzado hace 20 anos presumiblemente se desintegrara en mas de 100 trozos al entrar en la atmosfera y, aunque la mayoria se quemara, se calcula que 26 de los trozos metalicos mas pesados caeran a Tierra.

El mayor pesara unos 135 kilogramos (300 libras) y los fragmentos podrian dispersarse en un area de 800 kilometros (500 millas) de largo.

Jonathan McDowell no esta preocupado aunque esta en la zona de posible impacto... junto con la mayoria de los 7,000 millones de habitantes del planeta. Trabaja en el Centro de Astrofisica del Centro Harvard-Smithsonian en Cambridge, Massachusetts.

"Hay cosas pesadas que caen del cielo casi todos los anos", observo. Hasta ahora este ano, preciso, han caido dos etapas de cohetes rusos.

En cuanto a la probabilidad de que le de a alguien, "es muy escasa", dijo McDowell.

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Record - 48

DIALOG(R)

Latest Alabama news, sports, business and entertainment,
AP Alert – Alabama,
Tuesday, September 20, 2011

TEXT:

FALLING SATELLITE

Earth to satellite: When will you hit _ and where?

CAPE CANAVERAL, Fla. (AP) _ NASA scientists are doing their best to tell us where a plummeting 6-ton satellite will fall later this week. It's just that if they're off a little bit, it could mean the difference between hitting Florida or New York. Or, say, Iran or India.

Pinpointing where and when hurtling space debris will strike is an

imprecise science. For now, scientists predict the earliest it will hit is Thursday U.S. time, while the latest is Saturday.

Over the years, space debris has fallen into the ocean or empty spaces. This satellite will break into pieces, and scientists put the odds of it hitting someone at 1-in-3,200.

Jonathan McDowell of the Harvard-Smithsonian Center for Astrophysics says he is not worried because heavy space debris falls almost every year.
GULF OIL SPILL-REVOLVING DOOR

Top Interior official heads to firm working for BP

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Record - 49

DIALOG(R)

Restos de satelite por caer a tierra; La NASA no sabe donde,

Por MARCIA DUNN,

AP Online Regional - Latin America/Caribbean,

Tuesday, September 20, 2011

TEXT:

CABO CANAVERAL, Florida, EE.UU._Los cientificos de la NASA estan estrujandose los sesos para determinar donde caera un satelite de seis toneladas en los proximos dias.

Ocurre que si los calculos estan apenas equivocados, la diferencia del lugar de impacto podria ser tan amplia como entre Miami y Nueva York o entre India e Iran.

Localizar donde y cuando caeran los desechos espaciales es una ciencia imprecisa. Por ahora, los cientificos pronostican que caera entre el jueves y el sabado, pero la zona de impacto abarca casi todo el planeta.

No es necesario ponerse a cubierto. El satelite se desintegrara en pedazos y los cientificos calculan que las probabilidades que le caigan en la cabeza a alguien son demasiado bajas.

Segun se sabe, los desechos espaciales nunca han herido a nadie. Ni tampoco se han reportado danos materiales significativos. Eso se debe a que la mayoria de la superficie terrestre esta cubierta por agua y hay vastas regiones de espacios vacios.

Si alguien se topa con lo que supone es la pieza de un satélite, la NASA pide que no se toque: La agencia espacial dice que aunque no contiene sustancias tóxicas, pero podría tener bordes afilados. Además es propiedad del gobierno estadounidense, por lo que es ilegal conservarlo como recuerdo o venderlo por eBay. La NASA aconseja que se reporte a la Policía.

El satélite de investigación lanzado hace 20 años presumiblemente se desintegrará en más de cien trozos al entrar en la atmósfera y, aunque la mayoría se quemarán, se calcula que 26 de los trozos metálicos más pesados caerán a Tierra.

El mayor pesará unos 135 kilogramos (300 libras) y los fragmentos podrían dispersarse en un área de 800 kilómetros (500 millas) de largo.

Jonathan McDowell no está preocupado aunque está en la zona de posible impacto... junto con la mayoría de los 7.000 millones de habitantes del planeta. Trabaja en el Centro de Astrofísica del Centro Harvard-Smithsonian en Cambridge, Massachusetts.

"Hay cosas pesadas que caen del cielo casi todos los años", observo. Hasta ahora este año, preciso, han caído dos etapas de cohetes rusos.

En cuanto a la probabilidad de que le de a alguien, "es muy escasa", dijo McDowell. "Por eso no me calzare mi casco ni me escondere debajo de una roca".

En total, se calcula que caerán 545 kilogramos (1.200 libras) y que los trozos mayores serán de titanio, acero inoxidable o berilio. Eso representa el 10% de la masa del satélite UARS, siglas en inglés de Satélite de Investigación de la Atmósfera Superior, lanzado en 1991.

En línea:

NASA: http://www.nasa.gov/mission_pages/uars/index.html

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Record - 50

DIALOG(R)

FROM STAR WARS TO SCIENCE FACT: TATOOINE-LIKE PLANET DISCOVERED,

US Federal News,
Friday, September 16, 2011

TEXT:

WASHINGTON, Sept. 16 -- The Smithsonian Institution issued the following press release:

Although cold and gaseous rather than a desert world, the newfound planet Kepler-16b is still the closest astronomers have come to discovering Luke Skywalker's home world of Tatooine. Like Tatooine, Kepler-16b enjoys a double sunset as it circles a pair of stars approximately 200 light-years from Earth. It's not thought to harbor life, but its discovery demonstrates the diversity of planets in our galaxy.

"Kepler-16b is the first confirmed, unambiguous example of a circumbinary planet - a planet orbiting not one, but two stars," said Josh Carter of the Harvard-Smithsonian Center for Astrophysics (CfA). "Once again, we're finding that our solar system is only one example of the variety of planetary systems Nature can create."

Carter is second author on the study announcing the discovery, which appears in the Sept. 15th issue of the journal *Science*. He is presenting the finding today at the Extreme Solar Systems II conference in Jackson Hole, Wyoming.

Kepler-16b weighs about a third as much as Jupiter and has a radius three-fourths that of Jupiter, making it similar to Saturn in both size and mass. It orbits its two parent stars every 229 days at a distance of 65 million miles - similar to Venus' 225-day orbit.

Both stars are smaller and cooler than our Sun. As a result, Kepler-16b is quite cold, with a surface temperature of around -100 to -150 Fahrenheit.

NASA's Kepler mission detected the planet through what is known as a planetary transit - an event where a star dims when a planet crosses in front of it. The planet's discovery was complicated by the fact that the two stars in the system eclipse each other, causing the total brightness to dim periodically.

Astronomers noticed that the system's brightness sometimes dipped even when the stars were not eclipsing one another, hinting at a third body. The additional dimming events reappeared at irregular time intervals, indicating that the stars were in different positions in their orbit each time the third body passed. This showed that this third body was circling, not just one, but both stars.

Although Kepler data provided the relative sizes and masses of the stars and planet, astronomers needed more information to get absolute numbers. The crucial missing information came from the Tillinghast Reflector Echelle Spectrograph (TRES) on the 60-inch telescope at the Smithsonian Astrophysical Observatory's Whipple Observatory in Arizona.

TRES monitored the changing velocity of the primary star as it moved around in its orbit. This yielded an orbital solution that set the scale of the Kepler-16 system. The team found that the two stars orbit each other every 41 days at an average distance of 21 million miles.

"Much of what we know about the sizes of stars comes from such eclipsing binary systems, and most of what we know about the size of planets comes from transits," said lead author and Kepler scientist Laurance Doyle of the SETI Institute. "Kepler-16 combines the best of both worlds, with stellar eclipses and planetary transits in one system."

For more information about the Kepler mission, visit:
<http://www.nasa.gov/kepler> For any query with respect to this article or any other content requirement, please contact Editor at htsyndication@hindustantimes.com

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Wolbach Library: CfA in the News ~ Week ending 2 October 2011

1. **Rogue satellite slows death plunge to Earth**, MARCIA DUNN, Associated Press, Journal Gazette, The (Fort Wayne, IN), p11A, Saturday, September 24, 2011
2. **When, where will satellite fall?**, Associated Press, Journal Gazette, The (Fort Wayne, IN), p4A, Wednesday, September 21, 2011
3. **NASA downplays threats of asteroids to Earth**, Calgary Herald (Canada), Final ed, pA21, Friday, September 30, 2011
4. **Asteroid strikes unlikely, NASA says**, Windsor Star (Canada), Final ed, pD3, Friday, September 30, 2011
5. **NASA SPACE TELESCOPE FINDS FEWER ASTEROIDS NEAR EARTH**, US Federal News, Thursday, September 29, 2011
6. **NASA SELECTS SCIENCE INVESTIGATIONS FOR CONCEPT STUDIES**, US Federal News, Thursday, September 29, 2011
7. **When, where will satellite fall? Most of Earth in strike zone, but danger very slim**, Anonymous; Associated Press, Journal - Gazette, p4A, Wednesday, September 21, 2011
8. **Researchers from Harvard-Smithsonian Center for Astrophysics Detail Findings in Astronomy Research**, Science Letter, p784, Tuesday, October 4, 2011
9. **Research from Harvard-Smithsonian Center for Astrophysics in the Area of Astronomy Published**, Science Letter, p623, Tuesday, October 4, 2011
10. **New Astronomy Research Study Findings Recently Were Reported by Researchers at Harvard-Smithsonian Center for Astrophysics**, Science Letter, p227, Tuesday, October 4, 2011
11. **Harvard-Smithsonian Center for Astrophysics Publishes Research in Geophysical Research**, Science Letter, p179, Tuesday, October 4, 2011
12. **Daybook** Thu General, AP Alert - DC Daybook, Thursday, September 29, 2011
13. **A century of AAVSO progress: this internationally renowned organization has grown from a handful of amateurs making observations for professional...**

Williams, Thomas R., Saladyga, Michael, Sky & Telescope, v122, n4, p30(8),
Saturday, October 1, 2011

14. NATIONAL AIR AND SPACE MUSEUM ANNOUNCES 'SMITHSONIAN'S STARS',
US Federal News, Monday, September 26, 2011

**15. PRESIDENT BARACK OBAMA RECOGNIZES OUTSTANDING SCIENTISTS
AT THE SMITHSONIAN**, US Federal News, Tuesday, September 27, 2011

16. Satellite likely in ocean, but might have hit U.S.,
Kelli Kennedy and Seth Borenstein, Associated Press,
St. Paul Pioneer Press (MN), St. Paul ed, pA2,
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17. Satellite down in the Pacific, Post Wire Services,
New York Post, p003, Sunday, September 25, 2011

18. UI researcher among Presidential award recipients,
Michael Chevy Castranova, Gazette, The (Cedar Rapids, IA),
Monday, September 26, 2011

19. NASA TO HOST NEWS CONFERENCE ON ASTEROID SEARCH FINDINGS,
US Federal News, Monday, September 26, 2011

20. Northwest appears to dodge a satellite, Seth Borenstein and Kelli Kennedy,
The Associated Press, Seattle Times (WA), Fourth ed, pA2,
Sunday, September 25, 2011

21. SATELLITE HITS -- SOMEWHERE,
Seth Borenstein and Kelli Kennedy, Associated Press,
San Jose Mercury News (CA), Valley Final ed, p6A,
Sunday, September 25, 2011

22. PRESIDENT OBAMA HONORS OUTSTANDING EARLY-CAREER SCIENTISTS,
US Federal News, Monday, September 26, 2011

23. SATELLITE'S PLUNGE TOWARD EARTH ON HOLD,
Marcia Dunn, Associated Press, San Jose Mercury News (CA), Valley Final ed, p3A,
Saturday, September 24, 2011

24. 6-ton satellite hits Earth but it's MIA, Associated Press,
Memphis Commercial Appeal (TN), Final ed, pA8,
Sunday, September 25, 2011

**25. Falling NASA satellite losing speed -- Washington state in predicted strike
zone**, Marcia Dunn Associated Press, Memphis Commercial Appeal (TN), Final ed, pA13,
Saturday, September 24, 2011

26. **6-ton satellite hits earth, but where is anyone's guess**,
Virginia Pilot and Ledger-Star (Norfolk, VA), VP - The Virginian-Pilot ed, p3,
Sunday, September 25, 2011
27. **Satellite is likely in Pacific ocean**, SETH BORENSTEIN & KELLI KENNEDY,
Associated Press, Tulsa World, Final ed, pA18,
Sunday, September 25, 2011
28. **Satellite home, but where's it parked?**,
Hamilton Spectator wire services,
Hamilton Spectator, v2011092617481469, First ed, pA8,
Monday, September 26, 2011
29. **No sign of NASA wreckage**, The Canadian Press,
Waterloo Region Record, v2011092617481950, First ed, pA8,
Monday, September 26, 2011
30. **Satellite debris falling in Alberta a hoax**, RCMP says,
The Canadian Press, Guelph Mercury, v2011092617482162, First ed, pB8,
Monday, September 26, 2011

Record - 1

DIALOG(R)

Rogue satellite slows death plunge to Earth,
MARCIA DUNN Associated Press,
Journal Gazette, The (Fort Wayne, IN), p11A,
Saturday, September 24, 2011

TEXT:

CAPE CANAVERAL, Fla. - A 6-ton NASA satellite on a collision course with Earth clung to space Friday, apparently flipping position in its ever-lower orbit and stalling its death plunge.

The old research spacecraft was targeted to crash through the atmosphere Friday night or early today, putting Canada, Africa and Australia in the potential crosshairs, although most of the satellite should burn up during re-entry. The U.S. wasn't out of the woods; the possible strike zone skirted Washington state.

"It just doesn't want to come down," said Jonathan McDowell of the Harvard-Smithsonian Center for Astrophysics. McDowell said the satellite's delayed demise shows how unreliable predictions can be. That said, "the best guess is that it will still splash in the ocean, just because there's more ocean out there."

The Upper Atmosphere Research Satellite, or UARS, will be the biggest NASA spacecraft to crash back to Earth, uncontrolled, since the post-Apollo 75-ton Skylab space station and the more than 10-ton Pegasus 2 satellite, both in 1979.

The \$740 million UARS was launched in 1991 from space shuttle Discovery to study the atmosphere and the ozone layer. At the time, the rules weren't as firm for safe satellite disposal; now a spacecraft must be built to burn up upon re-entry or have a motor to propel it into a much higher, long-term orbit.

NASA shut UARS down in 2005 after lowering its orbit to hurry its end. A potential satellite-retrieval mission was ruled out after the 2003 shuttle Columbia disaster, and NASA did not want the satellite hanging around orbit posing a debris hazard.

Any surviving wreckage belongs to NASA, and it is illegal to keep or sell even the smallest piece. There are no toxic chemicals on board, but sharp edges could be dangerous, so the space agency is warning the public to keep hands off and call police.

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Record - 2

DIALOG(R)

When, where will satellite fall?,

Associated Press,

Journal Gazette, The (Fort Wayne, IN), p4A,

Wednesday, September 21, 2011

TEXT:

CAPE CANAVERAL, Fla. - NASA scientists are doing their best to tell us where a plummeting six-ton satellite will fall this week. It's just that if they're off a little bit, it could mean the difference between hitting Florida or landing on New York. Or, say, Iran or India.

Pinpointing where and when hurtling space debris will strike is an imprecise science. For now, scientists predict the earliest it will hit is Thursday, the latest Saturday. The strike zone covers most of Earth.

Not that citizens need to take cover. The satellite will break into pieces, and NASA put the chances that somebody somewhere on Earth will get hurt at 1 in 3,200. But any one person's odds of being struck have been estimated at 1 in 21 trillion.

As far as anyone knows, falling space debris has never injured anyone. Nor has significant property damage been reported. That's because most of the planet is covered in water and there are vast regions of empty land.

If you do come across what you suspect is a satellite piece, NASA doesn't want you to pick it up. The space agency says there are no toxic chemicals present, but there could be sharp edges. Also, it's government property. It's against the law to keep it as a souvenir or sell it on eBay. NASA's advice is to report it to the police.

The 20-year-old research satellite is expected to break into more than 100 pieces as it enters the atmosphere, most of it burning up. Twenty-six of the heaviest metal parts are expected to reach Earth, the biggest chunk weighing about 300 pounds. The debris could be scattered over an area about 500 miles long.

Jonathan McDowell, for one, isn't worried. He is in the potential strike zone - along with most of the world's 7 billion citizens.

"There's stuff that's heavy that falls out of the sky almost every year," said, McDowell, who is with the Harvard-Smithsonian Center for Astrophysics in Cambridge, Mass. So far this year, he noted, two massive Russian rocket stages have taken the plunge.

As for the odds of the satellite hitting someone, "it's a small chance. We take much bigger chances all the time in our lives," McDowell says. "So I'm not putting my tin helmet on or hiding under a rock."

All told, 1,200 pounds of wreckage is expected to smack down - the heaviest pieces made of titanium, stainless steel or beryllium. That represents just one-tenth the mass of the satellite, which stretches 35 feet long and 15 feet in diameter.

The strike zone stretches as far north as Edmonton and Alberta, Canada, and Aberdeen, Scotland, and as far south as Cape Horn, the southernmost tip of South America. So every continent but Antarctica is in the crosshairs.

Experts expect to have a good idea by Thursday of when and where the satellite might fall, Matney says. They won't be able to pinpoint the exact time, but they should be able to narrow it to a few hours.

It probably won't be clear where it fell until afterward, Matney says.

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DIALOG(R)

NASA downplays threats of asteroids to Earth,

Calgary Herald (Canada), Final ed, pA21,

Friday, September 30, 2011

TEXT:

WASHINGTON - Fewer giant asteroids are out in space than once thought and most of the biggest near-Earth asteroids have been found, leaving little threat of one smashing into the planet, NASA said Thursday.

The latest data from the U.S. space agency's Wide-field Infrared Survey Explorer, or WISE telescope, shows that 93 per cent of asteroids one kilometre and larger have been found.

Scientists used to think there were about 1,000 of them, but they have revised that number down to 981, of which 911 have been located and are being tracked.

"The risk of a really large asteroid impacting the Earth before we could find and warn of it has been substantially reduced," said Tim Spahr, the director of the Minor Planet Center at the Harvard-Smithsonian Center for Astrophysics in Cambridge, Massachusetts.

Where the challenge remains is with mid-sized near-Earth asteroids 100 metres and larger. The WISE data shows there are about 19,500 - not 35,000 as previous data suggested - and that only 5,200 of these are being tracked. That leaves nearly 15,000 yet to be found, NASA said.

A near-Earth asteroid is defined as a space rock that orbits within 120 million miles (195 million kilometres) of the sun into Earth's orbital vicinity.

Amy Mainzer, lead author of the latest research that appears in the Astrophysical Journal, said WISE has given astronomers a better sense of what is out there, and what is not.

"It's like a population census, where you poll a small group of people to draw conclusions about the entire country," she said.

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DIALOG(R)

Asteroid strikes unlikely, NASA says,

Windsor Star (Canada), Final ed, pD3,
Friday, September 30, 2011

TEXT:

WASHINGTON - Fewer giant asteroids are out in space than once thought and most of the biggest near-Earth asteroids have been found, leaving little threat of one smashing into the planet, NASA said Thursday.

The latest data from the U.S. space agency's Wide-field Infrared Survey Explorer, or WISE telescope, shows that 93 per cent of asteroids one kilometre and larger have been found.

Scientists used to think there were about 1,000 of them, but they have revised that number down to 981, of which 911 have been located and are being tracked.

"The risk of a really large asteroid impacting the Earth before we could find and warn of it has been substantially reduced," said Tim Spahr, the director of the Minor Planet Center at the Harvard-Smithsonian Center for Astrophysics in Cambridge, Mass.

Where the challenge remains is with mid-sized near-Earth asteroids 100 metres and larger. The WISE data shows there are about 19,500 - not 35,000 as previous data suggested - and that only 5,200 of these are being tracked.

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DIALOG(R)

NASA SPACE TELESCOPE FINDS FEWER ASTEROIDS NEAR EARTH,

US Federal News,
Thursday, September 29, 2011

TEXT:

WASHINGTON, Sept.29 -- NASA issued the following press release:

New observations by NASA's Wide-field Infrared Survey Explorer, or WISE,

show there are significantly fewer near-Earth asteroids in the mid-size range than previously thought. The findings also indicate NASA has found more than 90 percent of the largest near-Earth asteroids, meeting a goal agreed to with Congress in 1998.

Astronomers now estimate there are roughly 19,500 -- not 35,000 -- mid-size near-Earth asteroids. Scientists say this improved understanding of the population may indicate the hazard to Earth could be somewhat less than previously thought. However, the majority of these mid-size asteroids remain to be discovered. More research also is needed to determine if fewer mid-size objects (between 330 and 3,300-feet wide) also mean fewer potentially hazardous asteroids, those that come closest to Earth.

The results come from the most accurate census to date of near-Earth asteroids, the space rocks that orbit within 120 million miles (195 million kilometers) of the sun into Earth's orbital vicinity. WISE observed infrared light from those in the middle to large-size category. The survey project, called NEOWISE, is the asteroid-hunting portion of the WISE mission. Study results appear in the *Astrophysical Journal*.

"NEOWISE allowed us to take a look at a more representative slice of the near-Earth asteroid numbers and make better estimates about the whole population," said Amy Mainzer, lead author of the new study and principal investigator for the NEOWISE project at NASA's Jet Propulsion Laboratory (JPL) in Pasadena, Calif. "It's like a population census, where you poll a small group of people to draw conclusions about the entire country."

WISE scanned the entire celestial sky twice in infrared light between January 2010 and February 2011, continuously snapping pictures of everything from distant galaxies to near-Earth asteroids and comets. NEOWISE observed more than 100 thousand asteroids in the main belt between Mars and Jupiter, in addition to at least 585 near Earth.

WISE captured a more accurate sample of the asteroid population than previous visible-light surveys because its infrared detectors could see both dark and light objects. It is difficult for visible-light telescopes to see the dim amounts of visible-light reflected by dark asteroids. Infrared-sensing telescopes detect an object's heat, which is dependent on size and not reflective properties.

Though the WISE data reveal only a small decline in the estimated numbers for the largest near-Earth asteroids, which are 3,300 feet (1 kilometer) and larger, they show 93 percent of the estimated population have been found. This fulfills the initial "Spaceguard" goal agreed to with Congress. These large asteroids are about the size of a small mountain and would have global consequences if they were to strike Earth. The new data

revise their total numbers from about 1,000 down to 981, of which 911 already have been found. None of them represents a threat to Earth in the next few centuries. It is believed that all near-Earth asteroids approximately 6 miles (10 kilometers) across, as big as the one thought to have wiped out the dinosaurs, have been found.

"The risk of a really large asteroid impacting the Earth before we could find and warn of it has been substantially reduced," said Tim Spahr, the director of the Minor Planet Center at the Harvard Smithsonian Center for Astrophysics in Cambridge, Mass.

The situation is different for the mid-size asteroids, which could destroy a metropolitan area if they were to impact in the wrong place. The NEOWISE results find a larger decline in the estimated population for these bodies than what was observed for the largest asteroids. So far, the Spaceguard effort has found and is tracking more than 5,200 near-Earth asteroids 330 feet or larger, leaving more than an estimated 15,000 still to discover. In addition, scientists estimate there are more than a million unknown smaller near-Earth asteroids that could cause damage if they were to impact Earth.

"NEOWISE was just the latest asset NASA has used to find Earth's nearest neighbors," said Lindley Johnson, program executive for the Near Earth Object (NEO) Observation Program at NASA Headquarters in Washington. "The results complement ground-based observer efforts over the past 12 years. These observers continue to track these objects and find even more."

WISE is managed and operated by JPL for NASA's Science Mission Directorate in Washington. The principal investigator, Edward Wright, is at the University of California, Los Angeles. The WISE science instrument was built by the Space Dynamics Laboratory in Logan, Utah, and the spacecraft was built by Ball Aerospace and Technologies Corp. in Boulder, Colo. Science operations and data processing occur at the Infrared Processing and Analysis Center at the California Institute of Technology.

For more information about the mission, visit: <http://www.nasa.gov/wise> For any query with respect to this article or any other content requirement, please contact Editor at htsyndication@hindustantimes.com
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DIALOG(R)

NASA SELECTS SCIENCE INVESTIGATIONS FOR CONCEPT STUDIES,

US Federal News,

Thursday, September 29, 2011

TEXT:

WASHINGTON, Sept.29 -- NASA issued the following press release:

NASA has selected 11 science proposals for evaluation as potential future science missions. The proposals outline prospective missions to study the Earth's atmosphere, the sun, the Milky Way galaxy, and Earth-like planets around nearby stars.

The selections were made from responses to Announcements of Opportunity for Explorer Missions and Explorer Missions of Opportunity released by the agency last November. The proposals were judged to have the best science value and feasible development plans.

"NASA continues to seek opportunities to push the cutting edge of science," said Paul Hertz, chief scientist for NASA's Science Mission Directorate, Washington. "Innovative proposals like these will help us better understand our solar system and the universe."

Five Explorer Mission proposals were selected from 22 submitted in February. Each team will receive \$1 million to conduct an 11-month mission concept study. Mission costs are capped at \$200 million each, excluding the launch vehicle. In addition, one Explorer Mission proposal was selected for technology development and will receive \$600,000. Five Mission of Opportunity proposals were selected from 20 submissions. Each will receive \$250,000 to conduct an 11-month implementation concept study. Mission costs are capped at \$55 million each.

Following the detailed mission concept studies, NASA plans to select up to two of the Explorer Mission proposals and one or more of the five Mission of Opportunity proposals in February 2013. The missions would then proceed toward flight and some could launch by 2016.

The selected Explorer Mission proposals are:

* Ionospheric Connection Explorer (ICON) Thomas Immel, Principal Investigator (PI), University of California, Berkeley - The mission would fly instruments to understand the extreme variability in our Earth's ionosphere, which can interfere with communications and geopositioning signals.

* Fast Infrared Exoplanet Spectroscopy Survey Explorer (FINESSE) Mark Swain, PI, Jet Propulsion Laboratory, Pasadena, California - This proposal would use a space telescope to survey more than 200 planets around other stars. This would be the first mission dedicated to finding out what comprises exoplanet atmospheres, what conditions or processes are responsible for their composition, and how our solar system fits into the

larger family of planets.

* Observatory for Heteroscale Magnetosphere-Ionosphere Coupling (OHMIC) James Burch, PI, Southwest Research Institute, San Antonio, Texas - The mission would use a pair of spacecraft flying in formation to study the processes that provide energy to power space weather storms. These storms create auroras and other electromagnetic activity that can impact orbiting spacecraft operations.

* Transiting Exoplanet Survey Satellite (TESS) George Ricker, PI, Massachusetts Institute of Technology, Cambridge, Mass.- Using an array of telescopes, TESS would perform an all-sky survey to discover transiting exoplanets, ranging from Earth-sized to gas giants, in orbit around the nearest and brightest stars in the sky. The mission's primary goal would be to identify terrestrial planets in the habitable zones of nearby stars.

* Atmosphere-Space Transition Region Explorer (ASTRE) Robert Pfaff Jr., PI, NASA's Goddard Space Flight Center, Greenbelt, Md.- The mission would study the interaction between the Earth's atmosphere and the ionized gases of space. By flying excursions deep into the Earth's upper atmosphere, its measurements would improve satellite drag models and show how space-induced currents in electric power grids originate and evolve with time.

The selected Explorer Mission of Opportunity proposals are:

* Global-scale Observations of the Limb and Disk (GOLD) Richard Eastes, PI, University of Central Florida, Orlando - This would involve an imaging instrument that would fly on a commercial communications satellite in geostationary orbit to image the Earth's thermosphere and ionosphere.

* Neutron star Interior Composition ExploreR (NICER) Keith Gendreau, PI, Goddard - This mission would place an X ray timing instrument on the International Space Station (ISS) to explore the exotic states of matter within neutron stars and reveal their interior and surface compositions.

* Coronal Physics Investigator (CPI) John Kohl, PI, Smithsonian Astrophysical Observatory, Cambridge, Mass.- A solar telescope would be mounted on the ISS to investigate the processes that produce the sun's fast and slow solar wind.

* Gal/Xgal U/LDB Spectroscopic/Stratospheric THz Observatory (GUSSTO) Christopher Walker, PI, University of Arizona, Tucson - This mission would launch a high altitude balloon with a one-meter telescope to provide a comprehensive understanding of the inner workings of our Milky Way galaxy and one of our galaxy's companion galaxies, the Large Magellanic Cloud.

* Ion Mass Spectrum Analyzer for SCOPE (IMSA), Lynn Kistler PI, University of New Hampshire, Durham - This partner mission of opportunity would provide a composition instrument to the Japanese cross-Scale Coupling in the Plasma universe (SCOPE) mission. SCOPE will study fundamental space plasma processes including particle acceleration, magnetic reconnection, and plasma turbulence.

The proposal selected for technology development funding is:

* The Exoplanetary Circumstellar Environments and Disk Explorer (EXCEDE), Glenn Schneider, PI, University of Arizona, Tucson - The technology development effort will enable studies of the formation, evolution, and architectures of exoplanetary systems through direct imaging.

The Explorer program is the oldest continuous program at NASA. It is designed to provide frequent, low-cost access to space using PI-led space science investigations relevant to the agency's astrophysics and heliophysics programs. Initiated with the Explorer 1 launch in 1958 that discovered the Earth's radiation belts and including the Cosmic Background Explorer mission that led to Nobel prizes for their investigators, the Explorer program has launched more than 90 missions. It is managed by Goddard for NASA's Science Mission Directorate in Washington.

For more information about the Explorer program, visit:
<http://explorers.gsfc.nasa.gov> For any query with respect to this article or any other content requirement, please contact Editor at htsyndication@hindustantimes.com

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Record - 7

DIALOG(R)

When, where will satellite fall? Most of Earth in strike zone, but danger very slim,

Anonymous; Associated Press,
Journal - Gazette, p4A,
Wednesday, September 21, 2011

TEXT:

CAPE CANAVERAL, Fla. - NASA scientists are doing their best to tell us where a plummeting six-ton satellite will fall this week. It's just that if they're off a little bit, it could mean the difference between hitting Florida or landing on New York. Or, say, Iran or India.

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Not that citizens need to take cover. The satellite will break into pieces, and NASA put the chances that somebody somewhere on Earth will get hurt at 1 in 3,200. But any one person's odds of being struck have been estimated at 1 in 21 trillion.

As far as anyone knows, falling space debris has never injured anyone. Nor has significant property damage been reported. That's because most of the planet is covered in water and there are vast regions of empty land.

If you do come across what you suspect is a satellite piece, NASA doesn't want you to pick it up. The space agency says there are no toxic chemicals present, but there could be sharp edges. Also, it's government property. It's against the law to keep it as a souvenir or sell it on eBay. NASA's advice is to report it to the police.

The 20-year-old research satellite is expected to break into more than 100 pieces as it enters the atmosphere, most of it burning up. Twenty-six of the heaviest metal parts are expected to reach Earth, the biggest chunk weighing about 300 pounds. The debris could be scattered over an area about 500 miles long.

Jonathan McDowell, for one, isn't worried. He is in the potential strike zone - along with most of the world's 7 billion citizens.

"There's stuff that's heavy that falls out of the sky almost every year," said, McDowell, who is with the Harvard-Smithsonian Center for Astrophysics in Cambridge, Mass. So far this year, he noted, two massive Russian rocket stages have taken the plunge.

As for the odds of the satellite hitting someone, "it's a small chance. We take much bigger chances all the time in our lives," McDowell says. "So I'm not putting my tin helmet on or hiding under a rock."

All told, 1,200 pounds of wreckage is expected to smack down - the heaviest pieces made of titanium, stainless steel or beryllium. That represents just one-tenth the mass of the satellite, which stretches 35 feet long and 15 feet in diameter.

The strike zone stretches as far north as Edmonton and Alberta, Canada, and Aberdeen, Scotland, and as far south as Cape Horn, the southernmost tip of South America. So every continent but Antarctica is in the crosshairs.

Experts expect to have a good idea by Thursday of when and where the satellite might fall, Matney says. They won't be able to pinpoint the exact time, but they should be able to narrow it to a few hours.

It probably won't be clear where it fell until afterward, Matney says.

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Record - 8

DIALOG(R)

Researchers from Harvard-Smithsonian Center for Astrophysics Detail Findings in Astronomy Research,

Science Letter, p784,

Tuesday, October 4, 2011

TEXT:

"We present Herschel-Spectral and Photometric Imaging Receiver (SPIRE) Fourier transform spectrometer (FTS) and radio follow-up observations of two Herschel-Astrophysical Terahertz Large Area Survey (H-ATLAS)-detected strongly lensed distant galaxies. In one of the targeted galaxies H-ATLAS J090311.6+003906 (SDP. 81), we detect [O III] 88 μ m and [C II] 158 μ m lines at a signal-to-noise ratio of similar to 5. We do not have any positive line identification in the other fainter target H-ATLAS J091305.0-005343 (SDP. 130). Currently, SDP. 81 is the faintest submillimetre galaxy with positive line detections with the FTS, with continuum flux just below 200 mJy in the 200-600 μ m wavelength range," scientists in Cambridge, Massachusetts report (see also).

"The derived redshift of SDP. 81 from the two detections is $z = 3.043 \pm 0.012$, in agreement with ground-based CO measurements. This is the first detection by Herschel of the [O III] 88 μ m line in a galaxy at redshift higher than 0.05. Comparing the observed lines and line ratios with a grid of photodissociation region (PDR) models with different physical conditions, we derive the PDR cloud density n approximate to 2000 cm^{-3} and the far-ultraviolet ionizing radiation field $G(0)$ approximate to 200 (in units of the Habing field - the local Galactic interstellar radiation field of $1.6 \times 10^{-6} \text{ W m}^{-2}$). Using the CO-derived molecular mass and the PDR properties, we estimate the effective radius of the emitting region to be 500-700 pc. These characteristics are typical for star-forming, high-redshift galaxies. The radio observations indicate that SDP. 81 deviates significantly from the local far-infrared/radio (FIR/radio) correlation, which hints that some fraction of the radio emission is coming from an active galactic nucleus (AGN). The constraints on the source size from millimetre-wave observations put a very conservative upper limit of

the possible AGN contribution to less than 33 per cent," wrote I. Valtchanov and colleagues, Harvard-Smithsonian Center for Astrophysics.

The researchers concluded: "These indications, together with the high [OIII]/FIR ratio and the upper limit of [O I] 63 μ m/[C II] 158 μ m, suggest that some fraction of the ionizing radiation is likely to originate from the AGN."

Valtchanov and colleagues published their study in Monthly Notices of the Royal Astronomical Society (Physical conditions of the interstellar medium of high-redshift, strongly lensed submillimetre galaxies from the Herschel-ATLAS. Monthly Notices of the Royal Astronomical Society, 2011;415(4):3473-3484).

For more information, contact I. Valtchanov, Harvard Smithsonian Center Astrophysics, Cambridge, MA 02138, United States.

Publisher contact information for the journal Monthly Notices of the Royal Astronomical Society is: Wiley-Blackwell, Commerce Place, 350 Main St., Malden 02148, MA, USA.

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Record - 9

DIALOG(R)

Research from Harvard-Smithsonian Center for Astrophysics in the Area of Astronomy Published,

Science Letter, p623,

Tuesday, October 4, 2011

TEXT:

"Young protostars embedded in circumstellar discs accrete from an angular momentum rich mass reservoir. Without some braking mechanism, all stars should be spinning at or near breakup velocity," researchers in Cambridge, Massachusetts report (see also).

"In this paper, we perform simulations of the self-gravitational collapse of an isothermal cloud using the ORION adaptive-mesh refinement code and investigate the role that gravitational torques might play in the spin-down of the dense central object. While magnetic effects likely dominate for low-mass stars, high-mass and Population III stars might be less well magnetized. We find that gravitational torques alone prevent the central object from spinning up to more than half of its breakup velocity, because higher rotation rates lead to bar-like deformations that enable efficient angular momentum transfer to the surrounding medium. We also find that the

long-term spin evolution of the central object is dictated by the properties of the surrounding disc. In particular, spiral modes with the azimuthal wavenumber $m = 2$ couple more effectively to its spin than the lopsided $m = 1$ mode, which was found to inhibit spin evolution," wrote M.K. Lin and colleagues, Harvard-Smithsonian Center for Astrophysics.

The researchers concluded: "We suggest that even in the absence of magnetic fields, gravitational torques may provide an upper limit on stellar spin, and that moderately massive circumstellar discs can cause long-term spin-down."

Lin and colleagues published their study in Monthly Notices of the Royal Astronomical Society (Spin-down of protostars through gravitational torques. Monthly Notices of the Royal Astronomical Society, 2011;416(1):580-590).

For additional information, contact M.K. Lin, Harvard Smithsonian Center Astrophysics, Institute Theory & Computational, Cambridge, MA 02138, United States.

Publisher contact information for the journal Monthly Notices of the Royal Astronomical Society is: Wiley-Blackwell, Commerce Place, 350 Main St., Malden 02148, MA, USA.

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Record - 10

DIALOG(R)

New Astronomy Research Study Findings Recently Were Reported by Researchers at Harvard-Smithsonian Center for Astrophysics,

Science Letter, p227,
Tuesday, October 4, 2011

TEXT:

According to the authors of recent research from Cambridge, Massachusetts, "We report on the detection of an extremely bright (similar to 37 mJy at 1100 μ m and similar to 91 mJy at 880 μ m) submillimetre galaxy (SMG), AzTEC-ASTE-SXDF1100.001 (hereafter referred to as SXDF1100.001 or Orochi), discovered in the 1100 μ m observations of the Subaru/XMM-Newton Deep Field using AzTEC on ASTE. Subsequent CARMA 1300- μ m and SMA 880- μ m observations successfully pinpoint the location of Orochi and suggest that it has two components, one extended [full width at half-maximum (FWHM) of similar to 4 arcsec] and one compact (unresolved)."

"Z-Spec on CSO has also been used to obtain a wide-band spectrum from 190 to 308 GHz, although no significant emission/absorption lines were found. The derived upper limit to the line-to-continuum flux ratio is 0.1-0.3 (2 sigma) across the Z-Spec band. Based on the analysis of the derived spectral energy distribution from optical to radio wavelengths of possible counterparts near the SMA/CARMA peak position, we suggest that Orochi is a lensed, optically dark SMG lying at z similar to 3.4 behind a foreground, optically visible (but red) galaxy at z similar to 1.4. The deduced apparent (i.e., no correction for magnification) infrared luminosity (L-IR) and star formation rate (SFR) are 6×10^{13} L-circle dot and 11 000 M-circle dot yr(-1), respectively, assuming that the L-IR is dominated by star formation," wrote S. Ikarashi and colleagues, Harvard-Smithsonian Center for Astrophysics (see also).

The researchers concluded: "These values suggest that Orochi will consume its gas reservoir within a short time-scale (3×10^7 yr), which is indeed comparable to those in extreme starbursts like the centres of local ultraluminous infrared galaxies (ULIRGs)."

Ikarashi and colleagues published their study in Monthly Notices of the Royal Astronomical Society (Detection of an ultrabright submillimetre galaxy in the Subaru/XMM-Newton Deep Field using AzTEC/ASTE. Monthly Notices of the Royal Astronomical Society, 2011;415(4):3081-3096).

For additional information, contact S. Ikarashi, Harvard Smithsonian Center Astrophysics, Cambridge, MA 02138, United States.
Publisher contact information for the journal Monthly Notices of the Royal Astronomical Society is: Wiley-Blackwell, Commerce Place, 350 Main St., Malden 02148, MA, USA.

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Record - 11

DIALOG(R)

Harvard-Smithsonian Center for Astrophysics Publishes Research in Geophysical Research,
Science Letter, p179,
Tuesday, October 4, 2011

TEXT:

"Self-attraction and loading (SAL) effects caused by changes in mass loads associated with land hydrology, atmospheric pressure, and ocean dynamics produce time-varying, nonuniform spatial patterns in ocean bottom pressure (OBP). Such mass redistribution produced by SAL effects is shown to be an

important component of OBP variability on scales from months to years and to provide for a better description of the OBP annual cycle observed by GRACE (Gravity Recovery and Climate Experiment)," scientists in Cambridge, Massachusetts report (see also).

"The SAL-induced ocean mass variations have magnitudes comparable to the dynamic OBP signals at subannual, annual, and interannual time scales in many ocean regions and should not be ignored in studies of ocean mass. Annual variations account for the most variability in SAL-related mass signals and can be induced by all the loads considered, with hydrology having the largest contribution. At subannual and interannual time scales, impact of hydrology is minimal and variations are mostly related to load changes from ocean dynamics and from changes in atmospheric circulation, depending on ocean region. The results demonstrate that the large-scale SAL effects are not negligible in the analysis of GRACE-derived global observations of OBP," wrote N.T. Vinogradova and colleagues, Harvard-Smithsonian Center for Astrophysics.

The researchers concluded: "The estimated SAL effects can explain on average 0.2 cm(2) (16%) of the variance in the GRACE annual cycle (expressed in terms of equivalent water height), exceeding 1 cm(2) in both open ocean and coastal regions with strong annual SAL signals."

Vinogradova and colleagues published their study in the Journal of Geophysical Research-Oceans (Self-attraction and loading effects on ocean mass redistribution at monthly and longer time scales. Journal of Geophysical Research-Oceans, 2011;116():16-25).

For more information, contact N.T. Vinogradova, Harvard Smithsonian Center Astrophysics, Cambridge, MA 02138, United States.

Publisher contact information for the Journal of Geophysical Research-Oceans is: American Geophysical Union, 2000 Florida Avenue NW, Washington, DC 20009, USA.

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Record - 12

DIALOG(R)

Daybook Thu General,
AP Alert - DC Daybook,
Thursday, September 29, 2011

TEXT:

AP WASHINGTON DAYBOOK, Thursday, Sept. 29

GENERAL

1 p.m. NASA - ASTEROIDS _ NASA holds a news conference to reveal near-Earth asteroid findings and implications for future research. Panelists: Lindley Johnson, NEO program executive, NASA Headquarters, Washington; Amy Mainzer, NEOWISE principal investigator, NASA's Jet Propulsion Laboratory, Pasadena, Calif.; Tim Spahr, director, Minor Planet Center, Smithsonian Astrophysical Observatory, Cambridge, Mass.; Lucy McFadden, scientist, NASA's Goddard Space Flight Center, Greenbelt, Md.

Location: NASA headquarters, 300 E St. SW.

Contacts: Dwayne Brown (dwayne.c.brown@nasa.gov), 202-358-1726
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Record - 13

DIALOG(R)

A century of AAVSO progress: this internationally renowned organization has grown from a handful of amateurs making observations for professional...,

Williams, Thomas R., Saladyga, Michael,
Sky & Telescope, v122, n4, p30(8),
Saturday, October 1, 2011

TEXT:

A century of AAVSO progress: this internationally renowned organization has grown from a handful of amateurs making observations for professional astronomers.

[ILLUSTRATION OMITTED]

[ILLUSTRATION OMITTED]

VARIABLE STARS provide exciting insights about many stages of stellar evolution. Although variables have interested astronomers for more than a century and a half, only recently has the theory of stellar evolution and refined observational technology made clear exactly how important variables are. The centennial of the world's largest association of variable-star

observers is therefore a reason for celebration.

During 2011 the American Association of Variable Star Observers (AAVSO) is marking the centennial of its birth. Filled with exciting discoveries and significant astronomical progress, that century witnessed the AAVSO's growth from a handful of amateurs making observations for professional astronomers to a robust organization with the world's largest archive of variable-star observations and historical light curves. But this achievement only happened because of the tireless efforts of the people who made it possible, the variable-star observers and the AAVSO's staff and elected leaders.

[ILLUSTRATION OMITTED]

A Century Begins

Connecticut lawyer William Tyler Olcott (1873-1936) announced the founding of the AAVSO and reported the association's first variable-star observations in the December 1911 issue of *Popular Astronomy*. Olcott made it clear that he formed the association to gather variable-star observations for astronomers at Harvard College Observatory (HCO) in Cambridge, Massachusetts. He recruited observers intensively, attracting an early membership that included many professional women astronomers from New England colleges as well as other American and international observers.

[ILLUSTRATION OMITTED]

[ILLUSTRATION OMITTED]

After six years of effort, Olcott achieved his goal. The members formalized an association, elected officers, and incorporated. Exhausted by the process, Olcott handed over the leadership reins to others with pleasure and satisfaction. He remained as actively involved as his failing health would allow, but many others took up various tasks that he had handled by himself in the early years.

One of those who helped pick up the slack for Olcott was Leon Campbell (1880-1951). A native of Cambridge, Campbell joined the HCO staff as a night assistant in 1899 after graduating from Cambridge High School. His early success earned him a promotion to full observer, roughly akin to a professional astronomer in those days. From 1911 to 1915, Campbell served as supervisor of HCO's Boyden Station in Arequipa, Peru.

Upon his return to Cambridge in late 1915, Campbell immediately joined the AAVSO and began participating in its affairs. He helped Olcott organize observations for publication and advised members on technical aspects of

observing variables. Campbell quickly became well known and liked by the members of the AAVSO, and he served as a council member after the group incorporated. Since this work wasn't part of his regular HCO duties, Campbell carried out his AAVSO activities at home.

[ILLUSTRATION OMITTED]

In 1925 the AAVSO council recognized Campbell's many years of loyal and dedicated service by formally establishing a new position, AAVSO Recorder, and it elected Campbell to serve. Olcott remained as the corresponding secretary.

Edward Charles Pickering, the director of HCO during the AAVSO's early history, died in 1919. After a three-year search, Harvard University replaced him with a rising young star, Harlow Shapley of Mount Wilson Observatory. Shapley staffed the observatory with younger, highly qualified professional astronomers and rebuilt HCO's aging physical assets.

[ILLUSTRATION OMITTED]

[ILLUSTRATION OMITTED]

As part of a Rockefeller Foundation grant to fund Shapley's modernization program, Harvard received \$100,000 to endow a Pickering Memorial Astronomer. When Harvard awarded the endowed chair to Campbell as its first incumbent, Shapley defined Campbell's role as full-time support to the AAVSO. In return, the AAVSO identified the Pickering Memorial Astronomer as synonymous with the AAVSO Recorder. Thus the tie between the AAVSO and HCO was formalized for the first time in 1931.

The 1930s and '40s were exciting times for astronomy despite the economic depression and World War II. Variable-star astronomy at HCO expanded significantly as Cecilia Payne-Gaposchkin and others studied variability in pulsating stars and eclipsing binaries while Campbell and the AAVSO concentrated on the long-period variables. These decades also witnessed astronomers making progress in understanding the mechanisms behind stellar variation.

When Campbell retired in late 1949, Shapley nominated Margaret Walton Mayall (1902-95) as the next Pickering Memorial Astronomer and AAVSO Recorder. Mayall had worked at HCO since the mid-1920s as Annie Jump Cannon's assistant, classifying stellar spectra for the Henry Draper Catalogue. With a degree in astronomy from Radcliffe College, Mayall immediately started broadening the AAVSO's effort, adding entire classes of variable stars to its observing programs. Eclipsing binaries were the first addition at the suggestion of Joseph Ashbrook of Yale University. Mayall's

success initiating this program depended not only on observers in the United States, but also several in Sweden and Greece.

[ILLUSTRATION OMITTED]

A Change of Plans

Unfortunately, Mayall's freedom to reinvent the AAVSO's observing program ended suddenly. Harvard University had other plans for the observatory that were at cross-purposes with those of Mayall and the AAVSO. Progress at the observatory during Shapley's tenure peaked before World War II, but during and after the war the program deteriorated. When Shapley stepped down as HCO director in September 1952, Harvard appointed solar astronomer Donald H. Menzel as chairman of the Observatory Council, and the interim director of HCO.

Menzel was tasked with reducing expenses and reinvigorating the HCO program. His lengthy list of cost reduction and efficiency improvements included severing HCO's long-standing relationship with the AAVSO. In October 1952, he advised Mayall that the association was likely to lose its financial support and that she should begin planning to vacate the office space at the observatory.

At first Mayall resisted the eviction, but eventually she had to look for alternate arrangements with the help of AAVSO Secretary Clinton B. Ford and the council. In January 1954 the association moved to a tiny office on Brattle Street near Harvard Square in Cambridge. Tirelessly working extraordinarily long hours (even without a salary for at least the first year), Mayall saved the AAVSO from extinction. In 1956 the council changed Mayall's title to AAVSO Director in recognition of her dedication. Aided by financial support and advice from Ford and other members of the council, Mayall kept observers motivated, and the total observations recorded each year after the eviction continued to rise.

When survival was assured as the association found its financial footing, Mayall moved in July 1965 to larger office space on Concord Avenue only a short distance from HCO. Once settled, Mayall began recording observations on IBM punch cards. The observing program was also expanded, adding Cepheid variables, RV Tauri stars, and various eruptive and cataclysmic variables.

[ILLUSTRATION OMITTED]

Perhaps the most exciting new study in this era was initiated by AAVSO members Thomas Cragg and Larry Bornhurst at Ford Observatory in California. After astronomers accumulated evidence that the typical cataclysmic variable was part of a binary system, Cragg and Bornhurst followed U Geminorum intensively at minimum light, looking for eclipses during the

star's quiescent periods. They found changes that likely reflected events of astrophysical significance (see "50 & 25 Years Ago," page 10).

[ILLUSTRATION OMITTED]

Other AAVSO members with large telescopes began undertaking similar studies, cooperating with professional astronomers who eagerly sought their help. Leslie Peltier, at Delphos, Ohio, and a few other AAVSO observers, joined this effort, which helped support profound changes in the theoretical models for cataclysmic variables. The program expanded as fast as Clinton Ford and Charles Scovil at the AAVSO could make new charts for additional stars.

In 1971 Mayall announced her desire to retire, presenting the council with the unfamiliar problem of selecting a new director, since Mayall had started out as Shapley's choice as HCO's Pickering Memorial Astronomer. Furthermore, while Mayall had guided the AAVSO through difficult years, by the time she retired the association was a thriving independent entity.

[GRAPHIC OMITTED]

After considering many candidates, the council hired Janet Akyuz Mattei (1943-2004), who held a degree in physics from Ege University in Turkey, and another in astronomy from the University of Virginia. She had also gained much variable-star experience during a six-month stint at Maria Mitchell Observatory on Nantucket Island working with the observatory's director, Dorrit Hoffleit.

Mattei took the helm following the AAVSO's annual meeting in 1973 and immediately began dealing with issues involving the observing program and data processing. With the help of Owen Gingerich, Barbara Welther, and others at the Harvard-Smithsonian Center for Astrophysics, Mattei began converting observations on punch cards into light curves. The council also authorized hiring data-entry operators who were devoted full time to transferring observations dating back to 1902 to punch cards.

The publication of Scovil's *The AAVSO Variable Star Atlas* in 1980 generated considerable interest and drew in new members. The same was true for new observing programs that emphasized monitoring eruptive and cataclysmic variables. The AAVSO program that began with the Cragg and Bornhurst observations of these stars, and the AAVSO's historical light curves for a number of them, attracted the attention of professional astronomers. This led to requests for more monitoring of cataclysmic stars, as well as other variables, in support of orbiting observatories then being launched. The AAVSO was soon providing formal alerts to professional astronomers and those in charge of NASA's satellite observatories.

[ILLUSTRATION OMITTED]

One early breakthrough involved the organization's commitment for intensive visual monitoring of U Geminorum and SS Cygni during the late 1970s flight of the X-ray satellite HEAO-1. Astrophysicists were astonished at the correlations between the visual light curves of these stars and the unexpected onset of emissions of both hard and soft X-rays. The results led to significant changes in the theoretical models for this class of variable.

As the AAVSO staff expanded and the Concord Avenue headquarters filled up with punch cards, relocation became necessary. With generous support from Ford, the AAVSO acquired its own building at 25 Birch Street in Cambridge, next door to S&T's offices. The new headquarters were dedicated during the celebration of the association's 75th anniversary in August 1986.

Distinguished X-ray astronomer Riccardo Giacconi graced the occasion with an address that pointed to new directions for the AAVSO while celebrating its past accomplishments.

A New Era

The association continued to grow in membership, active observers, and especially the number of observations submitted each year. In the three decades after being evicted from HCO, annual observing totals doubled twice, rising from about 55,000 to more than 200,000 observations per year. In recent years, these annual totals have grown at an even faster rate as more members began observing with photoelectric photometers, and later with CCDs.

The association's educational program was broadened with the introduction of the Hands-On-Astrophysics curriculum codirected by Mattei and Canadian astronomer John R. Percy. It helped interest teachers from around the nation in variable-star astronomy. The association's international participation also grew, especially with the help of meetings held in Brussels, Belgium, in 1990 and Sion, Switzerland, in 1996.

Collaboration with professional astronomers continued to rise. NASA astronomers encouraged AAVSO observers by sponsoring several joint High Energy Astrophysics Workshops with the association, and joint meetings with the American Astronomical Society also emphasized professional astronomers' growing appreciation of the AAVSO. The High Energy Astrophysics Workshops led to a very successful cooperative program to search for the afterglows of gamma-ray bursts.

[ILLUSTRATION OMITTED]

[ILLUSTRATION OMITTED]

[ILLUSTRATION OMITTED]

One of the crowning achievements of the Mattei era came in early 2004 when she announced that the entire database of observations, from 1911 to the current period, was fully digitized. Light curves could now be generated that revealed the scientific treasure these historical observing records had always represented.

Tragically, Mattei was diagnosed with acute myelogenous leukemia shortly after the AAVSO's third International Meeting and High Energy Workshop in 2003, and she died the following year. Elizabeth O. Waagen, the senior member of the staff, served as the AAVSO's interim director while the council searched for a replacement.

In 2005 the council chose Arne Henden, a professional astronomer at the U. S. Naval Observatory in Flagstaff, Arizona, as Mattei's successor. An expert photometrist, Henden brought a new level of sophistication to the AAVSO's observing programs, encouraging rapid growth in the number and quality of observations added annually to the AAVSO's database.

Members of the association volunteered to work with the staff to upgrade the AAVSO's computer software. They created a sophisticated system of programs that receive, validate, and store observations submitted via the internet. There are also new programs for creating and printing variable-star charts on demand, and generating customized light curves. More than 20 million observations are presently stored in the database. It has every known or suspected variable star, including thousands of new variables discovered during ESA's Hipparcos spacecraft mission and other all-sky surveys. Arguably, the AAVSO International Database (AID) is the most comprehensive catalog of variable stars now in existence. Effort is underway to add observations of important 19th- and early 20th-century observers to the AID. For example, South African Alexander William Roberts recorded most of his variable-star observations before the founding of the AAVSO. Volunteers in South Africa have recently reduced more than 70,000 of Roberts's observations, and they are now included in the AID.

Henden's energetic style created the opportunity for a move to much more spacious quarters literally next door to the Birch Street office. Under his leadership, the association purchased one of the office buildings on Bay State Road that had served as S&T's some for half a century. Henden, his wife Linda, and the AAVSO staff worked tirelessly to refurbish the new headquarters. Thus, as it did with the 75th anniversary, the AAVSO will celebrate its centennial anniversary in a new location.

[ILLUSTRATION OMITTED]

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As a new century of variable-star observing begins, William Tyler Olcott's dream of a small band of observers in service to Harvard College Observatory has succeeded beyond his wildest dreams. AAVSO now encompasses a large international group of sophisticated observers in service to astrophysics. And as Henden explains on page 86, the next century will certainly be an exciting one. ?

Thomas R. Williams has served as AAVSO President and is currently its historian. Michael Saladyga is the organization's Technical Assistant and Archivist. Cambridge University Press has just published their centennial history of the AAVSO titled, *Advancing Variable Star Astronomy*.

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Record - 14

DIALOG(R)

NATIONAL AIR AND SPACE MUSEUM ANNOUNCES 'SMITHSONIAN'S STARS',

US Federal News,

Monday, September 26, 2011

TEXT:

WASHINGTON, Sept.26 -- The Smithsonian Institution's National Air and Space Museum issued the following press release:

The Smithsonian's National Air and Space Museum, in partnership with the Smithsonian Astrophysical Observatory and the National Museum of Natural History, will host a new annual series of 10 lectures by Smithsonian researchers who are exploring the sun, the moon, planets, stars, galaxies and the universe. The "Smithsonian's Stars" free public lectures will take place Saturday evenings, October through February 2012 and will present research projects conducted by scientists, historians and educators at the Institution.

Each free program will include a live planetarium program delivered in part by Smithsonian experts in the museum's Albert Einstein Planetarium. Accompanying the planetarium program will be relevant hands-on educational activities and-weather permitting-sky observing in the museum's

public observatory. The Smithsonian's Stars Lecture Series is made possible by a grant from NASA.

SCHEDULED PROGRAMS

Oct.8: "The Changing Face of the Moon: Exploring the Ancient History of Giant Impacts and Volcanism" Gareth Morgan, National Air and Space Museum's Center for Earth and Planetary Studies

Oct.22: "How to Learn a Star's True Age" Soren Meibom, Smithsonian Astrophysical Observatory

Nov.5: "Close-up Views of an Active Mars" Patrick Russell, National Air and Space Museum's Center for Earth and Planetary Studies

Nov.19: "Selecting the Landing Site for the Mars Science Laboratory" John Grant, National Air and Space Museum's Center for Earth and Planetary Studies

Dec.3: "Love, Fear and Greed: Why We Should Go to the Asteroids" Martin Elvis, Smithsonian Astrophysical Observatory

Dec.17: "Antarctic Meteorites: Collection, Classification, Curation and Investigation" Cari Corrigan, National Museum of Natural History

Jan.14: "Crashing Galaxies: New Insights into Our Future" Lauranne Lanz, Smithsonian Astrophysical Observatory

Jan.28: "Sand Dunes throughout the Solar System" Jim Zimbelman, National Air and Space Museum's Center for Earth and Planetary Studies

Feb.11: "Highlights from NASA's Chandra X-ray Observatory" Harvey Tananbaum, Smithsonian Astrophysical Observatory

Feb.25: "Revealing Mercury's Secrets with the MESSENGER Spacecraft" Maria Banks, National Air and Space Museum's Center for Earth and Planetary Studies

For more information on each lecture and to request free tickets, visit: <http://www.nasm.si.edu/events/lectures/stars/index.cfm>. For any query with respect to this article or any other content requirement, please contact Editor at htsyndication@hindustantimes.com

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Record - 15

DIALOG(R)

PRESIDENT BARACK OBAMA RECOGNIZES OUTSTANDING SCIENTISTS AT THE SMITHSONIAN,

US Federal News,

Tuesday, September 27, 2011

TEXT:

WASHINGTON, Sept.27 -- The Smithsonian Institution issued the following press release:

Two scientists at the Smithsonian Institution have been honored with the Presidential Early Career Award for Scientists and Engineers for their innovative research and scientific leadership. It is the highest honor bestowed by the U.S. government on science and engineering professionals in the early stages of their independent research careers. The awards were announced Monday, Sept.26.

Justin Kasper, an astrophysicist at the Smithsonian Astrophysical Observatory in Cambridge, Mass., was recognized for his work with Solar Probe Plus-the first mission to the sun, scheduled for 2018. Kasper's creation, SWEAP (Solar Wind Electrons Alphas and Protons) is one of the four instrument packages that will be on the spacecraft; it will help scientists learn how the sun's corona, or atmosphere, is heated and how the solar wind is accelerated to supersonic speeds.

"By flying a spacecraft through the upper atmosphere of the sun we will expose the fundamental physics responsible for the million-degree corona and help understand and forecast space weather," said Kasper. "I am honored to have received this recognition and encouragement to pursue the mysteries of our sun."

Pierre Comizzoli, a reproductive physiologist at the Smithsonian Conservation Biology Institute, received the award through a nomination from the National Institutes of Health. It is for his contributions to the field of fertility preservation to save endangered species while generating knowledge that also has relevance to improving human reproductive health. Comizzoli is exploring innovative approaches for drying and using only the DNA of egg cells rather than the far more complex and expensive approach of freezing the entire ovum. This could have enormous efficient and low-cost reproduction applications for many species, including humans.

"I am highly honored to receive this Presidential award," said Comizzoli. "It is a huge recognition for comparative medicine and the development of cutting-edge approaches for preserving and extending the

fertility in animals and humans." For any query with respect to this article or any other content requirement, please contact Editor at htsyndication@hindustantimes.com

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Record - 16

DIALOG(R)

Satellite likely in ocean, but might have hit U.S.,

Kelli Kennedy and Seth Borenstein, Associated Press,
St. Paul Pioneer Press (MN), St. Paul ed, pA2,
Sunday, September 25, 2011

TEXT:

WASHINGTON - It's as big as a bus and weighs 6 tons, but officials probably will never be able to pinpoint exactly where a massive NASA satellite plummeted to Earth.

NASA space-junk scientists believe that all -- or nearly all -- of the parts of their 20-year-old dead satellite safely plunged into the Pacific Ocean, likely missing land. But if their estimates are off, by only five minutes or so, fiery pieces could have fallen on parts of northwestern North America.

No injuries or damage have been reported on land, which NASA officials said was a good indication the satellite went into the ocean.

That doesn't necessarily mean it all fell into the sea. Some debris could have fallen over areas such as Portland, Ore.; Seattle; Calgary, Alberta; and Saskatoon, Saskatchewan, said Jonathan McDowell of the Harvard-Smithsonian Center for Astrophysics.

"Pieces are falling off of this flaming fire ball, and some of it has enough momentum to go hundreds of miles," he said.

Speculation was rampant on Twitter and elsewhere. There were no credible reports of debris on the ground, said Nick Johnson, NASA's chief scientist for orbital debris. But if the satellite fell even five minutes later than estimated, some of it could have hit land, he said.

"We don't know where the re-entry point exactly was. We don't exactly know where the debris field is," Johnson said.

NASA's earlier calculations had predicted that the former climate-research satellite would fall over a 500-mile swath and could include land. Officials said the 35-foot satellite fell sometime between 10:23 p.m. CDT

Friday and 12:09 a.m. CDT Saturday.

Speculation focused on unconfirmed reports and even video of debris from the Upper Atmosphere Research Satellite over Alberta, Canada. NASA spokesman Steve Cole said that was possible because the last track for the satellite included Canada, starting north of Seattle and then in a large arc north then south. From there, the track continued through the Atlantic south toward Africa, but it was unlikely the satellite got that far if it started falling over the Pacific.

Some 26 pieces of the satellite representing 1,200 pounds of heavy metal had been expected to rain down somewhere. The biggest surviving chunk should be no more than 300 pounds.

NASA urges anyone who thinks they've found satellite debris to call police. It's government property and illegal to keep it or try to sell it. The debris has no toxic contamination, but there could be sharp edges, NASA officials have said.

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Record - 17

DIALOG(R)

Satellite down in the Pacific,

Post Wire Services,

New York Post, p003,

Sunday, September 25, 2011

TEXT:

All " or nearly all " of a six-ton satellite plunged into the Pacific Ocean, NASA officials said yesterday. Even though it was as big as a bus, NASA says it can't be sure if bits of the satellite hit land. Some debris could have fallen over areas such as Portland, Ore., Seattle, Calgary, Alberta, and Saskatoon, Saskatchewan, said Jonathan McDowell of the Harvard-Smithsonian Center for Astrophysics.

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Record - 18

DIALOG(R)

UI researcher among Presidential award recipients,

Michael Chevy Castranova,

Gazette, The (Cedar Rapids, IA),
Monday, September 26, 2011

TEXT:

Sept. 26--Gregory G. Howes of the University of Iowa was among 94 researchers named by President Obama today as recipients of the Presidential Early Career Awards for Scientists and Engineers, the highest honor bestowed by the U.S. government on science and engineering professionals in the early stages of their independent research careers.

The Presidential early career awards embody the high priority the Obama Administration places on producing outstanding scientists and engineers to advance the Nation's goals, tackle grand challenges, and contribute to the American economy.

Sixteen Federal departments and agencies join together annually to nominate the most meritorious scientists and engineers whose early accomplishments show the greatest promise for assuring America's preeminence in science and engineering and contributing to the awarding agencies' missions.

"It is inspiring to see the innovative work being done by these scientists and engineers as they ramp up their careers--careers that I know will be not only personally rewarding but also invaluable to the Nation," President Obama said.

"That so many of them are also devoting time to mentoring and other forms of community service speaks volumes about their potential for leadership, not only as scientists but as model citizens."

The awards, established by President Clinton in 1996, are coordinated by the Office of Science and Technology Policy within the Executive Office of the President.

Awardees are selected for their pursuit of innovative research at the frontiers of science and technology and their commitment to community service as demonstrated through scientific leadership, public education, or community outreach.

This year's recipients are:

Department of Agriculture
Dr. Laura L. Bellows, Colorado State University

Dr. Jonathan G. Lundgren, Agricultural Research Service

Dr. Samuel L. Zelinka, U.S. Forest Service

Department of Commerce

Dr. Jeffrey A. Fagan, National Institute of Standards and Technology

Dr. James A. Morris, Jr., National Oceanic and Atmospheric Administration

Dr. Erin M. Oleson, National Oceanic and Atmospheric Administration

Dr. David E. Richardson, National Oceanic and Atmospheric Administration

Dr. Kartik A. Srinivasan, National Institute of Standards and Technology

Dr. Jacob M. Taylor, National Institute of Standards and Technology

Department of Defense

Dr. Michael S. Arnold, University of Wisconsin at Madison

Dr. Jeffrey W. Book, Naval Research Laboratory

Dr. Tad T. Brunye, U.S. Army Natick Soldier Research, Development and Engineering Center

Dr. Dirk R. Englund, Columbia University

Dr. Ali Khademhosseini, Harvard Medical School and Brigham and Women's Hospital

Dr. Reuben H. Kraft, U.S. Army Research Laboratory

Dr. Tonghun Lee, Michigan State University

Dr. Anne J. McNeil, University of Michigan

Dr. Aydogan Ozcan, University of California, Los Angeles

Dr. Tomas A. Palacios, Massachusetts Institute of Technology

Dr. Sumita Pennathur, University of California, Santa Barbara

Dr. Kyle M. Shen, Cornell University

Dr. Amit Singer, Princeton University

Dr. Stephen M. Spottswood, U.S. Air Force Research Laboratory

Dr. Joseph M. Teran, University of California, Los Angeles

Dr. Lan Yang, Washington University in St. Louis

Department of Education

Dr. Roy Levy, Arizona State University

Department of Energy

Dr. Christian W. Bauer, Lawrence Berkeley National Laboratory

Dr. Greg Bronevetsky, Lawrence Livermore National Laboratory

Dr. Fotini Katopodes Chow, University of California, Berkeley

Dr. Carole Dabney-Smith, Miami University

Dr. David Erickson, Cornell University

Dr. Daniel C. Fredrickson, University of Wisconsin--Madison

Dr. Christiane Jablonowski, University of Michigan

Dr. Gang Logan Liu, University of Illinois at Urbana-Champaign

Dr. Alysia D. Marino, University of Colorado at Boulder

Dr. Victoria J. Orphan, California Institute of Technology

Dr. Wei-Jun Qian, Pacific Northwest National Laboratory

Dr. Evgenya I. Simakov, Los Alamos National Laboratory

Dr. Feng Wang, University of California, Berkeley

Department of Health and Human Services

Dr. Rommie E. Amaro, University of California, Irvine

Dr. Sonja M. Best, National Institute of Allergy and Infectious Diseases

Dr. David T. Breault, Children's Hospital Boston

Dr. John S. Brownstein, Children's Hospital Boston

Dr. Brian S. Caffo, Johns Hopkins University

Dr. Nicola J. Camp, University of Utah

Dr. Pierre R. Comizzoli, Smithsonian Institution

Dr. Chyke A. Doubeni, University of Massachusetts Medical School

Dr. Jose C. Florez, Massachusetts General Hospital and the Broad Institute

Dr. James L. Gulley, National Cancer Institute

Dr. W. Nicholas Haining, Harvard Medical School

Dr. Thomas L. Kash, University of North Carolina School of Medicine

Dr. John C. March, Cornell University

Dr. Katherine L. O'Brien, Johns Hopkins Bloomberg School of Public Health

Dr. Carla M. Pugh, Northwestern University Feinberg School of Medicine

Dr. Jamie L. Renbarger, Indiana University

Dr. Sara L. Sawyer, University of Texas at Austin

Dr. Hari Shroff, National Institute of Biomedical Imaging and
Bioengineering

Dr. Mary Jo Trepka, Florida International University

Dr. Linda E. Wilbrecht, University of California at San Francisco

Department of the Interior

Dr. Sasha C. Reed, U.S. Geological Survey

Dr. David R. Shelly, U.S. Geological Survey

Department of Transportation

Dr. Kristin C. Lewis, Volpe National Transportation Systems Center

Department of Veterans Affairs

Dr. Tanya Z. Fischer, Veterans Health Administration

Dr. Christine M. Freeman, Veterans Health Administration

Dr. B. Price Kerfoot, Veterans Health Administration and Harvard Medical
School

Dr. Kristina M. Utzschneider, Veterans Health Administration and University of Washington

Environmental Protection Agency

Dr. Gayle S.W. Hagler, National Risk Management Research Laboratory

Dr. David M. Reif, National Center for Computational Toxicology

National Aeronautics and Space Administration

Dr. Jonathan W. Cirtain, Marshall Space Flight Center

Dr. Ian M. Howat, The Ohio State University

Dr. Gregory G. Howes, University of Iowa

Dr. Benjamin A. Mazin, University of California, Santa Barbara
National Science Foundation

Dr. Katherine E. Aidala, Mount Holyoke College

Dr. Hatice Altug, Boston University

Dr. Amir S. Avestimehr, Cornell University

Dr. Joshua C. Bongard, University of Vermont

Dr. David J. Brumley, Carnegie Mellon University

Dr. Elizabeth S. Cochran, U.S. Geological Survey

Dr. Noah J. Cowan, Johns Hopkins University

Dr. Xiangfeng Duan, University of California, Los Angeles

Dr. Michael J. Escuti, North Carolina State University

Dr. Demetra C. Evangelou, Purdue University

Dr. Benjamin A. Garcia, Princeton University

Dr. Tina A. Grotzer, Harvard Graduate School of Education

Dr. Lasse Jensen, Pennsylvania State University

Dr. Benjamin Kerr, University of Washington

Dr. Benjamin L. Lev, Stanford University

Dr. Elena G. Litchman, Michigan State University

Dr. Yasamin C. Mostofi, University of New Mexico

Dr. Lilianne R. Mujica-Parodi, State University of New York at Stony Brook

Dr. Andre D. Taylor, Yale University

Dr. Claudia R. Vaggia, University of Pennsylvania

Dr. Maria G. Westdickenberg, Georgia Institute of Technology

Smithsonian Institution

Dr. Justin C. Kasper, Smithsonian Astrophysical Observatory

For any questions, please contact:

Rick Weiss

Office of Science and Technology Policy

Executive Office of the President

202-456-6037

rweiss@ostp.eop.gov

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Record - 19

DIALOG(R)

NASA TO HOST NEWS CONFERENCE ON ASTEROID SEARCH FINDINGS,

US Federal News,
Monday, September 26, 2011

TEXT:

WASHINGTON, Sept.26 -- NASA issued the following media advisory:

NASA will hold a news conference at 1 p.m.EDT on Thurs., Sept.29, to reveal near-Earth asteroid findings and implications for future research. The briefing will take place in the NASA Headquarters James E. Webb Auditorium, located at 300 E St. SW in Washington.

NASA's Wide-field Infrared Survey Explorer (WISE) mission, launched in December 2009, captured millions of images of galaxies and objects in space. During the news conference, panelists will discuss results from an enhancement of WISE called Near-Earth Object WISE (NEOWISE) that hunted for asteroids.

The panelists are:

* Lindley Johnson, NEO program executive, NASA Headquarters, Washington

* Amy Mainzer, NEOWISE principal investigator, NASA's Jet Propulsion Laboratory, Pasadena, Calif.

* Tim Spahr, director, Minor Planet Center, Smithsonian Astrophysical Observatory, Cambridge, Mass.

* Lucy McFadden, scientist, NASA's Goddard Space Flight Center, Greenbelt, Md.

Reporters unable to attend may ask questions from participating NASA centers or by telephone. To participate by phone, reporters must contact Dwayne Brown at 202-358-1726 or dwayne.c.brown@nasa.gov by 10 a.m. EDT on Sept. 29.

The event will air live on NASA Television and the agency's website. For NASA TV streaming video, downlink and scheduling information, visit: <http://www.nasa.gov/ntv>

The briefing also will be streamed live, with a chat available, at: <http://www.ustream.tv/nasajpl2>

For more information about the mission, visit: <http://www.nasa.gov/wise> For any query with respect to this article or any other content requirement, please contact Editor at htsyndication@hindustantimes.com

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Record - 20

DIALOG(R)

Northwest appears to dodge a satellite,

Seth Borenstein and Kelli Kennedy,
The Associated Press,
Seattle Times (WA), Fourth ed, pA2,
Sunday, September 25, 2011

TEXT:

WASHINGTON - NASA scientists believe that all - or nearly all - of the parts of their 20-year-old, 6-ton dead satellite safely plunged into the Pacific Ocean, likely missing land.

But if their estimates are off, by only 5 minutes or so, fiery pieces could have fallen on parts of northwestern North America.

No injuries or damage have been reported on land, which NASA officials said was a good indication the satellite went into the ocean.

That doesn't necessarily mean it all fell into the sea. Some debris could have fallen over areas such as Portland, Seattle, Calgary or Saskatoon, Saskatchewan, said Jonathan McDowell of the Harvard-Smithsonian Center for Astrophysics.

Speculation was rampant on the Internet. There were no credible reports of debris on the ground, said Nick Johnson, NASA's chief scientist for orbital debris. But if the satellite fell even 5 minutes later than estimated, some of it could have hit land, he said.

"We don't know where the re-entry point exactly was. We don't exactly know where the debris field is," Johnson said.

NASA's earlier calculations had predicted that the former climate-research satellite would fall over a 500-mile swath and could include land. Officials said the 35-foot satellite fell sometime between 8:23 and 10:09 p.m. Friday.

Much of the speculation focused on unconfirmed reports and even video of debris from the Upper Atmosphere Research Satellite (UARS) over Alberta, Canada.

NASA spokesman Steve Cole said that was possible because the last track for the satellite included Canada, starting north of Seattle and then in a

large arc north then south.

NASA urges anyone who thinks they've found satellite debris to call police. It's government property and illegal to keep it or try to sell it. The debris has no toxic contamination, but there could be sharp edges, NASA officials have said.

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Record - 21

DIALOG(R)

SATELLITE HITS – SOMEWHERE,

Seth Borenstein and Kelli Kennedy, Associated Press,
San Jose Mercury News (CA), Valley Final ed, p6A,
Sunday, September 25, 2011

TEXT:

WASHINGTON -- It's as big as a bus and weighs 6 tons, but officials probably will never be able to pinpoint exactly where a massive NASA satellite plummeted to Earth.

NASA space junk scientists believe that all -- or nearly all -- of the parts of their 20-year-old dead satellite safely plunged into the Pacific Ocean, likely missing land. But if their estimates are off, by only five minutes or so, fiery pieces could have fallen on parts of northwestern North America.

No injuries or damage have been reported on land, which NASA officials said was a good indication the satellite went into the ocean.

That doesn't necessarily mean it all fell into the sea. Some debris could have fallen over areas such as Portland, Ore.; Seattle; Calgary, Alberta; and Saskatoon, Saskatchewan, said Jonathan McDowell of the Harvard-Smithsonian Center for Astrophysics.

"Pieces are falling off of this flaming fire ball, and some of it has enough momentum to go hundreds of miles," he said.

Speculation was rampant on sites such as Twitter. There were no credible reports of debris on the ground, said Nick Johnson, NASA's chief scientist for orbital debris. But if the satellite fell even five minutes later than estimated, some of it could have hit land, he said.

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Much of the speculation focused on unconfirmed reports and even video of debris from the Upper Atmosphere Research Satellite over Alberta, Canada. NASA spokesman Steve Cole said that was possible because the last track for the satellite included Canada, starting north of Seattle and then in a large arc north then south. From there, the track continued through the Atlantic south toward Africa, but it was unlikely the satellite got that far if it started falling over the Pacific.

Some 26 pieces of the satellite representing 1,200 pounds of heavy metal had been expected to rain down somewhere. The biggest surviving chunk should be no more than 300 pounds.

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Record - 22

DIALOG(R)

PRESIDENT OBAMA HONORS OUTSTANDING EARLY-CAREER SCIENTISTS,
US Federal News,
Monday, September 26, 2011

TEXT:

WASHINGTON, Sept.26 -- The White House released the following press release:

President Obama today named 94 researchers as recipients of the Presidential Early Career Awards for Scientists and Engineers, the highest honor bestowed by the United States government on science and engineering professionals in the early stages of their independent research careers.

The Presidential early career awards embody the high priority the Obama Administration places on producing outstanding scientists and engineers to advance the Nation's goals, tackle grand challenges, and contribute to the American economy. Sixteen Federal departments and agencies join together annually to nominate the most meritorious scientists and engineers whose early accomplishments show the greatest promise for assuring America's preeminence in science and engineering and contributing to the awarding agencies' missions.

"It is inspiring to see the innovative work being done by these scientists

and engineers as they ramp up their careers-careers that I know will be not only personally rewarding but also invaluable to the Nation," President Obama said."That so many of them are also devoting time to mentoring and other forms of community service speaks volumes about their potential for leadership, not only as scientists but as model citizens."

The awards, established by President Clinton in 1996, are coordinated by the Office of Science and Technology Policy within the Executive Office of the President. Awardees are selected for their pursuit of innovative research at the frontiers of science and technology and their commitment to community service as demonstrated through scientific leadership, public education, or community outreach.

This year's recipients are:

DEPARTMENT OF AGRICULTURE

Dr. Laura L. Bellows, Colorado State University

Dr. Jonathan G. Lundgren, Agricultural Research Service

Dr. Samuel L. Zelinka, U.S. Forest Service

DEPARTMENT OF COMMERCE

Dr. Jeffrey A. Fagan, National Institute of Standards and Technology

Dr. James A. Morris, Jr., National Oceanic and Atmospheric Administration

Dr. Erin M. Oleson, National Oceanic and Atmospheric Administration

Dr. David E. Richardson, National Oceanic and Atmospheric Administration

Dr. Kartik A. Srinivasan, National Institute of Standards and Technology

Dr. Jacob M. Taylor, National Institute of Standards and Technology

DEPARTMENT OF DEFENSE

Dr. Michael S. Arnold, University of Wisconsin at Madison

Dr. Jeffrey W. Book, Naval Research Laboratory

Dr. Tad T. Brunye, U.S. Army Natick Soldier Research, Development and Engineering Center

Dr. Dirk R. Englund, Columbia University

Dr.Ali Khademhosseini, Harvard Medical School and Brigham and Women's Hospital

Dr.Reuben H.Kraft, U.S.Army Research Laboratory

Dr.Tonghun Lee, Michigan State University

Dr.Anne J.McNeil, University of Michigan

Dr.Aydogan Ozcan, University of California, Los Angeles

Dr.Tomas A.Palacios, Massachusetts Institute of Technology

Dr.Sumita Pennathur, University of California, Santa Barbara

Dr.Kyle M.Shen, Cornell University

Dr.Amit Singer, Princeton University

Dr.Stephen M.Spottswood, U.S.Air Force Research Laboratory

Dr.Joseph M.Teran, University of California, Los Angeles

Dr.Lan Yang, Washington University in St.Louis

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Dr.Greg Bronevetsky, Lawrence Livermore National Laboratory

Dr.Fotini Katopodes Chow, University of California, Berkeley

Dr.Carole Dabney-Smith, Miami University

Dr.David Erickson, Cornell University

Dr.Daniel C.Fredrickson, University of Wisconsin-Madison

Dr.Christiane Jablonowski, University of Michigan

Dr.Gang Logan Liu, University of Illinois at Urbana-Champaign

Dr.Alysia D.Marino, University of Colorado at Boulder

Dr.Victoria J.Orphan, California Institute of Technology

Dr.Wei-Jun Qian, Pacific Northwest National Laboratory

Dr.Evgenya I.Simakov, Los Alamos National Laboratory

Dr.Feng Wang, University of California, Berkeley

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Dr.Sonja M.Best, National Institute of Allergy and Infectious Diseases

Dr.David T.Breault, Children's Hospital Boston

Dr.John S.Brownstein, Children's Hospital Boston

Dr.Brian S.Caffo, Johns Hopkins University

Dr.Nicola J.Camp, University of Utah

Dr.Pierre R.Comizzoli, Smithsonian Institution

Dr.Chyke A.Doubeni, University of Massachusetts Medical School

Dr.Jose C.Florez, Massachusetts General Hospital and the Broad Institute

Dr.James L.Gulley, National Cancer Institute

Dr.W.Nicholas Haining, Harvard Medical School

Dr.Thomas L.Kash, University of North Carolina School of Medicine

Dr.John C.March, Cornell University

Dr.Katherine L.O'Brien, Johns Hopkins Bloomberg School of Public Health

Dr.Carla M.Pugh, Northwestern University Feinberg School of Medicine

Dr.Jamie L.Renbarger, Indiana University

Dr.Sara L.Sawyer, University of Texas at Austin

Dr.Hari Shroff, National Institute of Biomedical Imaging and Bioengineering

Dr.Mary Jo Trepka, Florida International University

Dr.Linda E.Wilbrecht, University of California at San Francisco

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Dr.Sasha C.Reed, U.S.Geological Survey

Dr.David R.Shelly, U.S.Geological Survey

DEPARTMENT OF TRANSPORTATION

Dr.Kristin C.Lewis, Volpe National Transportation Systems Center

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Dr.Christine M.Freeman, Veterans Health Administration

Dr.B.Price Kerfoot, Veterans Health Administration and Harvard Medical School

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Dr.David M.Reif, National Center for Computational Toxicology

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

Dr.Jonathan W.Cirtain, Marshall Space Flight Center

Dr.Ian M.Howat, The Ohio State University

Dr.Gregory G.Howes, University of Iowa

Dr.Benjamin A.Mazin, University of California, Santa Barbara

NATIONAL SCIENCE FOUNDATION

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Dr.Hatice Altug, Boston University

Dr.Amir S.Avestimehr, Cornell University

Dr.Joshua C.Bongard, University of Vermont

Dr.David J.Brumley, Carnegie Mellon University

Dr.Elizabeth S.Cochran, U.S.Geological Survey

Dr.Noah J.Cowan, Johns Hopkins University

Dr.Xiangfeng Duan, University of California, Los Angeles

Dr.Michael J.Escuti, North Carolina State University

Dr.Demetra C.Evangelou, Purdue University

Dr.Benjamin A.Garcia, Princeton University

Dr.Tina A.Grotzer, Harvard Graduate School of Education

Dr.Lasse Jensen, Pennsylvania State University

Dr.Benjamin Kerr, University of Washington

Dr.Benjamin L.Lev, Stanford University

Dr.Elena G.Litchman, Michigan State University

Dr.Yasamin C.Mostofi, University of New Mexico

Dr.Lilianne R.Mujica-Parodi, State University of New York at Stony Brook

Dr.Andre D.Taylor, Yale University

Dr.Claudia R.Valeggia, University of Pennsylvania

Dr.Maria G.Westdickenberg, Georgia Institute of Technology

SMITHSONIAN INSTITUTION

Dr.Justin C.Kasper, Smithsonian Astrophysical Observatory For any query with respect to this article or any other content requirement, please contact Editor at htsyndication@hindustantimes.com

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Record - 23

DIALOG(R)

SATELLITE'S PLUNGE TOWARD EARTH ON HOLD,

Marcia Dunn, Associated Press,
San Jose Mercury News (CA), Valley Final ed, p3A,
Saturday, September 24, 2011

TEXT:

CAPE CANAVERAL, Fla. -- A 6-ton NASA satellite on a collision course with Earth clung to space Friday, apparently flipping position in its ever-lower orbit and stalling its death plunge.

The old research spacecraft was targeted to crash through the atmosphere sometime Friday night or early Saturday, putting Canada, Africa and Australia in the potential cross hairs, although most of the satellite should burn up during re-entry. The United States wasn't entirely out of the woods; the possible strike zone skirted Washington state.

"It just doesn't want to come down," said Jonathan McDowell of the Harvard-Smithsonian Center for Astrophysics.

McDowell said the satellite's delayed demise demonstrates how unreliable predictions can be. That said, "the best guess is that it will still splash in the ocean, just because there's more ocean out there."

Until Friday, increased solar activity was causing the atmosphere to expand and the 35-foot, bus-size satellite to free fall more quickly. But late Friday morning, NASA said the sun was no longer the major factor in the rate of descent and that the satellite's position, shape or both had changed by the time it slipped down to a 100-mile orbit.

"In the last 24 hours, something has happened to the spacecraft," said NASA orbital debris scientist Mark Matney.

On Friday night, NASA said it expected the satellite to come crashing down between 8 p.m. and midnight. It will be passing over the Atlantic, Pacific and Indian oceans at that time, as well as Canada, Africa and Australia.

"The risk to public safety is very remote," NASA said in a statement.

The Aerospace Corp., which tracks space debris, estimated the strike would happen sometime between about 9 p.m. and 3 a.m. EDT, which would make a huge difference in where the debris falls. Those late-night, early morning passes showed the satellite flying over parts of the United States.

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Record - 24

DIALOG(R)

6-ton satellite hits Earth but it's MIA,

Associated Press,

Memphis Commercial Appeal (TN), Final ed, pA8,

Sunday, September 25, 2011

TEXT:

WASHINGTON - NASA's dead 6-ton satellite plunged to Earth early Saturday, but more than eight hours later, U.S. space officials didn't know just where it hit. They thought the fiery fall was largely over water and the debris probably hurt no one.

The agency did not give a more specific location in a midday update on its website, which also said officials were not aware of any injuries or property damage. Most of the spacecraft was believed to have burned up.

The bus-sized satellite first penetrated Earth's atmosphere somewhere over the Pacific Ocean, according to NASA and the U.S. Air Force's Joint Space Operations Center. But that doesn't necessarily mean it all fell into the sea.

NASA's earlier calculations had predicted that the 20-year-old former climate research satellite would fall over a 500-mile swath and could include land.

Because the plummet began over the ocean and given the lack of any reports of people being hit, that "gives us a good feeling that no one was hurt," but officials didn't know for certain, NASA spokesman Steve Cole said.

There was speculation on the Internet and Twitter, much of it focusing on unconfirmed reports and even video of debris from the Upper Atmosphere Research Satellite over Alberta, Canada.

Jonathan McDowell of the Harvard-Smithsonian Center for Astrophysics said the spacecraft entered the atmosphere around 11:15 p.m. CDT over the coast of Washington state. He said much of the debris likely fell over the Pacific Ocean, with some making it to Canada over northern Alberta and perhaps as far as the Hudson Bay.

"Pieces are falling off of this flaming fire ball, and some of it has enough momentum to go hundreds of miles," he said. He added he'd be surprised if anyone was hurt by the debris because it appears to have fallen in such remote areas.

Cole said the last track for the satellite included Canada, starting north of Seattle and then in a large arc north then south. From there, the track continued through the Atlantic south toward Africa, but it was unlikely the satellite got that far if it started falling over the Pacific.

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Record - 25

DIALOG(R)

Falling NASA satellite losing speed -- Washington state in predicted strike Zone, Marcia Dunn Associated Press, Memphis Commercial Appeal (TN), Final ed, pA13, Saturday, September 24, 2011

TEXT:

CAPE CANAVERAL, Fla. - A 6-ton NASA satellite on a collision course with Earth clung to space Friday, apparently flipping position in its ever-lower orbit and stalling its plunge.

The old research spacecraft was targeted to crash through the atmosphere sometime Friday night or early today, putting Canada, Africa and Australia in the potential crosshairs, although most of the satellite should burn up during re-entry. The United States wasn't entirely out of the woods; the possible strike zone skirted Washington state.

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On Friday night, NASA said it expected the satellite to come crashing down between 11 p.m. and 3 a.m. EDT. It will be passing over the Atlantic, Pacific and Indian oceans at that time, as well as Canada, Africa and Australia.

The Aerospace Corp., which tracks space debris, estimated the strike would happen sometime between about 9 p.m. and 3 a.m. EDT, which would make a huge difference in where the debris falls. Those late-night, early morning passes showed the satellite flying over parts of the United States.

But NASA stressed its predictions had almost all of the U.S. in the clear - with Washington state the lone holdout.

Any surviving wreckage is expected to be limited to a 500-mile swath.

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Record - 26

DIALOG(R)

6-ton satellite hits earth, but where is anyone's guess,

Virginia Pilot and Ledger-Star (Norfolk, VA), VP - The Virginian-Pilot ed,
p3, Sunday, September 25, 2011

TEXT:

By Seth Borenstein and Kelli Kennedy

The Associated Press

WASHINGTON

It's as big as a bus and weighs 6 tons, but officials probably will never be able to pinpoint exactly where a massive NASA satellite plummeted to Earth.

NASA space junk scientists believe that all - or nearly all - of the parts of their 20-year-old dead satellite safely plunged into the Pacific Ocean, likely missing land.

No injuries or damage have been reported on land, which NASA officials said was a good indication the satellite went into the ocean.

That doesn't necessarily mean it all fell into the sea. Some debris could have fallen over areas such as Portland, Ore.; Seattle; Calgary, Alberta; and Saskatoon, Saskatchewan, said Jonathan McDowell of the Harvard-Smithsonian Center for Astrophysics.

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There were no credible reports of debris on the ground, said Nick Johnson, NASA's chief scientist for orbital debris.

NASA's earlier calculations had predicted that the former climate research satellite would fall over a 500-mile swath and could include land.

Officials said the 35-foot satellite fell sometime between 11:23 p.m. Friday and 1:09 a.m. Saturday.

one theory

NASA scientists believe that nearly all of the 35-foot dead satellite

plunged into the Pacific Ocean, likely missing land.
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Record - 27

DIALOG(R)

Satellite is likely in Pacific ocean,
SETH BORENSTEIN & KELLI KENNEDY Associated Press,
Tulsa World, Final ed, pA18,
Sunday, September 25, 2011

TEXT:

WASHINGTON - It's as big as a bus and weighs 6 tons, but officials probably will never be able to pinpoint exactly where a massive NASA satellite plummeted to Earth.

NASA space junk scientists believe that all - or nearly all - of the parts of their 20-year-old dead satellite safely plunged into the Pacific Ocean, likely missing land. But if their estimates are off, by only five minutes or so, fiery pieces could have fallen on parts of northwestern North America.

No injuries or damage have been reported on land, which NASA officials said was a good indication the satellite went into the ocean.

That doesn't necessarily mean it all fell into the sea. Some debris could have fallen over areas such as Portland, Ore.; Seattle; Calgary, Alberta; and Saskatoon, Saskatchewan, said Jonathan McDowell of the Harvard-Smithsonian Center for Astrophysics.

"Pieces are falling off of this flaming fire ball, and some of it has enough momentum to go hundreds of miles," he said.

Speculation was rampant on sites such as Twitter. There were no credible reports of debris on the ground, said Nick Johnson, NASA's chief scientist for orbital debris. But if the satellite fell even five minutes later than estimated, some of it could have hit land, he said.

"We don't know where the re-entry point exactly was. We don't exactly know where the debris field is," Johnson said.

NASA's earlier calculations had predicted that the former climate research satellite would fall over a 500-mile swath and could include land.

Officials said the 35-foot satellite fell sometime late Friday and early Saturday.

Much of the speculation focused on unconfirmed reports and even video of debris from the Upper Atmosphere Research Satellite over Alberta, Canada. NASA spokesman Steve Cole said that was possible because the last track for the satellite included Canada, starting north of Seattle and then in a large arc north then south. From there, the track continued through the Atlantic south toward Africa, but it was unlikely the satellite got that

far if it started falling over the Pacific.

Some 26 pieces of the satellite representing 1,200 pounds of heavy metal had been expected to rain down somewhere. The biggest surviving chunk should be no more than 300 pounds.

NASA urges anyone who thinks they've found satellite debris to call police. It's government property and illegal to keep it or try to sell it. The debris has no toxic contamination, but there could be sharp edges, NASA officials have said.

UARS is the biggest NASA spacecraft to crash back to Earth, uncontrolled, since the post-Apollo 75-ton Skylab space station and the more than 10-ton Pegasus 2 satellite, both in 1979.

Russia's 135-ton Mir space station slammed through the atmosphere in 2001, but it was a controlled dive into the Pacific.

Before UARS fell, no one had ever been hit by falling space junk and NASA expected that not to change.

NASA put the chances that somebody somewhere on Earth would get hurt at 1-in-3,200. But any one person's odds of being struck were estimated at 1-in-22 trillion, given there are 7 billion people on the planet.

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Record - 28

DIALOG(R)

Satellite home, but where's it parked?,

Hamilton Spectator wire services,
Hamilton Spectator, v2011092617481469, First ed, pA8,
Monday, September 26, 2011

TEXT:

LOS ANGELES - A defunct NASA satellite, whose doomed descent gained worldwide notoriety, fell back to Earth early Saturday - but exactly when or where the fiery plunge took place could forever be a mystery.

"We may never know," said Nicholas Johnson, NASA's chief orbital debris scientist.

It probably plunged into the Pacific Ocean, perhaps somewhere between Hawaii and the western coast of North America. There have been no reports of discovered pieces or injuries, he said.

The craft entered the atmosphere around 12:15 a.m. ET over the coast of Washington state, said Jonathan McDowell of the Harvard-Smithsonian Center for Astrophysics. He said while the ocean was the likeliest spot, debris may have made it to Canada.

A YouTube video and comments on Twitter triggered speculation that debris may have hit Okotoks, a town south of Calgary. But RCMP Sergeant Patrick Webb said the video is likely a hoax, adding police have heard nothing about falling debris in the area.

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Record - 29

DIALOG(R)

No sign of NASA wreckage,

The Canadian Press,

Waterloo Region Record, v2011092617481950, First ed, pA8,

Monday, September 26, 2011

TEXT:

CALGARY - Officials are trying to determine where debris from an American satellite landed, but the RCMP is shooting down reports that some pieces fell in an Alberta community.

The day after the spacecraft plunged over the northern Pacific early Saturday, U.S. space officials didn't know just where it crashed.

No injuries or damage were reported, leading NASA to conclude there's a good likelihood most of the space junk dropped safely into the sea.

The spacecraft entered the atmosphere at about 12:15 a.m. ET over the coast of Washington state, said Jonathan McDowell of the Harvard-Smithsonian Center for Astrophysics. He said that while the ocean was the likeliest crash pad, some debris may have made it to Canada, such as Calgary or Saskatoon.

Those locations were possible because the last track for the satellite included Canada, starting north of Seattle and making a large arc north and then south, NASA spokesperson Steve Cole said. Portland, Ore., and Seattle also might have been hit.

NASA has received no credible reports of debris on the ground.

Phil Langill, director of the Rothney Astrophysics Observatory at the University of Calgary, said figuring out where the 26 pieces rained down is difficult because the re-entry track was unpredictable.

"Having no solid predictions means that it's just luck of the draw," he

said. "And if it happened to be cloudy ... most people would have missed it even if they knew where to look."

A YouTube video and comments on Twitter triggered speculation that debris may have hit Okotoks, a town south of Calgary. But the RCMP said it found no evidence to support that.

The video is likely a hoax, RCMP Sgt. Patrick Webb said, adding police have heard nothing about falling debris in the area.

"If that video is real, I will buy you a cup of coffee," he said.

On the video, people talk throughout the footage and, at one point, a person says, "I am Oklahoma City, looking southeast and ... the debris pieces keep on coming."

The video was titled "Okotoks, Canada - UARS Fiery Footage" and the Oklahoma City reference was not immediately clear. The acronym UARS stands for Upper Atmospheric Research Satellite.

On Twitter, speculation spiralled wildly over where the pieces made landfall. Some users posted obviously fake videos that at first sounded like they could be real in attempts to generate views.

"It's pretty goofy," Langill said with a chuckle. "What does that say about people and getting attention? It's more of a psychological and sociological experiment than a scientific experiment."

If conditions were ideal, he said, there could have been a spectacular light show similar to a meteor flashing through the sky, but the display would be brighter as the pieces burned up and stayed illuminated longer. "It would have had a nice long tail and would have initially been one bright spot and then broken up into two or three bright spots," he said. Were anyone to find debris on the ground, most pieces would be smaller than a baseball and look like melted metal blobs, Langill said. However, NASA said the biggest surviving chunk could weigh as much as 136 kilograms.

Before it broke up, the satellite weighed six tonnes.

McDowell said he'd be surprised if anyone was hurt by the debris because it appears to have fallen in such remote areas. "I do think people saw lights in the sky and fireballs and may well be bits of UARS falling down," he said.

The bus-sized satellite was NASA's biggest spacecraft to tumble out of orbit, uncontrolled, in 32 years.

It was launched aboard the space shuttle Discovery in 1991. NASA decommissioned the satellite in 2005, moving it into a lower orbit that cut its life short by two decades.

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Record - 30

DIALOG(R)

Satellite debris falling in Alberta a hoax, RCMP says,

The Canadian Press,

Guelph Mercury, v2011092617482162, First ed, pB8

Monday, September 26, 2011

TEXT:

CALGARY - Officials are trying to determine where debris from an American satellite landed, but the RCMP is shooting down reports that some pieces fell in an Alberta community.

The day after the spacecraft plunged over the northern Pacific early Saturday, U.S. space officials didn't know just where it crashed.

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All the buzz surrounding the satellite's descent amused Langill, who said objects fall from the sky more frequently than the public realizes. "The only thing that was really different about this one is that there may be a chance that some of the larger, denser pieces could make it down to the ground," he said. "I think that's what made the story more interesting for everyone."

He added that expressions of concern from some people that the projectiles could do damage were unfounded.

"This one had no potential to explode, there were no volatiles on board, it was just going to be a nice pretty little light show," he said.

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Wolbach Library: CfA in the News ~ Week ending 9 October 2011

1. **Para escudrinar el espacio**, EFE, El Sentinel (Orlando), FINAL ed, p9, Saturday, October 8, 2011
2. **UNIVERSITY OF IOWA ASTRONOMER, COLLEAGUES FIND CLOCK TO TEST EINSTEIN'S LIMIT ON SPEED OF LIGHT**, US Federal News, Friday, October 7, 2011
3. **CRAB PULSAR EMITS LIGHT AT HIGHER ENERGIES THAN EXPECTED**, US Federal News, Thursday, October 6, 2011
4. **CRAB PULSAR EMITS LIGHT AT HIGHEST ENERGIES DETECTED**, US Federal News, Thursday, October 6, 2011
5. **Crab Nebula emissions surprise astronomers**, UPI Science News, Thursday, October 6, 2011
6. **Study Data from Harvard-Smithsonian Center for Astrophysics Update Knowledge of Life Science Research**, Life Science Weekly, p3262, Tuesday, October 11, 2011
7. **Observatory's champion retiring after 33 years**, DAN SHEARER, AP Alert - Arizona, Thursday, October 6, 2011
8. **Growing up with S&T: a family history: it's no exaggeration to say that this magazine began as a family affair.**, Meredith, Barbara, Federer, C. Anthony, Sky & Telescope, v122, n5, p18(6), Tuesday, November 1, 2011
9. **A planet blacker than the blackest coal.**, Sky & Telescope, v122, n5, p12(1), Tuesday, November 1, 2011
10. **Say what?**, Carlisle, Camille M., Science News, v180, n7, p4(1), Saturday, September 24, 2011
11. **ALMA telescope poised to peer into hidden corners of the cosmos**, Pete Spotts Staff writer, Christian Science Monitor (USA), ALL ed, Wednesday, October 5, 2011
12. **3 Win Nobel for Work on Accelerating Universe**, DENNIS OVERBYE, New York Times (NY), Late Edition - Final ed, p11, Wednesday, October 5, 2011
13. **Nobel-winning discovery on universe has Harvard roots**, Carolyn Y. Johnson, Boston Globe (MA), p1,

Wednesday, October 5, 2011

14. **Discoveries on expansion of universe win Nobel Prize for three physicists**, DICK AHLSTROM, Science Editor, Irish Times, Daily ed, p11, Wednesday, October 5, 2011

15. **3 astronomers share Nobel in physics**, DENNIS OVERBYE, International Herald Tribune, p4, Wednesday, October 5, 2011

16. **Smithsonian@ Renews, Expands Master Toy License with NSI International, Inc.@**, AP Alert - Business, Tuesday, October 4, 2011

17. **Smithsonian(R) Renews, Expands Master Toy License with NSI International, Inc.(R)**, PR Newswire, Tuesday, October 4, 2011

18. **World's largest radio telescope ALMA opens its eye on Universe**, ANI, Asian News International, Tuesday, October 4, 2011

19. **Red radiotelescopios ALMA comienza operaciones desde Chile**, Xinhua Spanish, Monday, October 3, 2011

20. **NASA window for falling satellite was overnight**, MARCIA DUNN, Press-Register (Mobile, AL), Mississippi Press 01 ed, p06, Saturday, September 24, 2011

21. **Satellite may hit today**, MARCIA DUNN, Press-Register (Mobile, AL), Press-Register 02 ed, p04, Saturday, September 24, 2011

Record - 1

DIALOG(R)

Para escudrinar el espacio,

EFE,

El Sentinel (Orlando), FINAL ed, p9,

Saturday, October 8, 2011

TEXT:

SANTIAGO -- El observatorio terrestre mas complejo del mundo, el Atacama Large Millimeter/submillimeter Array (ALMA), inicio oficialmente sus operaciones en el norte de Chile, desde donde se podra observar el universo frio, como las densas nubes de polvo cosmico y gas donde se forman estrellas y planetas.

Segun informo el Observatorio Europeo Austral (ESO), ALMA comenzara esta etapa con alrededor de un tercio de las 66 antenas que tendra cuando finalice su construccion, hacia el ano 2013.

Este observatorio unico esta instalado a 5,000 metros de altitud en el Llano de Chajnantor, en el inhospito desierto de Atacama, a unos 1,700 kilometros al norte de Santiago.

Las antenas de ALMA no funcionan como los telescopios opticos tradicionales, sino como radiotelescopios. Es decir, estan disenadas para detectar las longitudes de onda milimetricas y submilimetricas, aproximadamente 1,000 veces mas largas que la luz visible.

La observacion de estas longitudes de onda largas permite a los astronomicos estudiar objetos muy frios en el espacio, como las densas nubes de polvo cosmico y gas donde se forman estrellas y planetas, asi como objetos muy frios en el Universo primitivo.

Ademas, las antenas de ALMA estan concebidas para ser utilizadas de forma conjunta, como un interferometro unico y colosal.

Para ello pueden adoptar distintas posiciones a lo ancho y largo del Llano de Chajnantor y abarcar una extension de hasta 16 kilometros.

Los datos obtenidos por estas antenas, conectadas entre si mediante cables de fibra optica, son combinados por el supercomputador mas rapido del mundo, fabricado especialmente para ALMA.

"Incluso en esta fase tan temprana, ALMA ya supera a todos los conjuntos submilimetricos que existen", resalto Tim de Zeeuw, director general de ESO, organizacion que integran 14 paises europeos y Brasil. ESO es el socio europeo en ALMA, una alianza internacional en la que tambien participan Estados Unidos, Canada, Japon y Taiwan.

Este equipo ha trabajado intensamente en los ultimos meses probando los sistemas del observatorio y uno de los resultados de esas pruebas es la primera imagen publicada por ALMA sobre la galaxia de las Antenas.

Esa imagen ofrece una vista del Universo imposible de obtener con los telescopios que observan la luz visible e infrarroja.

La mayoria de las observaciones se lograron usando solo 12 antenas interconectadas -- muchas menos de las que se usaran para las primeras observaciones cientificas -- y con separaciones mucho menores entre ellas.

A medida que el observatorio crezca y se vayan incorporando nuevas antenas, aumentara de forma exponencial la precision, eficiencia y calidad de sus observaciones.

Para los primeros nueve meses, ALMA pudo aceptar solo un centenar de proyectos de las mas de 900 propuestas presentadas por astronomicos de todo

el mundo.

Uno de los proyectos elegidos es el de David Wilner, del Harvard-Smithsonian Center for Astrophysics de Cambridge, Massachusetts. "Mi equipo busca los componentes basicos de los sistemas solares, y ALMA es la mejor herramienta que existe para detectarlos", explica Wilner.

En tanto, Simon Casassus, de la Universidad de Chile, y su equipo usaran ALMA para observar el disco de gas y polvo que rodea HD142527, una joven estrella que se encuentra a 400 anos-luz de distancia.

"El disco de polvo alrededor de esta estrella tiene un espacio vacio muy grande, que podria haber sido causado por la formacion de planetas gigantes", explica Casassus. YES

COLUMN: CHILE> ASTRONOMIA

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Record - 2

DIALOG(R)

UNIVERSITY OF IOWA ASTRONOMER, COLLEAGUES FIND CLOCK TO TEST EINSTEIN'S LIMIT ON SPEED OF LIGHT,

US Federal News,
Friday, October 7, 2011

TEXT:

IOWA CITY, Iowa, Oct.7 -- The University of Iowa's College of Liberal Arts and Sciences Department issued the following news release:

Einstein's Theory of Special Relativity and its speed limit on the velocity of light seem to be under special scrutiny by scientists these days.

And so it is that a University of Iowa researcher and his colleagues have published a paper in the Oct.7 issue of the journal Science about a discovery that may make it possible to test whether the speed of light really is constant under all conditions.

Philip Kaaret, professor in the UI College of Liberal Arts and Sciences Department of Physics and Astronomy, says that the discovery was made while using the Arizona-based telescope VERITAS (Very Energetic Radiation Imaging Telescope Array System) to detect gamma rays being emitted by a pulsar - a dense neutron star.

In brief, the Science paper discusses the unexpected discovery of pulsed gamma rays at energies higher than 100 billion electron volts - higher than current theory explains - emanating from the Crab pulsar, one of the most powerful pulsars in gamma rays. Rotating about 30 times per second, the Crab pulsar is located in the Crab Nebula some 6,500 light years from the Earth.

Kaaret says the discovery also makes possible a clock to test fundamental physics.

"Beyond helping understand pulsars, these results will also let us carry out an experiment I suggested back in 1999 to test if the speed of light really is constant at very high energies," Kaaret says. "Variations in the speed of light are expected when Einstein's theory of gravity is extended to include the effects of quantum mechanics, but only at very high energies.

"The pulses from the Crab are locked to its spin and come once every 33 thousandths of second. The pulsar spin is a clock, like a frantically accelerated second hand on a watch, that lets us time the gamma-rays very precisely," he says.

The pulses of gamma rays coming from the Crab pulsar at different energy levels can be compared to two different cars - a race car and a passenger car - rolling side-by-side down a race course and trying to match the speed limit. If both are successful, they should reach the finish line at exactly the same time. Similarly, Einstein's theories predict that gamma rays, regardless of their energy levels, should move no faster than the speed of light.

"By checking if the pulses at the highest energies come at the same time as the pulses at lower energies, we can see if the high energy photons are slowed, or possibly even sped up, along the way," he says.

"With VERITAS, we see no evidence that the speed of light changes. There are no problems with Einstein here. And, because the Crab pulsar just keeps on pulsing, we can get better and better limits as we keep observing," Kaaret says.

The Science paper comes in the wake of a Sept. 22 announcement that a group of European physicists working at CERN, the European Center for Nuclear Research, had timed a burst of subatomic particles called neutrinos breaking the limit on the speed of light as set down by Albert Einstein in 1905. Understandably, their results have been met with significant skepticism and await experimental verification by other researchers.

The Oct. 7 Science paper can be found at <http://www.sciencemag.org/content/334/6052/69>.

The 95 coauthors of the Science paper include scientists from 26 institutions involved in the VERITAS collaboration. There are three corresponding authors.

Corresponding author and postdoctoral researcher Nepomuk Otte is one of five coauthors at the University of California, Santa Cruz. Corresponding author and graduate student Andrew McCann is one of seven coauthors at McGill University. Corresponding author and research scientist Martin Schroedter is one of seven coauthors at the Fred Lawrence Whipple Observatory of the Harvard-Smithsonian Center for Astrophysics.

VERITAS is funded by the U.S. Department of Energy Office of Science, the National Science Foundation, the Smithsonian Astrophysical Observatory, the National Sciences and Engineering Research Council of Canada, Science Foundation Ireland and, in the U.K., by the Science and Technology Facilities Council. For any query with respect to this article or any other content requirement, please contact Editor at htsyndication@hindustantimes.com

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Record - 3

DIALOG(R)

CRAB PULSAR EMITS LIGHT AT HIGHER ENERGIES THAN EXPECTED,

US Federal News,

Thursday, October 6, 2011

TEXT:

WASHINGTON, Oct. 6 -- The National Science Foundation issued the following press release:

Pulsars--highly magnetized, rotating stars--were first discovered more than 40 years ago, and are now believed to be a type of stellar leftover, or remnant--in this case, a neutron star--that results from the explosion and gravitational collapse of a more massive star. In the October 7 issue of Science, astrophysicists with VERITAS report an unexpected finding in the Crab Pulsar, which is the central star in the Crab Nebula in the constellation of Taurus. They detected pulsed gamma rays, or light energy, above one hundred thousand million electron volts.

The detection cannot be explained with current pulsar models that show pulsed gamma rays in the range of a few hundred million electron volts to a few thousand million electron volts. The finding is causing researchers to consider new theories about gamma-ray production. More on the discovery can

be found in press releases by the Harvard-Smithsonian Center for Astrophysics, University of California, Los Angeles, University of California, Santa Cruz and others.

The paper, online in Science today, had 95 coauthors, including scientists from 26 institutions in five countries, who are part of the VERITAS collaboration.

Left is an artist's conception of the VERITAS array of imaging atmospheric Cherenkov telescopes (IACTs) observing the Crab Nebula. IACTs detect high-energy gamma-rays. Also seen is a very high energy gamma-ray originating from the Crab Nebula producing an airshower in the high atmosphere. The telescopes observe the Cherenkov radiation produced by the energetic electrons in the airshower. Right is an artist's conception of the pulsar at the center of the Crab Nebula, with a Hubble Space Telescope photo of the nebula in the background.

VERITAS, or Very Energetic Radiation Imaging Telescope Array System, is a ground-based observatory for gamma-ray astronomy located at the Fred Lawrence Whipple Observatory in southern Arizona. It is operated by a collaboration of more than 100 scientists from 22 different institutions in the United States, Ireland, England and Canada. VERITAS is funded by the U.S. National Science Foundation, U.S. Department of Energy Office of Science, Smithsonian Institution, Natural Sciences and Engineering Research Council of Canada, Science Foundation Ireland, and Science and Technology Facilities Council of the United Kingdom. For any query with respect to this article or any other content requirement, please contact Editor at htsyndication@hindustantimes.com

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Record - 4

DIALOG(R)

CRAB PULSAR EMITS LIGHT AT HIGHEST ENERGIES DETECTED,

US Federal News,

Thursday, October 6, 2011

TEXT:

LOS ANGELES, Oct. 6 -- The University of California issued the following press release:

An international team of scientists has detected the highest energy gamma rays ever observed from a pulsar, a highly magnetized and rapidly spinning neutron star.

The VERITAS experiment measured gamma rays coming from the Crab Pulsar at such large energies that they cannot be explained by current scientific models of how pulsars behave, the researchers said.

The results, published today (Oct.6) in the journal Science, outline the first observation of photons from a pulsar system with energies greater than 100 billion electron volts - more than 50 billion times higher than visible light from the sun.

"This is the highest energy pulsar system ever detected," said Rene Ong, a UCLA professor of physics and astronomy and spokesperson for the VERITAS collaboration. "It is a completely new and surprising phenomenon for pulsars."

Data were acquired for 107 hours over the course of three years by VERITAS's ground-based gamma ray observatory, which is part of southern Arizona's Whipple Observatory, a facility managed by the Harvard-Smithsonian Center for Astrophysics. VERITAS (Very Energetic Radiation Imaging Telescope Array System) observes gamma rays using a network of four telescopes, each 12 meters in diameter.

Ong noted that all previous observations of pulsars indicated that the radiation cuts off at the high energies the team observed.

"It means the radiation we detect must be a new component that was completely unexpected," he said.

Gamma rays, the most energetic type of electromagnetic radiation, cannot be directed by lenses or bounced off mirrors like ordinary visible light, Ong said. Because the rays are invisible to the human eye, the only way telescopes on Earth can detect them is by observing the path they take as they are absorbed in the planet's atmosphere.

Gamma rays are ejected from the Crab Pulsar, and they smash into Earth's atmosphere, causing "the electromagnetic equivalent of a sonic boom," Ong said. This collision creates a shower of visible light more than 6 miles above the ground that is recorded by VERITAS.

"The atmosphere is an integral part of our measurement system, which makes VERITAS different from conventional telescopes," Ong said.

One of the most widely studied astronomical objects in the northern hemisphere, the Crab Nebula, which is some 6,500 light-years from Earth, was formed when a massive star exploded in a supernova event that was observed on Earth in the year 1054. While it is most typical for pulsars to

be ejected from the stellar wreckage during a supernova, in the case of the Crab system, the pulsar remained at its center, producing radiation that covers the entire electromagnetic spectrum, Ong said.

He calls the Crab system the "Rosetta Stone of astronomy," because astronomers and astrophysicists have observed this object at every conceivable wavelength of light.

"The Crab Pulsar is considered among the best understood systems in all of astronomy, yet here we have found something totally new," he said. "It is astronomy in a completely new light; we are seeing phenomena that you just can't explore with optical light or X-rays, or even low-energy gamma rays."

The Crab Pulsar is a highly magnetized neutron star with a surface magnetic field a trillion times stronger than that of the Earth. The star spins at the dizzying rate of about 30 times a second and emits gamma rays through "curvature radiation," an effect that creates a lighthouse-like beacon that winks on when the beam faces the Earth and off when the star pivots away.

Light detected by the VERITAS experiment cannot be explained by curvature radiation, however, and likely comes from regions well outside the high-magnetic field region close to the neutron star, Ong said. While such energetic gamma rays have been observed elsewhere in the galaxy, the actual mechanism of how they are created in a pulsar is not fully understood.

"The pulse duration of the radiation we see is almost three times shorter than that seen at other gamma ray energies," he said. "This was very surprising and means this new radiation is probably coming from a different physical region of the star's outer magnetosphere."

The VERITAS experiment looks for radiation emanating from celestial objects such as pulsars, active galaxies, the center of the Milky Way and supermassive black holes. It has collected data for nearly 1,000 hours every year since it began operating in 2007.

"We are trying to understand processes out in the cosmos that can create particles at these extreme energies, beyond what can be produced here on Earth," Ong said. "We are also very interested in seeing if these processes indicate some sort of new physics."

Ong hopes his research may shed some light on the mystery of cosmic rays.

"We are bombarded by high-energy particles from all over the cosmos that reach unimaginable energies," he said. "These cosmic rays are an important energy source in our galaxy, yet we have no clue where they are coming from."

"This measurement indirectly gives us clues to the highest energies in the cosmos, telling us about particles and energies that we can't generate here on Earth but that nature's accelerators are able to create for us."

Ong is currently helping to plan the next-generation ground-based gamma ray observatory, called the Cherenkov Telescope Array (CTA). Covering more than one-half square mile with dozens of telescopes, the CTA will be 10 times more sensitive than VERITAS, allowing radiation from fainter and more distant objects to be accurately resolved.

The 95 co-authors of the Science paper on the Crab Pulsar include scientists from 26 institutions in five countries who are part of the VERITAS collaboration. UCLA co-authors include Vladimir Vassiliev, an associate professor of physics and astronomy; Pratik Majumdar, a postdoctoral scholar in physics and astronomy; and Timothy Arlen, a graduate student.

This research is supported by the U.S. Department of Energy, the U.S. National Science Foundation, the Smithsonian Institution, the National Sciences and Engineering Research Council of Canada, the U.K.'s Science and Technology Facilities Council, and the Science Foundation Ireland. For any query with respect to this article or any other content requirement, please contact Editor at htsyndication@hindustantimes.com

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Record - 5

DIALOG(R)

Crab Nebula emissions surprise astronomers,
UPI Science News,
Thursday, October 6, 2011

TEXT:

An exploding star that dazzled sky-gazers in 1054 still intrigues U.S. astronomers by pumping out radiation at higher energies than expected, they say.

The explosion witnessed by observers in North America and China centuries ago left behind a gaseous remnant known as the Crab Nebula, which emits gamma rays with energies a million times that of medical X-rays, a release from the Harvard-Smithsonian Center for Astrophysics said Thursday.

"If you asked theorists a year ago whether we would see gamma-ray pulses this energetic, almost all of them would have said, 'No.' There's just no

theory that can account for what we've found," Harvard-Smithsonian researcher Martin Schroedter said.

The gamma rays are coming from an extreme object at the Crab Nebula's center known as a pulsar, the collapsed core of a massive star that has become a small but incredibly dense spinning neutron star, astronomers said.

Nepomuk Otte, a postdoctoral researcher at the University of California, Santa Cruz, who was involved in the observations said some researchers had told him he was crazy even to look for pulsar emissions at this energy level.

"It turns out that being persistent and stubborn helps," Otte said. "These results put new constraints on the mechanism for how the gamma-ray emission is generated."

Several theories have been put forward to explain the unexpectedly high energy levels observed but it will take more data to understand thoroughly the mechanisms behind the gamma-ray pulses, astronomers said.

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Record - 6

DIALOG(R)

Study Data from Harvard-Smithsonian Center for Astrophysics Update,

Knowledge of Life Science Research,

Life Science Weekly, p3262,

Tuesday, October 11, 2011

TEXT:

Researchers detail in "Birth of a relativistic outflow in the unusual γ -ray transient Swift J164449.3+573451," new data in Life Science Research.

"Active galactic nuclei, which are powered by long-term accretion onto central supermassive black holes, produce relativistic jets with lifetimes of at least one million years, and the observation of the birth of such a jet is therefore unlikely. Transient accretion onto a supermassive black hole, for example through the tidal disruption of a stray star, thus offers a rare opportunity to study the birth of a relativistic jet," scientists in Cambridge, Massachusetts report (see also).

"On 25 March 2011, an unusual transient source (Swift J164449.3+573451) was found, potentially representing such an accretion event. Here we report observations spanning centimetre to millimetre wavelengths and covering the first month of evolution of a luminous radio transient associated with Swift J164449.3+573451. The radio transient coincides with the nucleus of

an inactive galaxy. We conclude that we are seeing a newly formed relativistic outflow, launched by transient accretion onto a million-solar-mass black hole. A relativistic outflow is not predicted in this situation, but we show that the tidal disruption of a star naturally explains the observed high-energy properties and radio luminosity and the inferred rate of such events," wrote B.A. Zauderer and colleagues, Harvard-Smithsonian Center for Astrophysics.

The researchers concluded: "The weaker beaming in the radio-frequency spectrum relative to γ -rays or X-rays suggests that radio searches may uncover similar events out to redshifts of $z \sim 6$."

Zauderer and colleagues published their study in Nature (Birth of a relativistic outflow in the unusual γ -ray transient Swift J164449.3+573451 Nature, 2011;476(7361):425-8).

For additional information, contact B.A. Zauderer, Harvard-Smithsonian Center for Astrophysics, 60 Garden Street, Cambridge, Massachusetts 02138, United States.

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JOURNAL REGION: USA

JOURNAL SUBJECT: Healthcare; Pharmaceuticals & Biotechnology

Record - 7

DIALOG(R)

Observatory's champion retiring after 33 years,

DAN SHEARER,

AP Alert – Arizona,

Thursday, October 6, 2011

TEXT:

GREEN VALLEY, Ariz. _Thirty-three years is a blip on an astronomer's timeline but it's an entire career for Dan Brocius, and on Monday he'll see it wind down.

Brocius, 59, is the only public affairs director Fred Lawrence Whipple Observatory has ever known. The complex's prize telescope looks down on Green Valley from the 8,550-foot summit of Mount Hopkins to the east, and it has been Brocius' job to explain what it does in terms a layman can understand.

Smithsonian Astrophysical Observatory owns the complex and runs it with the University of Arizona. Its 10-meter gamma-ray telescope was built in 1968, and Brocius joined the team 10 years later as it prepared to dedicated the

MMT (Multiple Mirror Telescope) in May 1979. That six-mirrored telescope was replaced by another MMT (Magnum Mirror Telescope) which is a single mirror.

Through all the changes, Brocious has educated himself to the point that he speaks nearly as authoritatively about the mountain's treasured telescopes as the world-renowned scientists who stand in line to use them.

Brocious has a bachelor's degree in political science from Arizona State University and a master's in journalism from UofA. He also has some background in engineering, "but I had to come to understand the work as a member of the public," he says.

That grass-roots understanding has helped thousands of visitors get their arms around supernovas, black holes and the importance of spectroscopy.

When Brocious came to the job, the visitors center was housed in a one-room 1938 WPA adobe schoolhouse in Amado. Lectures were usually pulled off with a dozen metal folding chairs near a small exhibit that hung on the wall. The small space was used as a lunchroom, conference room and staff room, and there were about 2,000 visitors per year.

The visitors center moved to its current location near Elephant Head Road in 1991, and now sees about 5,000 visitors a year. About 3,000 of them take the tour up the 13-mile road to the telescope complex, though the VERITAS project has four telescopes at what's called the base camp by the visitors center. Today, lectures fill 300 seats at the West Center, and there are 25 visitors center volunteers, most from Green Valley.

Brocious smiles when the word "retirement" comes up. He may be leaving, but he's not going far, at least not yet.

He will, as a volunteer, continue to represent Whipple as a consulting agency on the Environmental Impact Statement for the proposed Rosemont copper mine. Brocious says the mine, which will be over a nearby ridge, could bring a lot of unwelcome light and dust.

In addition, he is preparing to sort and evaluate decades of slides and photographs for the Smithsonian Institution archive.

"I've been going through 33 years of files _ it's amazing what you find," he says.

Brocious isn't sure how many times he has driven the narrow, mostly dirt road to the summit, but on a recent trip up it's clear that every mile holds a memory.

He shakes his head as he recalls a cement truck tumbling down the mountainside and catching fire. The driver was fine but some of the dry cement hit a spring. Then there was the semi-flatbed that was supposed to make a delivery at the visitors center but sped by it and headed up the mountain. The driver met his match on a hairpin turn and dumped part of his load when the flatbed tilted.

Then there are the tragic stories of illegal immigrants who make their way across the mountain and flatlands around base camp. Many, Brocius said, are sent up a ridge by coyotes who tell them Phoenix is just on the other side.

Brocius has heard all the questions, but patiently answers them time and again _ questions about everything from extraterrestrials to the value of the astronomy done on Mount Hopkins.

To the latter, he readily admits that much of the work doesn't offer practical application, but it's important for humans to keep exploring and asking questions.

"This is to find out how the universe works," he says of the work. "Most of what exists is out there, not here."

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Record - 8

DIALOG(R)

Growing up with S&T: a family history: it's no exaggeration to say that this magazine began as a family affair.

Meredith, Barbara, Federer, C. Anthony,
Sky & Telescope, v122, n5, p18(6),
Tuesday, November 1, 2011

TEXT:

[ILLUSTRATION OMITTED]

In early October 1941 a husband and wife barely into their 30s drove their Ford convertible from New York City to Boston with a 2-week-old daughter in a basket on the back seat next to her nearly 3-year-old brother. They moved the family into a home in Arlington, Massachusetts, and they moved their tiny company, Sky Publishing, to Harvard College Observatory (HCO), where they quickly produced the inaugural November 1941 issue of Sky & Telescope.

The parents were Charlie and Helen (Spence) Federer, and the children were the authors of this reminiscence, Barbara and Tony Federer.

For the next 15 years, the magazine and Federer family life were inseparable. An early photograph shows Barbara (known to the family as "Bar") in her playpen next to Charlie with galley proofs in his hand. Few children, then or now, grow up seeing so much of their parents at work. Few children, especially now, were expected to be as independent as we were. And few children, especially then, got to see so much of their country and the world. We were also privileged to be introduced from birth to the concept of equal rights for women, and much of the magazine's early success was due to the drive and energy of our mother, an English major, whose editorial skills complemented the more scientific bent of our father.

The "Magazine"

Wherever we were, at home, on trips, or on holiday breaks, the monthly deadlines were always in control. Even as young children we became involved with the labor-intensive production process of the magazine. Type-scripts were prepared for the printers and galleys from the linotype machines were proofread. We were often called upon to read the original copy aloud, learning to state all the punctuation marks, so that our parents could mark corrections.

[ILLUSTRATION OMITTED]

The corrected galleys were cut, arranged, and pinned to layout sheets together with proof images from the engraved "cuts." This was not an easy environment for young children, and there was no room for error in our use of grammar, figures of speech, and spelling. Monthly visits to Adams Press in nearby Lexington often saw us playing outside on the grass or, more exciting, being allowed inside to see and hear the racket of the linotype machines and the rolling presses.

In the basement playroom of our home was a makeshift darkroom, complete with a cardboard blackout panel for the one window. Here we learned to develop film and make contact prints and enlargements as we watched Dad produce photographs for S&T. Once a year the playroom table became the accounting office, where our maternal grandmother, Mary Louise Thomas Spence, pored over the company books, making this a three-generation family enterprise.

Playing and Working at HCO

The story of how Harvard astronomer Harlow Shapley talked our parents into coming to HCO and merging The Sky, which they produced at the Hayden

Planetarium, with The Telescope, produced at HCO, has been told in earlier issues of S&T.* Shapley provided space for Sky Publishing within the observatory's labyrinth of buildings, including initially a cubbyhole office underneath the stairs leading up to the famous 15-inch refractor.

We grew up with HCO as our playground, exploring its grounds while our parents worked. When they played, it was on the HCO tennis court, so we also learned the game. We sledded on the hill below the 15-inch and took regular outings to HCO's Oak Ridge Observatory in the town of Harvard, Massachusetts, where a summer picnic brought the HCO "family" together. We also regularly convened at the Shapley's HCO residence. Here we sang Christmas carols and watched eminent astronomers, such as Bart Bok, assume their regular roles in the annual holiday pageant "We Three Kings."

Harvard astronomers, faculty, staff, and students supported S&T in many ways and provided most of our parents' social life. Astronomers Dorrit Hoffleit and Cecilia Payne-Gaposchkin were early examples, in addition to our mother, of why women should be treated as professional equals of men.

We were supervised both as young children and as young workers by S&T employees. We remember licking envelopes and stamps by the hundreds for special mailings of the magazine and of other publications, such as Splendors of the Sky. This became Tony's first paid job. We also worked with an Addressograph machine, which used playing-card size mimeograph stencils to address envelopes. The stencils had various color markings to indicate subscription expiration dates and other information. Working with these was guaranteed to produce inky fingers.

[ILLUSTRATION OMITTED]

Other Work

In spite of deadlines, S&T did not require a full month's work to produce, and it certainly did not generate enough income for a young family. During World War II Dad taught astronavigation and meteorology at Harvard and Radcliffe. In the late 1940s he gave planetarium lectures for the start-up Boston Museum of Science. Then, in his own words (from a dictated family history):

During the Korean War, with Helen holding the S&T fort, I took a full time job as head of the Scientific Literature Division of the Air Force Cambridge Research Laboratories ... After about a year and a half I resigned and returned full time to s&t. Of course, my nights and weekends had been devoted to the magazine, which always came first in the Federer menage.

In the early 1950s, at the suggestion of David Ludlum and Kenneth Spengler of the American Meteorological Society in Boston, I

undertook bi-monthly publication of a small popular journal Weatherwise. Dave gathered the articles, I edited them, did the layout and printing supervision. After five years, with S&T growing larger, Dave took over the project himself. But I had learned quite a bit about meteorology.

In the mid 1950s, Dad's final extracurricular activity was as editor of the astronomy entries for Webster's Third International Dictionary. The already cluttered editorial office in the enclosed sunroom of our house became even more so, with a growing collection of index cards for words to be entered into the dictionary.

[ILLUSTRATION OMITTED]

Star Trail

Mom and Dad met in about 1935 in New York City, where they both were working at the Hayden Planetarium. They loved hiking and skiing in New England, so just after World War II they bought an 1850s farm in Danbury, New Hampshire, as a second home and named it "Star Trail" (note the initials). The multiple buildings had no electricity, no insulation, no telephone, and only occasionally running cold water, but we spent many weekends, and sometimes weeks at Star Trail throughout the summer and winter.

[ILLUSTRATION OMITTED]

Our parents often took work to Star Trail, pinning up pages on the big kitchen table as they prepared drinking water by melting snow on the kerosene stove, which, with the fireplace, provided the only heat. When not working we all played canasta by the light of kerosene lamps or listened to records on a hand-cranked Victrola.

Many professional astronomers and Harvard graduate students visited Star Trail, maintaining a family tradition of visitors that began at our grandfather's original country retreat in Branchville, Connecticut, where Bob Cox, of the New York Amateur Telescope Makers (and later a regular S&T contributor), had been a frequent guest. Bob's name also appears in the Star Trail logbook.

Travels Far and Near

Trips were (and still are) important for the editors of S&T. Our parents traveled to meet with current and prospective S&T authors, to encourage the development of amateur astronomy (Dad was a founder and Mom the second president of the Astronomical League), to meet with advertisers, to learn

of new discoveries and scientific developments, and to take photos for the magazine. Our childhood memories are marked by our major trips. As children we were brought up to be self-sufficient--sometimes to an extent that bemused our parents' professional colleagues. In July, 1945, at age 6, Tony was in Bredenbury, Saskatchewan, with our parents for a solar eclipse expedition. He decided to wander away from the eclipse camp and trek two miles into town to find our parents.

[ILLUSTRATION OMITTED]

In Switzerland for the 1948 meeting of the International Astronomical Union (IAU), there were certainly mutterings when the family roped up to climb to the 13,474-foot summit of the Monch near the Jungfrauoch, when Bar was only 6! (Earlier that summer we had climbed California's 14,505-foot Mount Whitney.) Shortly after, our family hiked to the Hornli Hut at the foot of the Matterhorn with long-time S&T author Otto Struve.

In 1955 we were at an IAU reception at the home of the President of Ireland, Sean O'Kelly. Bar asked Mrs. O'Kelly's permission to go into the house and wander around while the president and his wife were outside talking to people. Later, in imitation of Dad's role as S&T photographer, Bar asked them if she could take their picture, so they said yes and dutifully formed a group.

On the same trip, in England, we joined many others at a formal luncheon at the new Jodrell Bank Transit Radio Telescope, and stopped by the then-soon-to-be new home of the Royal Greenwich Observatory at Herstmonceux.

In the U.S., our travels took us to 47 of the 48 states. One eclipse trip stands out for cliff-hanging adventure; on June 30, 1954 we hastily left a campsite (and most of the astronomical community) on the shore of Lake Michigan and made an overnight drive to avoid overcast skies. We arrived at Clam Lake, Wisconsin, just in time for a spectacular (and mosquito-ridden) view of a sunrise total solar eclipse. One of our eclipse photos appeared in the October 1954 issue of S&T.

There was usually time for stops at various National Parks and Monuments or for assaults up available peaks or down into canyons and craters. We paid several visits to Mesa Verde, the Grand Canyon, and Arizona's Meteor Crater. Sometimes, however, we had to travel quickly between meetings and back home for the next deadline.

In those days before the interstate highways we'd use the straight-through approach to getting home--Bar navigating for Dad while Mom slept on the back seat and Tony slept on a duffel bag between the seats, then we'd all switch positions. As kids we learned how to read maps, resulting much later

in competitive orienteering for both our families. Camping out was frequent on these trips, particularly in National Forests, which led Tony into a career as a U.S. Forest Service scientist. In later years the family had Nash Ramblers in which the seats could be flattened to allow cramped sleep for the whole family in the car.

Trips closer to S&T's home included Stellafane in Vermont after the famed telescope-making convention re-convened in 1954 following an interruption that began during the war years. The programs of that time list not only our father, but also many names in the world of amateur telescope making who were old family friends: Bob Cox, Chet Cook (Bar's piano teacher), Jim Baker, Earle Brown, and Armand Spitz.

The End of an Era

For more than 15 years, we heard many loud, even rancorous debates between our strong-willed and perfectionist parents. They argued long and hard about the magazine and the business, but only rarely about non-business life and the major task of raising children. We were not aware of any separation or hierarchy of responsibilities or decisions, though Mom certainly did buffer and soften Dad's frequent arrogance and rectitude.

Looking back on Dad's strong personality, we have always been amazed at his ability to hire and retain so many long-term employees over so many decades. Perhaps they recognized that he held himself to the same high standard he expected of others--having to publish a correction in the magazine was anathema and very rare.

The stress of partnership took its toll, and by 1955 their close relationship began to break up. Tony was off at college, but Bar lived through the marital and business separation during her last years of high school. The break was gradual and reasonably amicable; our parents weren't officially divorced until 1965. Mom left S&T in 1956 and within a year went back to work as Administrative Officer at HCO, from where she retired in 1976.

[ILLUSTRATION OMITTED]

Other changes came too. Professional astronomer Joe Ashbrook joined S&T in 1953, and in the late 1950s the magazine moved to Bay State Road in Cambridge, which became its home for the next half century. The business expanded rapidly, especially with the advent of the Space Age. S&T no longer needed the services of its junior editors/mailling operators/general hands, and we were ready to launch ourselves into college and our adult lives. But we always fondly remember growing up with the magazine that was an inseparable part of our family.

* Major articles appeared in this magazine's November 1986 issue (The Story of "The Sky") and November 1991 issue (How S&T Came To Be). Digital copies of all issues of Sky & Telescope, as well as The Sky and The Telescope, can be purchased at SkyandTelescope.com.

Lasting Legacy

Although difficult to measure, Sky & Telescope's contributions to amateur astronomy have been enormous, especially during the hobby's growth spurt in the years after World War II. For example, New York City postal worker Allyn J. Thompson, pictured here, wrote a series of articles about building his 6-inch reflector that were re-published in book form in 1947. *Making Your Own Telescope* went on to become one of the most influential works in the world of amateur telescope making, and only recently has the book gone out of print.

[ILLUSTRATION OMITTED]

Project Moonwatch

During the 1950s Sky & Telescope was more than just a chronicler of events leading up to the Space Age. Through a series of special supplements bound into issues beginning in 1956, the magazine provided a vital source of communication among Moonwatch volunteers organized by the Smithsonian Astrophysical Observatory to track the first artificial satellites. Observing teams at Philadelphia's Franklin Institute (right) and Fort Worth, Texas (below), were among those featured in S&T's Moonwatch coverage.

[ILLUSTRATION OMITTED]

[ILLUSTRATION OMITTED]

Barbara Meredith has lived near London, England, since leaving college in 1962. Semi-retired from a varied career in the arts and social sciences, she still raises fruits and vegetables with the skills she learned 60 years ago in the sandy soil of Star Trail. C. Anthony Federer continued to live in New Hampshire after Star Trail, and now practices his orienteering skills with a sky chart and his 8-inch reflector named "Charlie."

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DIALOG(R)

A planet blacker than the blackest coal.

Sky & Telescope, v122, n5, p12(1)

Tuesday, November 1, 2011

TEXT:

Exoplanets keep coming in ever more alien varieties. The latest is a hot giant that's darker than powdered charcoal.

The planet, TrES-2b, closely orbits an 11th-magnitude Sun-like star 700 light-years away in Draco. Speeding around just 3 million miles from the star, the planet is so brilliantly illuminated that it should be hotter than 1,800[degrees]F (1,000[degrees]C).

David Kipping (Harvard-Smithsonian Center for Astrophysics) and David Spiegel (Princeton University) used precision photometry from NASA's Kepler mission to tease out the planet's reflected light from the system's total light, when the planet orbits around to the far side of the star and shows us its full lit face. They found that the planet reflects less than 1% of the light hitting it--making it blacker than any ordinary substance on Earth.

[ILLUSTRATION OMITTED]

Astronomers had already found that some, but not all, "hot Jupiters" are quite dark, as might be expected from the black dust that ought to condense high in their broiling atmospheres. But no one knows why TrES-2b is so extraordinarily dark. "We can't, as of now, identify the molecular species that's responsible for this absorption," says Spiegel.

"This discovery is less about something completely new," comments planetary scientist Sara Seager (MIT), "and more about adding to the growing evidence that a class of hot Jupiters is indeed very dark."

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Record - 10

DIALOG(R)

Say what?

Carlisle, Camille M.,

Science News, v180, n7, p4(1)

Saturday, September 24, 2011

TEXT:

[ILLUSTRATION OMITTED]

gyrochronology
jai-roh-kron-AH-lo-gee
n.

The measurement of a star's age by clocking its spin rate. Usually researchers can date stars only by looking at them in a cluster and finding ones that have reached a distinctive point in their evolution. But most stars also spin more slowly as they age, like a top spinning on a table, Soren Meibom of the Harvard-Smithsonian Center for Astrophysics reported May 23 at the American Astronomical Society meeting in Boston. The finding could help astronomers estimate the ages of solo stars--which are thought to be more likely to host planets (as illustrated above)--using the stars' color and rotation rate.

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Record - 11

DIALOG(R)

ALMA telescope poised to peer into hidden corners of the cosmos,

Pete Spotts, Staff writer,

Christian Science Monitor (USA), ALL ed,

Wednesday, October 5, 2011

TEXT:

Sitting atop a plateau some 16,500 feet high, a growing array of upturned dishes has started to plumb the secrets of planet formation and star formation in early galaxies, and promises to take astronomers to the very brink of a supermassive black hole at the center of the Milky Way.

This marks the first week of science operations for the Atacama Large Millimeter/submillimeter Array (ALMA), perched high in Chile's Atacama Desert a(euro)" by all accounts the driest desert on the planet.

That may be bad news for fish, but for astronomers, the desert's extreme aridity is welcome. The array observes the universe in a region of the electromagnetic spectrum whose radiation is readily absorbed by water vapor. The radiation ranges from the extreme high end of radio frequencies to the extreme low end of infrared light. In this range, cosmic objects obscured by dust or hidden deep within the cold interstellar clouds where

stars eventually form a(euro)" barely visible to most telescopes a(euro)" burst into brilliance.

ALMA has been a long time coming. "I attended my first ALMA planning meeting in 1983," says Al Wootten, a researcher at the National Radio Astronomy Observatory headquarters in Charlottesville, Va., and the program's project scientist.

Now, he says, the observatory has 22 dish antennas installed, each just over 39 feet across. Sixteen of the 22 are now operational, en route to 66 antennas by 2013.

Signals coming in from each are combined to build images of the objects astronomers are studying, and the antennas are mobile, allowing the facility to vary the level of detail the array can capture. In their most compact array, the antennas have the ability to capture detail comparable to a single dish 525 feet across. At their maximum spread, the 66 antennas will collectively match the resolving power of a single dish 10 miles wide.

That capability opens the way for a range of new observations, Dr. Wootten says.

Seeing beyond the dust Hints of the potential for studying the distant cosmos at ALMA's wavelengths began to appear in 1998. Researchers were trying to determine when the universe underwent its most intense burst of star formation. Based on visible and ultraviolet images gathered by the Hubble Space Telescope, it appeared that star formation peaked between 4 billion and 6 billion years ago. Not much appeared to be happening earlier than that.

But a team using the James Clerk Maxwell submillimeter telescope on Hawaii's Mauna Kea observed galaxies producing new stars at enormous rates back to about 8 billion years ago a(euro)" activity Hubble couldn't see because it was obscured by dust.

This ability of submillimeter telescopes like ALMA to see into the murky regions of the universe could lead to further discoveries. For instance, astrophysicists want to know if these locally bright, early starburst galaxies had dimmer, "normal" kin more like the Milky Way. ALMA is the first instrument sensitive enough to detect dimmer galaxies that might be present during those early times, Wootten says.

"Were there galaxies such as the Milky Way, which we would call normal galaxies, or were galaxies fundamentally different then?" he asks.

Witness to planet formation? Another objective is to capture images of planet formation around other stars at its earliest stages, when objects

are still shrouded with dust.

One early target is a star known as AU Microscopii, which is only about 1 percent of the sun's age.

If planets are orbiting the star, some 33 light-years away, they could leave "observable signatures on the dust," says David Wilner, an astronomer at the Harvard-Smithsonian Center for Astrophysics in Cambridge, Mass.

Those signatures would appear as "long-lived concentrations, such as clumps or eccentric rings," he says.

An eight-dish telescope on Mauna Kea known as the Submillimeter Array has identified several stars where these features may be present, Dr. Wilner says, but this smaller facility can't produce images with the level of detail needed to spot the features.

"This is where ALMA will really shine," Wootten says.

Window on a black hole For some researchers, one of the most exciting prospects for ALMA involves using it as a window on the innermost regions around the supermassive black hole that sits at the center of the Milky Way.

Black holes in the million to billion solar-mass range are thought to lie at the heart of virtually every galaxy. The Milky Way's monster tips the scales at some 4 million times the mass of the sun.

Although ALMA will be able to make some valuable images on its own, the major advances are likely to come when ALMA is linked to the array on Mauna Kea, as well as to submillimeter telescopes elsewhere to act as one virtual dish thousands of miles across a (euro)" a project known as the Event Horizon Telescope.

Such a telescope would allow astronomers to view the space around the black hole in sufficient detail to image processes taking place at the black hole's event horizon, the slippery slope down which matter around the object falls, never to escape.

Although a black hole's gravity is so intense that not even light can escape, these objects signal their presence by the effect they have on matter falling into them. As matter approaches, it gets compressed under the intensifying gravity, heats, and emits radiation.

Using a smaller array in 2008 and a slightly larger one in 2009, scientists spotted radiation coming from a very tiny source where the Milky Way's black hole is said to lurk. And they saw changes from one year to the next.

"We now know there's something very tiny, and it's changing," says Sheperd Doeleman, an astronomer with the Massachusetts Institute of Technology's Haystack Observatory, in Westford, Mass., who worked on the array in 2008 and 2009 and is leading the Event Horizon Telescope effort.

This opens the possibility of observing matter as it makes its final spiral into the event horizon, he says.

One feature the team will seek is a black hole's shadow. The black hole's gravity is so strong that it can bend radiation all the way around it. Theory predicts that this would generate a ring of radiation around the black hole that, when seen edge on, would be brightest on the side where matter is orbiting toward an observer and dimmer where orbiting away. Seen from above, it would look like bit like a doughnut a(euro)" a bright arc with a dim center.

"This only happens where you get an object that is so incredibly dense that light is being bent by gravity in a very severe way," Dr. Doeleman says.

To see this, "the key, really, is ALMA," with its unprecedented resolution and sensitivity, he says.

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Record - 12

DIALOG(R)

3 Win Nobel for Work on Accelerating Universe,
DENNIS OVERBYE,
New York Times (NY), Late Edition - Final ed, p11,
Wednesday, October 5, 2011

TEXT:

CORRECTION APPENDED

Three astronomers won the Nobel Prize in Physics on Tuesday for discovering that the universe is apparently being blown apart by a mysterious force that cosmologists now call dark energy, a finding that has thrown the fate of the universe and indeed the nature of physics into doubt.

The astronomers are Saul Perlmutter, 52, of the Lawrence Berkeley National Laboratory and the University of California, Berkeley; Brian P. Schmidt, 44, of the Australian National University in Canberra; and Adam G. Riess, 41, of the Space Telescope Science Institute and Johns Hopkins University in Baltimore.

"I'm stunned," Dr. Riess said by e-mail, after learning of his prize by reading about it on The New York Times's Web site.

The three men led two competing teams of astronomers who were trying to use the exploding stars known as Type 1a supernovae as cosmic lighthouses to limn the expansion of the universe. The goal of both groups was to measure how fast the cosmos, which has been expanding since its fiery birth in the Big Bang 13.7 billion years ago, was slowing down, and thus to find out if its ultimate fate was to fall back together in what is called a Big Crunch or to drift apart into the darkness.

Instead, the two groups found in 1998 that the expansion of the universe was actually speeding up, a conclusion that nobody would have believed if not for the fact that both sets of scientists wound up with the same answer. It was as if, when you tossed your car keys in the air, instead of coming down, they flew faster and faster to the ceiling.

Subsequent cosmological measurements have confirmed that roughly 70 percent of the universe by mass or energy consists of this antigravitational dark energy that is pushing the galaxies apart, though astronomers and physicists have no conclusive evidence of what it is.

The most likely explanation for this bizarre behavior is a fudge factor that Albert Einstein introduced into his equations in 1917 to stabilize the universe against collapse and then abandoned as his greatest blunder.

Quantum theory predicts that empty space should exert a repulsive force, like dark energy, but one that is 10 to the 120th power times stronger than what the astronomers have measured, leaving some physicists mumbling about multiple universes. Abandoning the Einsteinian dream of a single final theory of nature, they speculate that there are a multitude of universes with different properties. We live in one, the argument goes, that is suitable for life.

"Every test we have made has come out perfectly in line with Einstein's original cosmological constant in 1917," Dr. Schmidt said.

If the universe continues accelerating, astronomers say, rather than coasting gently into the night, distant galaxies will eventually be moving apart so quickly that they cannot communicate with one another and all the energy will be sucked out of the universe.

Edward Witten, a theorist at the Institute for Advanced Study, Einstein's old stomping grounds, called dark energy "the most startling discovery in physics since I have been in the field." Dr. Witten continued, "It was so startling, in fact, that I personally took quite a while to become

convinced that it was right."

He went on, "This discovery definitely changed the way physicists look at the universe, and we probably still haven't fully come to grips with the implications."

Dr. Perlmutter, who led the Supernova Cosmology Project out of Berkeley, will get half of the prize of 10 million Swedish kronor (\$1.4 million). The other half will go to Dr. Schmidt, leader of the rival High-Z Supernova Search Team, and Dr. Riess, who was the lead author of the 1998 paper in *The Astronomical Journal*, in which the dark energy result was first published.

All three astronomers were born and raised in the United States; Dr. Schmidt is also a citizen of Australia. They will get their prizes in Stockholm on Dec. 10.

Since the fate of the universe is in question, astronomers would love to do more detailed tests using supernovas and other observations. So they were dispirited last year when NASA announced that cost overruns and delays on the James Webb Space Telescope had left no room in the budget until the next decade for an American satellite mission to investigate dark energy that Dr. Perlmutter and others had been promoting for almost a decade. Indeed on Tuesday the European Space Agency announced that it would launch a mission called Euclid to study dark energy in 2019. Cosmic expansion was discovered by Edwin Hubble, an astronomer at the Mount Wilson Observatory in Pasadena, Calif., in 1929, but the quest for precision measurements of the universe has been hindered by a lack of reliable standard candles, objects whose distance can be inferred by their brightness or some other observable characteristic. Type 1a supernovae, which are thought to result from explosions of small stars known as white dwarfs, have long been considered uniform enough to fill the bill, as well as bright enough to be seen across the universe.

In the late 1980s Dr. Perlmutter, who had just gotten a Ph.D. in physics, devised an elaborate plan involving networks of telescopes tied together by the Internet to detect and study such supernovae and use them to measure the presumed deceleration of the universe. The Supernova Cosmology Project endured criticism from other astronomers, particularly supernova experts, who doubted that particle physicists could do it right.

Indeed, it took seven years before Dr. Perlmutter's team began harvesting supernovae in the numbers it needed. Meanwhile, the other astronomers had formed their own team, the High-Z team, to do the same work.

"Hey, what's the strongest force in the universe?" Robert P. Kirshner of the Harvard-Smithsonian Center for Astrophysics, and a mentor to many of

the astronomers on the new team, asked a reporter from this newspaper once. "It's not gravity, it's jealousy," Dr. Kirshner said.

In an interview with The Associated Press, Dr. Perlmutter described the subsequent work of the teams as "a long aha." The presence of dark energy showed up in an expected faintness on the part of some distant supernovae: the universe had sped up and carried them farther away from us than conventional cosmology suggested.

As recounted by the science writer Richard Panek in his recent book, "The 4% Universe, Dark Matter, Dark Energy, and the Race to Discover the Rest of Reality," neither team was eager to report such a strange result.

In January 1998, Dr. Riess interrupted preparations for his honeymoon to buck up his comrades. "Approach these results not with your heart or head but with your eyes," he wrote in an e-mail. "We are observers after all!"

In the years since, the three astronomers have shared a number of awards, sometimes giving lectures in which they completed one another's sentences. A Nobel was expected eventually.

"No more waiting!" Dr. Kirshner said Tuesday.

Online Correction: October 4, 2011, Tuesday

This article has been revised to reflect the following correction: An earlier version of this article incorrectly stated the publication in which Adam G. Riess's 1998 paper on dark energy appeared. It was The Astronomical Journal, not Science. The article also stated incorrectly the amount of the prize. It is 10 million Swedish kronor (\$1.4 million).

PHOTOS: Top, a Type 1a supernova outside a galaxy in the Virgo cluster, the kind that figured in the Nobel-winning work of Saul Perlmutter, left, Adam G. Riess and Brian P. Schmidt on dark energy. (PHOTOGRAPHS BY CHANDRA; BEN MARGOT/ASSOCIATED PRESS; DON BLAKE/REUTERS; REUTERS)

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Record - 13

DIALOG(R)

Nobel-winning discovery on universe has Harvard roots

Carolyn Y. Johnson

Boston Globe (MA), p1

Wednesday, October 5, 2011

TEXT:

The Nobel Prize in physics was awarded yesterday for the surprising discovery that the universe's expansion is speeding up, not slowing down, a finding that has transformed scientists' understanding of the universe and has deep roots at Harvard University

In the run-up to the discovery in 1998, the effort to determine the universe's rate of expansion became a high-stakes race between two rival teams, one based at the Lawrence Berkeley National Laboratory and the other an international team with strong local ties. Two of the Nobelists - Brian Schmidt of Australian National University and Adam Riess of Johns Hopkins University in Baltimore - were graduate students at Harvard

It is in Cambridge where they did their scientific training and got started on the work that would ultimately build to their Nobel, working with Robert Kirshner, a Harvard professor and member of the High-Z Supernova Search Team that made the discovery, though he did not share in the prize. Riess and Schmidt will each receive a quarter of the \$1.4 million prize, while Saul Perlmutter, an astrophysicist at Berkeley and a Harvard graduate, will receive half

"I think it would be great if the Nobel prize could go to entire teams of people, because it's really a lot of teamwork that allows these projects to succeed," Riess said during a press conference. "If you want to know how science is really done and how recognition is doled out - I think it should be the whole team. I wish that could be true."

Kirshner, an astronomer at the Harvard-Smithsonian Center for Astrophysics who advised both students and played a role in the then-startling discovery that the universe's expansion was accelerating, said that he had heard from both of them already and that he hoped to attend the award ceremony

"This is very good; now we don't have to wait anymore," Kirshner said in an interview. "It was a good choice. I want to go to Stockholm; I'm keeping December open."

Since 1929, scientists have known that the universe is expanding, as a result of the Big Bang nearly 14 billion years ago. But astronomers thought that the expansion was slowing down because of gravity, although there was vigorous debate about how fast that was happening.

Scientists began to use the brightness of exploding stars, called supernovae, as a measurement of the rate of expansion. Initial results from the rival team in California in 1996 seemed to square with people's expectations: The universe's expansion was slowing down.

"They said the universe looks like it's slowing down, just the way everybody expected," Kirshner said. "We thought we've worked on supernovae

a lot. . . . If we only knew how to find the distant ones, we can do that. I said - the other guys have been working for five years. Brian said we could do this. . . . He said, 'I could do it in a month.' It was partly youthful exuberance, but also true. He did have something working in a month."

Over the course of the research, Schmidt, who led the team, moved to Australia, and Riess moved to Berkeley. But they continued working with other team members, on results that they initially thought could not be right. The supernovae appeared dimmer than expected, suggesting that the universe's expansion was speeding up, not slowing down.

As a graduate student in the 1990s, Riess had written his doctoral thesis on devising ways to measure the distance and brightness of supernovae to account for whether a star was dim because it was actually that dim; because it was far away; or because its light was being obscured by dust

"That was one of the techniques that allowed us to have the confidence in our results, that we weren't fooled by one of the other effects, that it was the universe accelerating," Riess said

Alan Guth, a physics professor at MIT, said that the finding went against the prevailing understanding of the universe

"It was a big shock," Guth said. "We did not expect it, and it really has dramatically changed both our view of cosmology and, perhaps even more important, our understanding, or the lack of it, of fundamental physics itself."

Riess, who played games of "mud football" with some of his peers on the Perlmutter team in California, said that competition helped move the work forward because it was becoming clear in early 1998 that the rival team had concurrently been finding its own evidence that the universe's expansion was accelerating.

Riess said many questions remain to be explored, such as understanding the nature of dark energy, the mysterious energy that has been proposed as the cause for the acceleration and is thought to make up most of the universe.

Riess, a Red Sox fan from his days in Boston, was asked whether winning the Nobel takes the sting out of the team not making the playoffs

"I spent a lot of years in Boston, so I got to see a lot of collapses," he said. "I think nothing ever takes the sting out of those."

Carolyn Y. Johnson can be reached at cjohnson@globe.com. Follow her on Twitter @globecarolynj.

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Record - 14

DIALOG(R)

Discoveries on expansion of universe win Nobel Prize for three physicists,

DICK AHLSTROM, Science Editor,

Irish Times, Daily ed, p11,

Wednesday, October 5, 2011

TEXT:

Wed, Oct 05, 2011 - THREE PHYSICISTS who discovered why we have a very cold, very dark future ahead of us have won the 2011 Nobel Prize for physics. Their realisation that the universe is expanding at a faster and faster rate has transformed our understanding of how the cosmos works.

Saul Perlmutter of the Lawrence Berkeley National Laboratory at the University of California, Berkeley, Brian Schmidt of the Australian National University and Adam Riess from Johns Hopkins University and the Space Telescope Science Institute share the coveted \$1.5 million ((euro)1.14 million) prize.

Working in two separate research teams, they astounded the world's science community in 1998 with the news that our universe was expanding at a faster and faster rate.

They achieved this by using exploding stars - supernovas - as a kind of measuring tape to gauge distances for billions of light years across space. Their ability to use these "standard candles" as an extremely accurate measuring system proved conclusively that the expansion of spacetime was speeding up.

The assumption for decades had been that the universe was expanding but at a slowing rate as gravity gradually put the brakes on. The discovery shook cosmological theory to the core however and helped spawn the idea that some kind of "anti-gravity" was pushing everything apart.

This force, dubbed dark energy, is now estimated to make up about 75 per cent of the mass/energy of the universe and remains one of the most profound mysteries of astrophysics. It is expected in time to deliver a cold, dark universe as galaxies are carried further and further apart and as stars age and grow dim.

Schmidt and Riess took measurements using their supernova metre sticks at the Harvard Smithsonian Centre for Astrophysics. They will share half the cash award, while competitor Perlmutter of the Supernova Cosmology Project

claims the other half for his research efforts.

"It seemed too crazy to be right and I think we were a little scared," Schmidt said yesterday, while Perlmutter said the finding was a "huge surprise".

Riess used an effective analogy to describe it all. "If you tossed a ball into the air and it kept right on going up instead of falling to the ground, you'd be pretty surprised. Well that's about how surprised we were."

The results show the universe is expanding but "all bets [were] off" about whether the expansion would actually continue forever, Riess declared. "The universe could still recollapse," he warned yesterday.

The discovery "revolutionised our understanding of the universe", said University College Cork professor of physics Paul Callanan. "It was completely unexpected, as some of the best discoveries are," said emeritus professor Mike Redfern of NUI Galway's Centre for Astronomy.

"It is the most striking discovery to have been made since I became involved in physics," said Prof Edward Witten, professor of physics at the Institute for Advanced Study in Princeton, New Jersey. "It changes our understanding of the universe."

Additional reporting: Reuters
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Record - 15

DIALOG(R)

3 astronomers share Nobel in physics,

DENNIS OVERBYE,

International Herald Tribune, p4,

Wednesday, October 5, 2011

TEXT:

Three astronomers were awarded the Nobel Prize in Physics on Tuesday for discovering that the universe is apparently being blown apart by a mysterious force that cosmologists now call dark energy, a finding that has thrown the fate of the universe and indeed the nature of physics into doubt.

They are Saul Perlmutter of the Lawrence Berkeley National Laboratory, in Berkeley, California; Brian P. Schmidt of the Australian National University, in Weston Creek, Australia; and Adam G. Riess of the Space

Telescope Science Institute and The Johns Hopkins University, in Baltimore, Maryland.

They were the leaders of two competing teams of astronomers who were trying to use the exploding stars known as Type 1a supernovae as cosmic lighthouses to measure the expansion of the universe.

They were hoping to measure how much the universe, which has been expanding since its fiery birth in the Big Bang 14 billion years ago, was slowing down, and thus to find out if its ultimate fate was to fall back together in what is called a Big Crunch. Instead, they reported in 1998, it was inexplicably speeding up, a conclusion that nobody would have accepted if not for the fact that both groups wound up with the same answer. It was as if, when you tossed your car keys in the air, instead of coming down, they flew faster and faster to the ceiling.

At the time, Dr. Schmidt said, "we were a little scared."

Subsequent cosmological measurements have confirmed that roughly 70 percent of the universe by mass or energy consists of this anti-gravitational dark energy, though astronomers and physicists have no conclusive evidence of what it is.

The most likely explanation for this bizarre behavior is a fudge factor that Albert Einstein introduced into his equations in 1917 to stabilize the universe against collapse, and then abandoned as his greatest blunder.

Quantum theory predicts that empty space should exert a repulsive force, like dark energy, but one that is 10 to the 120th power times stronger than what astronomers have measured. Abandoning the Einsteinian dream of a single final theory of nature, some physicists speculate that there are a multitude of universes with different properties. We live in one, the argument goes, that is suitable for life.

"Every test we have made," Dr. Schmidt said, "has come out perfectly in line with Einstein's original cosmological constant in 1917."

If the universe continues accelerating, astronomers say, rather than coasting gently into the night, distant galaxies will eventually be moving apart so quickly that they cannot communicate with one another and all the energy will be sucked out of the universe.

Edward Witten, a theorist at the Institute for Advanced Study, Einstein's scientific refuge in Princeton, New Jersey, called dark energy "the most startling discovery in physics since I have been in the field."

"It was so startling, in fact, that I personally took quite a while to become convinced that it was right," he said. "This discovery definitely changed the way physicists look at the universe, and we probably still haven't fully come to grips with the implications."

Dr. Perlmutter, who led the Supernova Cosmology Project out of Berkeley, will get half of the prize of 10 million Swedish kronor, or about \$1.4 million. The other half will go to Dr. Schmidt, leader of the rival High-Z Supernova Search Team, and Dr. Riess, who was the lead author of the 1998 paper in *The Astronomical Journal* in which the dark energy result was first published. All three were born and raised in the United States; Dr. Schmidt is also a citizen of Australia. They are to receive their prizes in Stockholm on Dec. 10.

Astronomers would love to do more detailed tests, using supernovae and other observations, so they were dispirited last year when the U.S. space agency announced that cost overruns and delays on the James Webb Space Telescope had left no room in the budget until the next decade for a satellite mission to investigate dark energy that Dr. Perlmutter and others had been promoting for almost a decade.

Cosmic expansion was discovered in 1929 by Edwin Hubble, an astronomer at the Mount Wilson Observatory in Pasadena, California, but the quest for precision measurements of the universe has been hindered by a lack of reliable standard candles, objects whose distance can be inferred by their brightness of some other observable characteristic. Type 1a supernovae have long been thought to be uniform enough to fill the bill as well as bright enough to be seen across the universe.

In the late 1980s, Dr. Perlmutter devised an elaborate system, involving networks of telescopes tied together by the Internet, to detect and study such supernovae and use them to measure the presumed deceleration of the universe. The project endured criticism from other astronomers, particularly supernova experts, who doubted that particle physicists could do it right.

Indeed, it took seven years before Dr. Perlmutter's team began harvesting supernovae in the numbers they needed. Meanwhile, the other astronomers had formed their own team, the High-Z team, to do the same work.

"Hey, what's the strongest force in the universe?" Robert P. Kirshner of the Harvard-Smithsonian Center for Astrophysics, a mentor to many of the astronomers on the new team, once asked. "It's not gravity - it's jealousy."

But by both teams' measurements, the presence of dark energy showed up in

an expected faintness on the part of some distant supernovae: the universe had sped up and carried them farther away from us than conventional cosmology suggested.

"The chain of analysis was so long that at first we were reluctant to believe our result," Dr. Perlmutter said, according to Reuters. "But the more we analyzed it, the more it wouldn't go away. "It was the longest 'Aha!' moment ever."

As recounted by the science writer Richard Panek in his recent book, "The 4% Universe: Dark Matter, Dark Energy, and the Race to Discover the Rest of Reality," neither team was eager to report such a strange result.

In January 1998, Dr. Riess took time off from his honeymoon to go over the results one more time and then notified his comrades by e-mail: "Approach these results not with your heart or head but with your eyes. We are observers after all!"

In the years since, the three astronomers have shared a number of awards, sometimes giving lectures in which they completed each other's sentences. A Nobel was expected eventually.

"No more waiting!" Dr. Kirshner said Tuesday.

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Record - 16

DIALOG(R)

Smithsonian@ Renews, Expands Master Toy License with NSI International, Inc. @,

AP Alert – Business,
Tuesday, October 4, 2011

TEXT:

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TO BUSINESS, AND EDUCATION EDITORS:

Smithsonian@ Renews, Expands Master Toy License with NSI

International, Inc. @

NEW YORK, Oct. 4, 2011 /PRNewswire/ -- NSI International, Inc. and the Smithsonian Institution announce the renewal of their long-standing

licensing agreement for science-based toys, as well as expansion into a new line of crafts kits for kids.

In addition to continuing with core science SKUs, the NSI product team has worked extensively with Smithsonian paleontologists, geologists, astronomers, and more to develop new, engaging experiences for kids.

The goal of the new program is to create amazing experiences that connect kids to their love of learning, and celebrate what is special about the Smithsonian.

New product releases include the Galaxies Planetarium, featuring images from so deep into space, they could only be captured by the Chandra telescope, run by the Smithsonian Astrophysical Observatory. This amazing new product also projects the stars of the northern sky onto your ceiling and walls -- effectively turning your bedroom into both a planetarium, and a deep space observatory.

The expansion into craft kits will offer additional ways for kids to experience the vast stories told across the Smithsonian's 19 museums and National Zoo, and to express their own unique connections to those stories through art. "NSI is very excited to expand our Smithsonian master toy license into the craft category," says Brian Waldman SVP, NSI. "By giving kids the tools they need to create their own 'masterpieces,' it's almost like they're making their own mini-museums

at home."

"We're looking forward to continuing this partnership, and to all the new ways in which we can bring the museums' most exciting experiences

to life for kids and families at home," said Carol LeBlanc, Vice

President, Smithsonian Enterprises.

About Smithsonian Institution:

Founded in 1846, the Smithsonian is the world's largest museum and research complex, consisting of 19 museums and galleries, the National Zoological Park and nine research facilities. There are 6,000 Smithsonian employees and 6,500 volunteers. In 2010, there were approximately 30 million visits to the Smithsonian, with 188 million visits to the Smithsonian websites. There are 137 million objects, works of art and specimens at the Smithsonian.

About NSI International, Inc.:

NSI International Inc. is a global marketer and manufacturer of creative toy and consumer products including Smithsonian@ Science kits, Magic RocksT and its own craft and activity brands. NSI's products can be found in thousands of retail locations in more than 30 countries around the globe.

CONTACT: NSI International Inc. Brian Waldman (212) 993-6228 ext. 1009

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Record - 17

DIALOG(R)

Smithsonian(R) Renews, Expands Master Toy License with NSI International, Inc.(R)

PR Newswire

Tuesday, October 4, 2011

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SOURCE NSI International, Inc.

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Record - 18

DIALOG(R)

World's largest radio telescope ALMA opens its eye on Universe,
ANI,
Asian News International,
Tuesday, October 4, 2011

TEXT:

Washington, Sept 04 (ANI): The most complex ground-based astronomy observatory on Earth has opened its eyes for the first time, 5,000 metres above sea level in Chile's northern Atacama Desert.

ALMA, the Atacama Large Millimeter/submillimeter Array, was officially opened for astronomers on Monday after a decade of planning and construction.

The 1.35-billion-dollars telescope, a joint project by the United States, the European Union, Canada, Chile, Japan and Taiwan, will explore some of the darkest, coldest, farthest, and most hidden secrets of the Cosmos.

"We went to one of the most extreme locations on Earth to build the world's largest array of millimeter/sub-millimeter telescopes having a level of technical sophistication that was merely a dream only a decade ago," said Dr. Mark McKinnon, North American ALMA Project Manager at the National Radio Astronomy Observatory (NRAO) in Charlottesville, Virginia.

"We made the impossible possible. This truly is a great occasion!" he added.

ALMA, which is under construction, is currently using 16 large antennas to see wavelengths of light that are much longer than what the human eyes can see. Eventually it will use 66 antennas.

Over 900 project proposals were submitted from around the world, competing to be the first ones to explore the universe using ALMA.

However, its first round of scientific observations, dubbed "Early Science", will be limited to 100 projects.

The successful projects were chosen based on their scientific value, their regional diversity, and also their relevance to ALMA's major science goals.

Among the projects chosen for "Early Science" observations is the hunt for the building blocks of solar systems by a team led by David Wilner of the Harvard-Smithsonian Center for Astrophysics in Cambridge, Massachusetts. In another project, Japanese astronomer Masami Ouchi of the University of Tokyo will observe Himiko, a very distant galaxy that produces at least 100 suns' worth of stars every year and surrounded by a giant, bright nebula.

Dr. Simon Casassus, from the University of Chile, and his team will use ALMA to observe the gas and dust disk around HD142527, a young star that is 400 light years away.

ALMA will also hunt for cold gas and dust tracers here, as far back as a few hundred million years after the Big Bang, at a time astronomers call "cosmic dawn."

By 2013, ALMA will be an up to 11-mile wide array of 66 ultra-precision millimeter/submillimeter wave radio telescopes working together as one and built by ALMA's multinational partners in North America, East Asia, and Europe. (ANI)

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Record - 19

DIALOG(R)

Red radiotelescopios ALMA comienza operaciones desde Chile,
Xinhua Spanish,
Monday, October 3, 2011

TEXT:

SANTIAGO, Oct 03, 2011 (Xinhua via COMTEX News Network) -- La red de radiotelescopios ALMA, la mas avanzada del mundo, instalada en el desierto de Atacama en el norte de Chile, comenzo hoy sus operaciones cientificas.

La red quedo lista tras la instalacion de 16 de las 66 gigantescas antenas, que supone la primera etapa del proyecto ALMA (Atacama Large Millimeter/submillimeter Array).

La primera imagen obtenida este lunes ofrecio una vista unica del Universo, imposible de obtener con los telescopios que observan luz visible e infrarroja y revela la caracteristica esencial del proyecto, la posibilidad de captar el Universo a mayor distancia y remontarse mas atras en el tiempo, indicaron cientificos de la agencia ESO, el socio europeo de ALMA. Al finalizar la instalacion de las 66 antenas y funcione como un unico radiotelescopio, sera el observatorio terrestre mas grande que se haya construido, lo que contribuira de acuerdo con los cientificos a aproximar a la Tierra a momentos de la formacion de los planetas y las estrellas que ocurrieron hace miles de millones de anos.

Ubicado a unos 3.000 metros de altura, en el desierto mas arido del mundo, el conjunto principal de la red de radiotelescopios ocupara un area de 5.650 metros cuadrados en la que habra 54 antenas de 12 metros de diametro y otras 12 de siete metros.

Su funcion es captar y concentrar las ondas de radio submilimetricas que llegan desde el Cosmos y que han emitido los astros desde su origen.

"Incluso en esta fase tan temprana, ALMA ya supera a todos los conjuntos submilimetricos que existen. Alcanzar este hito es un homenaje al notable esfuerzo de muchos cientificos e ingenieros de regiones de todo el mundo asociadas con ALMA, quienes hicieron esto posible", dijo el director general de ESO, Tim de Zeeuw.

Fruto de la colaboracion entre Europa, America del Norte y Japon, el radiotelescopio ha llevado a miles de cientificos a competir por transformarse en los primeros investigadores que podran explorar el cosmos con esta nueva herramienta astronomica.

En marzo pasado, 923 proyectos de todo el mundo postularon para investigar en Alma durante este primer periodo. Aunque de estos fueron seleccionados solo 112 planes de investigacion.

Uno de los proyectos elegidos para la Ciencia Inicial es el de David Wilner del Harvard-Smithsonian Center for Astrophysics de Cambridge (Massachusetts, Estados Unidos).

"Mi equipo busca los componentes basicos de los sistemas solares, y ALMA es la mejor herramienta que existe para detectarlos", dijo Wilner.

El objetivo elegido por el equipo es AU Microscopii, una estrella que se encuentra a 33 anos-luz de distancia y tiene apenas un 1 por ciento de la edad de nuestro Sol.

"Usaremos ALMA para captar imagenes del anillo donde nacen los planetesimales, el que, segun creemos, orbita alrededor de esta joven estrella. Solo con ALMA, sin embargo, podemos tener la esperanza de descubrir agrupaciones en estos cinturones de polvo y asteroides, que podrian constituir la materia prima de planetas aun no descubiertos", agrego.

El proyecto ALMA es el resultado de la fusion de tres proyectos astronomicos: el Millimeter Array (MMA) de los Estados Unidos, el Large Southern Array (LSA) de Europa, y el Large Millimeter Array (LMA) de Japon y se estima que completara su instalacion en 2013.

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Record - 20

DIALOG(R)

NASA window for falling satellite was overnight,

MARCIA DUNN,

Press-Register (Mobile, AL), Mississippi Press 01 ed, p06,

Saturday, September 24, 2011

TEXT:

NASA window for falling satellite was overnight

Latest timeline had Washington state in possible strike zone of the old research spacecraft

By MARCIA DUNN

AP Aerospace Writer

File Name=B904355A,Slug=bc-us-sci--fallingsatell a4764,Page Name=6MR0601C0924,Author=ap streams,

CAPE CANAVERAL, Fla. - A 6-ton NASA satellite on a collision course with Earth clung to space Friday, apparently flipping position in its ever-lower orbit and stalling its death plunge.

The old research spacecraft was targeted to crash through the atmosphere sometime Friday night or early today, putting Canada and Africa in the potential crosshairs, although most of the satellite was expected to burn up during re-entry. The United States wasn't entirely out of the woods; the possible strike zone skirted Washington state.

"It just doesn't want to come down," said Jonathan McDowell of the Harvard-Smithsonian Center for Astrophysics.

McDowell said the satellite's delayed demise demonstrates how unreliable predictions can be. That said, "The best guess is that it will still splash in the ocean, just because there's more ocean out there."

Until Friday, increased solar activity was causing the atmosphere to expand and the 35-foot, bus-size satellite to free fall more quickly. But late Friday morning, NASA said the sun was no longer the major factor in the rate of descent and that the satellite's position, shape or both had changed by the time it slipped down to a 100-mile orbit.

"In the last 24 hours, something has happened to the spacecraft," said NASA orbital debris scientist Mark Matney.

On Friday night, NASA said it expected the satellite to come crashing down between 11:45 p.m. Friday and 12:45 a.m. EDT today. It was going to be passing over the Atlantic, Pacific and Indian oceans at that time, as well as Canada and Africa.

"The risk to public safety is very remote," NASA said in a statement.

Any surviving wreckage is expected to be limited to a 500-mile swath.

The Upper Atmosphere Research Satellite, or UARS, would be the biggest NASA spacecraft to crash back to Earth, uncontrolled, since the post-Apollo 75-ton Skylab space station and the more than 10-ton Pegasus 2 satellite, both in 1979.

Russia's 135-ton Mir space station slammed through the atmosphere in 2001, but it was a controlled dive into the Pacific.

Some 26 pieces of the UARS satellite - representing 1,200 pounds of heavy metal - are expected to rain down somewhere. The biggest surviving chunk should be no more than 300 pounds.

Earthlings can take comfort in the fact that no one has ever been hurt by falling space junk - to anyone's knowledge - and there has been no serious property damage. NASA put the chances that somebody somewhere on Earth would get hurt at 1-in-3,200. But any one person's odds of being struck were estimated at 1-in-22 trillion, given there are 7 billion people on the planet.

"Keep in mind that we have bits of debris re- entering the atmosphere every single day," Matney said in brief remarks broadcast on NASA TV.

Any surviving wreckage belongs to NASA, and it is against the law to keep or sell even the smallest piece. There are no toxic chemicals on board, but sharp edges could be dangerous, so the space agency is warning the public to keep hands off and call police.

The \$740 million UARS was launched in 1991 from space shuttle Discovery to study the atmosphere and the ozone layer. At the time, the rules weren't as firm for safe satellite disposal; now a spacecraft must be built to burn up upon re-entry or have a motor to propel it into a much higher, long-term orbit.

NASA shut UARS down in 2005 after lowering its orbit to hurry its end. A

potential satellite-retrieval mission was ruled out following the 2003 shuttle Columbia disaster, and NASA did not want the satellite hanging around orbit posing a debris hazard.

Space junk is a growing problem in low-Earth orbit. More than 20,000 pieces of debris, at least 4 inches in diameter, are being tracked on a daily basis. These objects pose a serious threat to the International Space Station. ON THE NET Satellite updates: www.nasa.gov/uars Aerospace Corp: <http://reentrynews.aero.org/1991063b.html>

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Record - 21

DIALOG(R)

Satellite may hit today,

MARCIA DUNN,

Press-Register (Mobile, AL), Press-Register 02 ed, p04,
Saturday, September 24, 2011

TEXT:

Satellite may hit today

By MARCIA DUNN

AP Aerospace Writer

File Name=B901974A,Slug=bc-us-sci--fallingsatell a4736,Page
Name=6MR0402C0924,Author=ap streams,

CAPE CANAVERAL, Fla. - A 6-ton NASA satellite on a collision course with Earth clung to space Friday, apparently flipping position in its ever-lower orbit and stalling its death plunge.

"It just doesn't want to come down," said Jonathan McDowell of the Harvard-Smithsonian Center for Astrophysics.

McDowell said the satellite's delayed demise demonstrates how unreliable predictions can be. That said, "the best guess is that it will still splash in the ocean, just because there's more ocean out there."

Until Friday, increased solar activity was causing the atmosphere to expand and the 35-foot, bus-size satellite to free fall more quickly. But late Friday morning, NASA said the sun was no longer the major factor in the rate of descent and that the satellite's position, shape or both had

changed by the time it slipped down to a 100-mile orbit.

On Friday night, NASA said it expected the satellite to come crashing down between 11:45 p.m. and 12:45 a.m. EDT today. It was going to be passing over the Atlantic, Pacific and Indian oceans at that time, as well as Canada and Africa.

"The risk to public safety is very remote," NASA said in a statement.

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Wolbach Library: CfA in the News ~ Week ending 16 October 2011

1. **US Company Levanta Scientific Plans To Set Up Subsidiary in Lithuania**,
World News Connection, Saturday, October 15, 2011
2. **Cores of two merging galaxies prepare for final cataclysmic collision**,
ANI, Asian News International, Saturday, October 15, 2011
3. **Michael J. Drake, 65, Space Investigator**, PAUL VITELLO,
New York Times (NY), Late Edition - Final ed, p19,
Tuesday, October 11, 2011
4. **Belleville's astronaut to appear at Scifest at the Science Center**,
Belleville News Democrat (IL), Tuesday, October 11, 2011

Record - 1

DIALOG(R)

US Company Levanta Scientific Plans To Set Up Subsidiary in Lithuania,
World News Connection,
Saturday, October 15, 2011

TEXT:

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VILNIUS, Oct 14 (BNS) -- Levanta Scientific, a Silicon Valley industrial engineering and production company, is set to launch operations in the Sunrise Valley in Vilnius, under a project worth 16.2 million litas [LTL] (EUR 4.64 million), the Lithuanian Economy Ministry said on Friday [14 October].

The US company's subsidiary will employ more than 80 chemists, microbiologists, engineers, and designers, according to a letter of intent that has been signed by Levanta Scientific CEO Michael Bryan and Economy Minister Rimantas Zylius.

"Serious investments are coming to the Sunrise Valley, offering a good opportunity to improve the scientific research base," the minister said in a press release.

Levanta Scientific's unit will conduct scientific research and develop technologies needed for the production of hypochlorous acid and sodium hydroxide. Its products will be supplied to pharmaceutical and food industry companies in Lithuania and abroad, with exports expected to reach 40 percent of production in the third year of operation.

Levanta Scientific is headquartered in Dover, New Hampshire. Its customers include NASA, the US Navy, the Massachusetts Institute of Technology, and the Smithsonian Astrophysical Observatory.

[Description of Source: Vilnius BNS in English -- Baltic News Service, the largest private news agency in the Baltic States, providing news on political developments in all three Baltic countries; URL: <http://www.bns.lt>]

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Record - 2

DIALOG(R)

Cores of two merging galaxies prepare for final cataclysmic collision,
ANI, Asian News International,
Saturday, October 15, 2011

TEXT:

Washington, March 17 (ANI): A new image from NASA's Spitzer Space Telescope offers a rare view of an imminent collision between the cores of two merging galaxies, each powered by a black hole with millions of times the mass of the sun.

The galactic cores are in a single, tangled galaxy called NGC 6240, located 400-million light years away in the constellation Ophiuchus.

Millions of years ago, each core was the dense center of its own galaxy before the two galaxies collided and ripped each other apart.

Now, these cores are approaching each other at tremendous speeds and preparing for the final cataclysmic collision. They will crash into each other in a few million years, a relatively short

period on a galactic timescale.

It combines visible light from NASA's Hubble Space Telescope and infrared light from Spitzer.

It catches the two galaxies during a rare, short-lived phase of their evolution, when both cores of the interacting galaxies are still visible but closing in on each other fast.

"One of the most exciting things about the image is that this object is unique," said Stephanie Bush of the Harvard-Smithsonian Center for Astrophysics, Cambridge, and Massachusetts.

"Merging is a quick process, especially when you get to the train wreck that is happening. There just aren't many galactic mergers at this stage in the nearby universe," she added.

NGC 6240 is already putting out huge amounts of infrared light, an indication that a burst of star formation is underway.

The extra infrared radiation is common in interacting galaxies. As the two galaxies interact, dust and gas swept up by the collision form a burst of new stars that give off infrared light.

Such galaxies are called luminous infrared galaxies.

Spitzer's infrared array camera can image the extra heat from newly formed stars, even though their visible light is obscured by thick dust clouds around them.

The blob-like shape of the galaxy is due to the sustained violence of the collision.

Streams of millions of stars are being ripped off the galaxy, forming wispy "tidal tails" that lead off NGC 6240 in several directions.

But, things are about to get even more violent as the main event approaches and the two galactic cores meld into one.

In the center of NGC 6240, the two black holes in the cores will whip up a frenzy of radiation as they careen towards one another head-on, likely transforming the galaxy into a monster known as an ultra-luminous infrared galaxy, thousands of times as bright in infrared as our Milky Way. (ANI)

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Provided by an company

Record - 3

DIALOG(R)

Michael J. Drake, 65, Space Investigator,
PAUL VITELLO,
New York Times (NY), Late Edition - Final ed, p19,
Tuesday, October 11, 2011

TEXT:

Michael J. Drake, a planetary scientist, worked on many NASA space missions in his lifetime. But he remained devoted to one idea that he proposed several times in the last decade and that NASA officials rejected twice: to send a spacecraft to an asteroid, take rock samples from the surface and bring them home to study the origins of life.

The expedition finally received NASA's approval on May 24 after a grueling two-year review process, during which Dr. Drake continued working despite receiving a diagnosis of liver cancer and undergoing liver transplant surgery.

His exhilaration about the go-ahead sustained him as his health declined in recent months, and it kept him involved in plans for the mission's 2016 launching "to his last breath," said his wife, Gail Georgenson. He died on Sept. 21 in Tucson. He was 65.

Dr. Drake, the head of the Lunar and Planetary Laboratory at the University of Arizona, was a leader in the field of extraterrestrial geology. He studied lunar rocks, meteors and the moons of Saturn. He helped map the surface of Mars and was part of a NASA team that detected the presence of ice below the Martian surface in 2002.

But Dr. Drake, like many planetary scientists, considered asteroids the most promising frontier for exploring what he described in his writing as the "big picture questions."

In an interview shortly after NASA announced its decision to finance the asteroid mission, which is dubbed Osiris-Rex, he listed some of the questions he hoped it would help answer: "Where do we come from? How did we come to exist? What's the origin of the organic material that provided the building blocks that led to life?" he said.

Asteroids are considered the original stuff of the solar system -- leftover scraps from the cataclysmic nebula collapse in which the solar system was

formed 4.5 billion years ago. They were relatively untouched by collisions and other events that might have incinerated the surfaces of larger bodies like the planets, changing the molecular structure of their original terrains. A sample from the surface of an asteroid might prove (or disprove) one of planetary science's big emerging theories: that the Earth was scorched and barren until it was "reseeded" eons ago by asteroids.

"We already know that amino acids exist in space, and we find them in some meteorites: chipped-off asteroids that strike Earth," Dr. Drake said. "We believe it's the sort of stuff that came in through the Earth's atmosphere and provided the building blocks of life."

"The asteroid is literally a time capsule of 4.5 billion years," he added.

Michael Julian Drake was born on July 8, 1946, in Bristol, England, to Betty Eileen Mary and Allen Drake. He graduated with a degree in geology from Victoria University in Manchester and received his Ph.D. in 1972 from the University of Oregon.

After postdoctoral studies at the Smithsonian Astrophysical Observatory in Cambridge, Mass., he joined the faculty of the University of Arizona in 1973. He met his wife and remained in Tucson for the rest of his life.

Besides his wife, he is survived by their two children, Matthew and Melissa; a granddaughter; and his father and sister, Lisbeth, of East Sussex, England.

Along with colleagues, Dr. Drake worked on the Cassini mission to explore Saturn; the Gamma-Ray Spectrometer aboard the Mars Odyssey Orbiter, which first detected Mars's ice; and the Phoenix Mars Lander, which landed in 2008 in search of Martian water and microbial life.

The NASA asteroid mission, which will cost \$800 million, is basically as Dr. Drake proposed it: a spacecraft will travel to an asteroid known as 1999-RQ36, a rock about the size of Grand Central Terminal somewhere between Mars and Jupiter. The trip will take about four years. Robotic devices on the spacecraft will take measurements, photographs and readings, then scoop about two ounces of material from the asteroid's surface to be sent back to Earth in a capsule, which is scheduled to land on the floor of the Utah desert sometime in 2023.

A secondary but not insignificant goal of the mission, as Dr. Drake designed it, will be figuring out how the trajectory of an asteroid like RQ36 might be changed if it ever happened to be heading in our direction.

Two criteria were used in selecting RQ36 as the mission's destination, Dr.

Drake said. The asteroid seemed from telescope studies to be rich in carbon and other elements found in organic compounds, making it a good candidate for testing the life-came-from-a-meteor theory.

Second, the path of RQ36's orbit put it on a course for a possible collision with Earth in 2086. (NASA calculates the chance of that as one in 1,800.) Measurements taken by the spacecraft will help determine what kind of human-sent shove or bump, in the worst-case scenario, might keep that from happening.

On the day NASA announced its plan for the Osiris-Rex mission, an elated Dr. Drake summed up its scope. It would be about nothing less than "the origin and destiny of humanity," he said. "The 'origin' is 'Where did the organics come from that led to us?' The 'destiny' is 'Will we go the way of the dinosaurs?' "

PHOTO: Michael J. Drake studied extraterrestrial geology as head of the University of Arizona's Lunar and Planetary Laboratory. (PHOTOGRAPH BY UNIVERSITY OF ARIZONA)

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Record - 4

DIALOG(R)

Belleville's astronaut to appear at Scifest at the Science Center,
Belleville News Democrat (IL),
Tuesday, October 11, 2011

TEXT:

SciFest St. Louis will be at the St. Louis Science Center next week, the fourth year the international science festival has been held in St. Louis.

The event will be held Oct. 18-23. World-renowned scientists will be at the event to discuss topics that range from farthest reaches of space to the inside of a cell.

Daytime sessions, lead by guest speakers, scientists and experts, Oct. 18-21 are open to school groups only. The general public is invited to nearly 40 sessions on Saturday and Sunday and special evening programs on Tuesday, Friday and Saturday.

Notable speakers for the weekend sessions include:

* Sandra Magnus , Belleville native and astronaut on Shuttle Atlantis, the 135th and final mission of NASA's Space Shuttle Program.

* Graciela Chilchinisky, Ph.D., world-renowned economist and author of the carbon market of the UN Kyoto Protocol.

* Giovanni Fazio , senior physicist, Harvard Smithsonian Center for Astrophysics .

* Jim Gates , member of the U.S. President's Council of Advisors on Science and Technology .

* Hans Van Hoof , "edutainer" from Technopolis in Belgium.

* Mark Poirier , cinematographer for K2 Communications' film "Rescue."

* Charles Metz , world-famous harpsichordist with his 16th century Italian Polygonal Virginal.

Day passes for Saturday and Sunday are \$10 for adults, \$5 for member adults, \$6 for children and \$3 for member children on each day.

A full list of ticket prices, sessions and school group information can be found at scifeststl.org.

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1. **Cientifico EEUU: Satelite debe haberse estrellado en Asia,**
Por JUERGEN BAETZ, AP Online Regional - Latin America/Caribbean,
Sunday, October 23, 2011
2. **Scientist: Satellite must have crashed into Asia,**
JUERGEN BAETZ, AP Online,
Sunday, October 23, 2011
3. **No reports yet of debris from falling satellite,**
JUERGEN BAETZ, AP DataStream,
Sunday, October 23, 2011
4. **NEARBY PLANET-FORMING DISK HOLDS WATER FOR THOUSANDS OF OCEANS,**
US Federal News, Thursday, October 20, 2011
5. **Solar Research Discussed by Scientists at Harvard-Smithsonian
Center for Astrophysics,** Science Letter, p591,
Tuesday, October 25, 2011
6. **Research from Harvard-Smithsonian Center for Astrophysics Provide New
Insights into Astronomy,** Science Letter, p492,
Tuesday, October 25, 2011
7. **DARK MATTER MYSTERY DEEPENS,** US Federal News,
Monday, October 17, 2011
8. **Standard cosmological model of dark matter may be wrong,**
Hindustan Times, Tuesday, October 18, 2011

Record - 1

DIALOG(R)

Cientifico EEUU: Satelite debe haberse estrellado en Asia,
Por JUERGEN BAETZ,
AP Online Regional - Latin America/Caribbean,
Sunday, October 23, 2011

TEXT:

BERLIN_Un obsoleto satelite cientifico aleman debe haberse estrellado el domingo en alguna parte del sudeste de Asia, dijo un cientifico estadounidense, pero nadie esta seguro donde.

La mayoría de los fragmentos del satélite ROSAT se incineraron cuando ingresaron a la atmósfera terrestre a velocidades de hasta 450 kilómetros por hora, pero unos 30 pedazos con un peso total de hasta 1,7 toneladas métricas pudieron haberse estrellado en la Tierra, dijo el Centro Aeroespacial Alemán.

Jonathan McDowell, del Centro Harvard-Smithsonian de Astrofísica en Cambridge, Massachusetts, dijo que el satélite parece haberse estrellado en el sudeste asiático. Dijo que dos ciudades chinas con millones de habitantes, Chongqing y Chengdu, estaban en la ruta proyectada del satélite en su reingreso a la atmósfera baja.

"Pero si hubiese caído en una zona poblada hubiéramos tenido reportes", dijo el astrofísico, que monitorea objetos espaciales producidos por el hombre, en conversación telefónica con The Associated Press.

Cálculos basados en datos militares estadounidenses indicaron que los fragmentos del satélite deben haber caído en algún lugar al este de Sri Lanka, sobre el Océano Índico; sobre el Mar de Andaman, frente a la costa de Myanmar; tierra adentro en Myanmar o en el sur de China.

El satélite ingresó a la atmósfera entre las 0145 GMT y las 0215 GMT del domingo y le habría tomado 15 minutos o menos caer a la Tierra, dijo el Centro Aeroespacial Alemán. Horas antes del reingreso, el centro dijo que no se esperaba que el satélite cayese en Europa, África o Australia.

No hubo reportes inmediatos de gobiernos ni agencias espaciales asiáticas sobre el satélite.

El satélite orbitaba la Tierra en unos 90 minutos y pudiera haber recorrido miles de kilómetros durante su reingreso, lo que dificulta predecir el sitio de su caída.

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Record - 2

DIALOG(R)

Scientist: Satellite must have crashed into Asia,

JUERGEN BAETZ,

AP Online,

Sunday, October 23, 2011

TEXT:

BERLIN_A defunct German research satellite crashed into the Earth somewhere

in Southeast Asia on Sunday, a U.S. scientist said _ but no one is still quite sure where.

Most parts of the minivan-sized ROSAT research satellite were expected to burn up as they hit the atmosphere at speeds up to 280 mph (450 kph), but up to 30 fragments weighing a total of 1.87 tons (1.7 metric tons) could have crashed, the German Aerospace Center said.

Jonathan McDowell of the Harvard-Smithsonian Center for Astrophysics in Cambridge, Massachusetts, said the satellite appears to have gone down over Southeast Asia. He said two Chinese cities with millions of inhabitants each, Chongqing and Chengdu, had been in the satellite's projected path during its re-entry time.

"But if it had come down over a populated area there probably would be reports by now," the astrophysicist, who tracks man-made space objects, told The Associated Press in a telephone interview.

Calculations based on U.S. military data indicate that satellite debris must have crashed somewhere east of Sri Lanka over the Indian Ocean, or over the Andaman Sea off the coast of Myanmar, or further inland in Myanmar or as far inland as China, he said.

The satellite entered the atmosphere between 0145 GMT to 0215 GMT Sunday (9:45 p.m. to 10:15 p.m. Saturday EDT) and would have taken 15 minutes or less to hit the ground, the German Aerospace Center said. Hours before the re-entry, the center said the satellite was not expected to land in Europe, Africa or Australia.

There were no immediate reports from Asian governments or space agencies about the fallen satellite.

The satellite used to circle the planet in about 90 minutes, and it may have traveled several thousand kilometers (miles) during its re-entry, rendering exact predictions of where it crashed difficult.

German space agency spokesman Andreas Schuetz said a falling satellite also can change its flight pattern or even its direction once it sinks to within 90 miles (150 kilometers) above the Earth.

Schuetz said the agency was waiting for data from scientific partners around the globe. He noted it took the U.S. space agency NASA several days to establish where one of its satellites had hit last month.

The 2.69-ton (2.4 metric ton) scientific ROSAT satellite was launched in Cape Canaveral, Florida, in 1990 and retired in 1999 after being used for research on black holes and neutron stars and performing the first all-sky

survey of X-ray sources with an imaging telescope.

ROSAT's largest single fragment that could have hit is the telescope's heavy heat-resistant mirror.

"The impact would be similar to, say, an airliner having dropped an engine," said McDowell. "It would damage whatever it fell on, but it wouldn't have widespread consequences."

A dead NASA satellite fell into the southern Pacific Ocean last month, causing no damage but spreading debris over a 500-mile (800-kilometer) area.

Since 1991, space agencies have adopted new procedures to lessen space junk and having satellites falling back to Earth. NASA says it has no more large satellites that will fall back to Earth uncontrolled in the next 25 years.

Online:

The German space agency on ROSAT: <http://bit.ly/papMAA>

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Record - 3

DIALOG(R)

No reports yet of debris from falling satellite,

JUERGEN BAETZ,

AP DataStream,

Sunday, October 23, 2011

TEXT:

BERLIN_Scientists were trying to establish how and where exactly a defunct German research satellite returned to the Earth on Sunday, after warning that some parts might survive re-entry and crash at up to 280 mph (450 kph).

Most parts of the minivan-sized ROSAT scientific research satellite were expected to burn up, but up to 30 fragments weighing a total of 1.87 tons (1.7 metric tons) could have crashed.

But there was no immediate solid evidence to determine where exactly the satellite entered the atmosphere, indicating it did not hit a populated

area, said Andreas Schuetz, spokesman for the German Aerospace Center. The center said the satellite entered between 0145 and 0215 GMT Sunday (9:45 p.m. and 10:15 p.m. Saturday EDT) and would have taken only 10 or 15 minutes to hit the ground.

Hours before the re-entry into the atmosphere the center said the satellite was not expected to hit over Europe, Africa or Australia. According to the satellite's predicted path, scientists estimated it could have been above Asia at the time of its re-entry.

Jonathan McDowell of the Harvard-Smithsonian Center for Astrophysics in Cambridge, Massachusetts, said the satellite appears to have gone down over Southeast Asia.

Calculations based on data made available to scientists by the U.S. military indicate that it must have crashed somewhere between the Indian Ocean off the coast of Myanmar, further inland in Myanmar or as far inland as China, he said.

McDowell, an astrophysicist who tracks man-made space objects and who worked on one of ROSAT's instruments, said two Chinese cities with millions of inhabitants each, Chongqing and Chengdu, were in the satellite's projected path during the time window in which it must have crashed.

"But if it had come down over a populated area there probably would be reports by now," he told The Associated Press in a telephone interview.

Schuetz said it could take days to determine exactly where pieces of the satellite had fallen.

"I don't think that we'll have a confirmation of any sort today," he said, pointing out that it also took NASA several days to establish where one of its satellites had hit last month.

The 2.69-ton (2.4 metric ton) scientific ROSAT satellite was launched in Cape Canaveral, Florida, in 1990 and retired in 1999 after being used for research on black holes and neutron stars and performing the first all-sky survey of X-ray sources with an imaging telescope.

Even in the last days, the satellite still circled the planet every 90 minutes, making it hard to predict where on Earth it would eventually come down.

The largest single fragment of ROSAT that could hit into the earth is the telescope's heavy heat-resistant mirror.

"The impact would be similar to, say, an airliner having dropped an engine," said McDowell. "It would damage whatever it fell on, but it wouldn't have widespread consequences."

A dead NASA satellite fell into the southern Pacific Ocean last month, causing no damage, despite fears it would hit a populated area and cause damage or kill people. Experts believe about two dozen metal pieces from the bus-sized UARS satellite fell over a 500-mile (800 kilometer) span.

The German space agency put the odds of somebody somewhere on Earth being hurt by its satellite at one in 2,000 _ a slightly higher level of risk than was calculated for the NASA satellite. But any one individual's odds of being struck were one in 14 trillion, given there are 7 billion people on the planet.

After NASA's UARS was launched in 1991, space agencies adopted new procedures to lessen space junk and satellites falling back to Earth.

NASA has said it has no more large satellites that will fall back to Earth uncontrolled in the next 25 years.

Most big satellites now have propulsion systems that allow a controlled re-entering into the Earth's atmosphere, and better software allows more precise predictions and monitoring, McDowell said.

"We are in a more risk-averse culture now. If you say there is a 1-in-3000 chance that it might hurt someone, in the 1990s a government agency might have said 'that's an acceptable risk,' but in 2010 that's not the case," he said.

—

Online:

The German space agency on ROSAT: <http://bit.ly/papMAA>

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Record - 4

DIALOG(R)

NEARBY PLANET-FORMING DISK HOLDS WATER FOR THOUSANDS OF OCEANS,

US Federal News,

Thursday, October 20, 2011

TEXT:

ANN ARBOR, Mich., Oct.20 -- The University of Michigan issued the following news release:

For the first time, astronomers have detected around a burgeoning solar system a sprawling cloud of water vapor that's cold enough to form comets, which could eventually deliver oceans to dry planets.

Water is an essential ingredient for life. Scientists have found thousands of Earth-oceans' worth of it within the planet-forming disk surrounding the star TW Hydrae. TW Hydrae is 176 light years away in the constellation Hydra and is the closest solar-system-to-be.

University of Michigan astronomy professor Ted Bergin is a co-author of a paper on the findings published in the Oct.21 edition of Science. The researchers used the Heterodyne Instrument for the Far-Infrared (HIFI) on the orbiting Herschel Space Observatory to detect the chemical signature of water.

"This tells us that the key materials that life needs are present in a system before planets are born," said Bergin, a HIFI co-investigator. "We expected this to be the case, but now we know it is because we have directly detected it. We can see it."

Scientists had previously found warm water vapor in planet-forming disks close to the central star. But until now, evidence for vast quantities of water extending into the cooler, far reaches of disks where comets and giant planets take shape had not emerged. The more water available in disks for icy comets to form, the greater the chances that large amounts will eventually reach new planets through impacts.

"The detection of water sticking to dust grains throughout the planet-forming disk would be similar to events in our own solar system's evolution, where over millions of years, these dust grains would then coalesce to form comets. These would be a prime delivery mechanism for water on planetary bodies," said principal investigator Michiel Hogerheijde of Leiden University in the Netherlands.

Other recent findings from HIFI support the theory that comets delivered a significant portion of Earth's oceans. Researchers found that the ice on a comet called Hartley 2 has the same chemical composition as our oceans.

HIFI is helping astronomers gain a better understanding of how water comes to terrestrial planets-Earth and beyond. If TW Hydrae and its icy disk are representative of many other young star systems, as researchers think they are, then the process for creating planets around numerous stars with

abundant water throughout the universe appears to be in place, NASA officials say.

The paper is titled "Detection of the Water Reservoir in a Forming Planetary System." Also contributing are researchers from California Institute of Technology, the University of Amsterdam, the Harvard-Smithsonian Center for Astrophysics, Johns Hopkins University, the European Southern Observatory, NASA Jet Propulsion Lab and the Max-Planck-Institut für Extraterrestrische Physik.

Herschel, a European Space Agency mission with NASA participation, is an orbiting telescope that allows astronomers to observe at the far-infrared wavelengths where organic molecules and water emit their chemical signatures. For any query with respect to this article or any other content requirement, please contact Editor at htsyndication@hindustantimes.com

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Record - 5

DIALOG(R)

Solar Research Discussed by Scientists at Harvard-Smithsonian Center for Astrophysics,
Science Letter, p591,
Tuesday, October 25, 2011

TEXT:

In this recent study, researchers in Cambridge, Massachusetts conducted a study "Total internal partition sums are determined from 65 to 3010 K for (CO₂)-C-13-O-18, (COO)-C-13-O-18-O-17, (CH₃D)-C-12, (CH₃D)-C-13, (HCCD)-C-12-C-12, (CCH₆)-C-13-C-12, (CH₃Br)-C-12-Br-79, (CH₃Br)-C-12-Br-81, (CF₄)-C-12, (HCCCCH)-C-12-C-12-C-12-C-12, (HCCCN)-C-12-C-12-C-12-N-14, (HCCCN)-C-12-C-12-C-13-N-14, (HCCCN)-C-12-C-13-C-12-N-14, (HCCCN)-C-13-C-12-C-12-N-14, (HCCCN)-C-12-C-12-C-12-N-15, (DCCCN)-C-12-C-12-C-12-N-14, (NCCN)-N-14-C-12-C-12-N-14, (NCCN)-N-15-C-12-C-12-N-15, (CS)-C-12-S-32, (CS)-C-12-S-33, (CS)-C-12-S-34, (CS)-C-13-S-32, H-2, HD, (SO)-S-32-O-16, (SO)-S-32-O-18, (SO)-S-34-O-16, (C₃H₄)-C-12, (CH₃)-C-12, (CS₂)-C-12-S-32, (SCS)-S-32-C-12-S-34, (CS₂)-C-13-S-32, and (SCS)-S-32-C-12-S-33."

"These calculations complete the partition sum data needed for additional isotopologues in HITRAN2008 and also extend the partition sums to molecules of astrophysical interest," wrote A.L. Laraia and colleagues, Harvard-Smithsonian Center for Astrophysics (see also).

The researchers concluded: "These data, at 25 K steps, are incorporated

into a FORTRAN code (TIPS_2011.for) that can be used to rapidly generate the data at any temperature in the range 70-3000 K."

Laraia and colleagues published their study in *Icarus* (Total internal partition sums to support planetary remote sensing. *Icarus*, 2011;215(1):391-400).

For more information, contact A.L. Laraia, Harvard Smithsonian Center Astrophysics, Atom & Molecular Physics Division, Cambridge, MA 02138, United States.

Publisher contact information for the journal *Icarus* is: Academic Press Inc. Elsevier Science, 525 B St., Ste. 1900, San Diego, CA 92101-4495, USA.

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Record - 6

DIALOG(R)

Research from Harvard-Smithsonian Center for Astrophysics Provide New Insights into Astronomy,

Science Letter, p492,

Tuesday, October 25, 2011

TEXT:

According to the authors of recent research from Cambridge, Massachusetts, "We use the high-resolution cosmological N-body simulations from the Aquarius project to investigate in detail the mechanisms that determine the shape of Milky Way type dark matter haloes. We find that, when measured at the instantaneous virial radius, the shape of individual haloes changes with time, evolving from a typically prolate configuration at early stages to a more triaxial/oblate geometry at the present day."

"This evolution in halo shape correlates well with the distribution of the infalling material: prolate configurations arise when haloes are fed through narrow filaments, which characterizes the early epochs of halo assembly, whereas triaxial/oblate configurations result as the accretion turns more isotropic at later times. Interestingly, at redshift $z = 0$, clear imprints of the past history of each halo are recorded in their shapes at different radii, which also exhibit a variation from prolate in the inner regions to triaxial/oblate in the outskirts," wrote C.A. Vera-Ciro and colleagues, Harvard-Smithsonian Center for Astrophysics (see also).

The researchers concluded: "Provided that the Aquarius haloes are fair

representatives of Milky Way like 10(12) M-circle dot objects, we conclude that the shape of such dark matter haloes is a complex, time-dependent property, with each radial shell retaining memory of the conditions at the time of collapse."

Vera-Ciro and colleagues published their study in Monthly Notices of the Royal Astronomical Society (The shape of dark matter haloes in the Aquarius simulations: evolution and memory. Monthly Notices of the Royal Astronomical Society, 2011;416(2):1377-1391).

For additional information, contact C.A. Vera-Ciro, Harvard Smithsonian Center Astrophysics, Cambridge, MA 02138, United States.

Publisher contact information for the journal Monthly Notices of the Royal Astronomical Society is: Wiley-Blackwell, Commerce Place, 350 Main St., Malden 02148, MA, USA.

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Record - 7

DIALOG(R)

DARK MATTER MYSTERY DEEPENS,

US Federal News,

Monday, October 17, 2011

TEXT:

WASHINGTON, Oct.17 -- The Smithsonian Institution issued the following press release:

Like all galaxies, our Milky Way is home to a strange substance called dark matter. Dark matter is invisible, betraying its presence only through its gravitational pull. Without dark matter holding them together, our galaxy's speedy stars would fly off in all directions. The nature of dark matter is a mystery - a mystery that a new study has only deepened.

"After completing this study, we know less about dark matter than we did before," said lead author Matt Walker, a Hubble Fellow at the Harvard-Smithsonian Center for Astrophysics.

The standard cosmological model describes a universe dominated by dark energy and dark matter. Most astronomers assume that dark matter consists of "cold" (i.e. slow-moving) exotic particles that clump together gravitationally. Over time these dark matter clumps grow and attract normal matter, forming the galaxies we see today.

Cosmologists use powerful computers to simulate this process. Their simulations show that dark matter should be densely packed in the centers of galaxies. Instead, new measurements of two dwarf galaxies show that they contain a smooth distribution of dark matter. This suggests that the standard cosmological model may be wrong.

"Our measurements contradict a basic prediction about the structure of cold dark matter in dwarf galaxies. Unless or until theorists can modify that prediction, cold dark matter is inconsistent with our observational data," Walker stated.

Dwarf galaxies are composed of up to 99 percent dark matter and only one percent normal matter like stars. This disparity makes dwarf galaxies ideal targets for astronomers seeking to understand dark matter.

Walker and his co-author Jorge Penarrubia (University of Cambridge, UK) analyzed the dark matter distribution in two Milky Way neighbors: the Fornax and Sculptor dwarf galaxies. These galaxies hold one million to 10 million stars, compared to about 400 billion in our galaxy. The team measured the locations, speeds and basic chemical compositions of 1500 to 2500 stars.

"Stars in a dwarf galaxy swarm like bees in a beehive instead of moving in nice, circular orbits like a spiral galaxy," explained Penarrubia. "That makes it much more challenging to determine the distribution of dark matter."

Their data showed that in both cases, the dark matter is distributed uniformly over a relatively large region, several hundred light-years across. This contradicts the prediction that the density of dark matter should increase sharply toward the centers of these galaxies.

"If a dwarf galaxy were a peach, the standard cosmological model says we should find a dark matter 'pit' at the center. Instead, the first two dwarf galaxies we studied are like pitless peaches," said Penarrubia.

Some have suggested that interactions between normal and dark matter could spread out the dark matter, but current simulations don't indicate that this happens in dwarf galaxies. The new measurements imply that either normal matter affects dark matter more than expected, or dark matter isn't "cold."

The team hopes to determine which is true by studying more dwarf galaxies, particularly galaxies with an even higher percentage of dark matter.

The paper discussing this research was accepted for publication in The

Astrophysical Journal and is available online. For any query with respect to this article or any other content requirement, please contact Editor at htsyndication@hindustantimes.com

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Record - 8

DIALOG(R)

Standard cosmological model of dark matter may be wrong,

Hindustan Times,

Tuesday, October 18, 2011

TEXT:

Washington, Oct. 18 -- A new study has suggested that the standard cosmological model about dark matter in the universe may be wrong. Dark matter is invisible, betraying its presence only through its gravitational pull. Without dark matter holding them together, our galaxy's speedy stars would fly off in all directions.

The nature of dark matter is a mystery - a mystery that the new study has only deepened.

'After completing this study, we know less about dark matter than we did before,' said lead author Matt Walker, a Hubble Fellow at the Harvard-Smithsonian Centre for Astrophysics.

Most astronomers assume that dark matter consists of 'cold' (i.e. slow-moving) exotic particles that clump together gravitationally.

Over time these dark matter clumps grow and attract normal matter, forming the galaxies we see today.

Cosmologists use powerful computers to simulate this process. Their simulations show that dark matter should be densely packed in the centres of galaxies.

Instead, new measurements of two dwarf galaxies show that they contain a smooth distribution of dark matter, suggesting that the standard cosmological model may be wrong.

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The new measurements imply that either normal matter affects dark matter more than expected, or dark matter isn't 'cold.' Published by HT Syndication with permission from Asian News International. For any query with respect to this article or any other content requirement, please contact Editor at htsyndication@hindustantimes.com

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Wolbach Library: CfA in the News ~ Week ending 6 November 2011

1. City Lights Could Reveal E.T. Civilization,

World News Connection,
Saturday, November 5, 2011

2. CITY LIGHTS COULD REVEAL EXTRATERRESTRIAL CIVILIZATION,

US Federal News,
Thursday, November 3, 2011

3. Could city lights help locate alien civilisations?,

Indo-Asian News Service,
Friday, November 4, 2011

4. 'City lights' could help spot extraterrestrial civilisations in space,

Hindustan Times,
Friday, November 4, 2011

5. SETI search urged to look for city lights,

UPI Science News,
Thursday, November 3, 2011

6. No injuries cited from space junk,

Press Wire Services,
Grand Rapids Press, The, 1 and 2 and 3 and 4 ed, pA3
Sunday, September 25, 2011

Record - 1

DIALOG(R)

City Lights Could Reveal E.T. Civilization
World News Connection
Saturday, November 5, 2011

TEXT:

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[Computer selected and disseminated without OSC editorial intervention]
TEHRAN (FNA)- In the search for extraterrestrial intelligence, astronomers

have hunted for radio signals and ultra-short laser pulses. In a new paper, Avi Loeb (Harvard-Smithsonian Center for Astrophysics) and Edwin Turner (Princeton University) suggest a new technique for finding aliens: look for their city lights.

"Looking for alien cities would be a long shot, but wouldn't require extra resources. And if we succeed, it would change our perception of our place in the universe," said Loeb. As with other SETI methods, they rely on the assumption that aliens would use Earth-like technologies. This is reasonable because any intelligent life that evolved in the light from its nearest star is likely to have artificial illumination that switches on during the hours of darkness.

How easy would it be to spot a city on a distant planet? Clearly, this light will have to be distinguished from the glare from the parent star. Loeb and Turner suggest looking at the change in light from an exoplanet as it moves around its star.

As the planet orbits, it goes through phases similar to those of the Moon. When it's in a dark phase, more artificial light from the night side would be visible from Earth than reflected light from the day side. So the total flux from a planet with city lighting will vary in a way that is measurably different from a planet that has no artificial lights.

Spotting this tiny signal would require future generations of telescopes. However, the technique could be tested closer to home, using objects at the edge of our solar system.

Loeb and Turner calculate that today's best telescopes ought to be able to see the light generated by a Tokyo-sized metropolis at the distance of the Kuiper Belt -- the region occupied by Pluto, Eris, and thousands of smaller icy bodies. So if there are any cities out there, we ought to be able to see them now. By looking, astronomers can hone the technique and be ready to apply it when the first Earth-sized worlds are found around distant stars in our galaxy.

"It's very unlikely that there are alien cities on the edge of our solar system, but the principle of science is to find a method to check," Turner said. "Before Galileo, it was conventional wisdom that heavier objects fall faster than light objects, but he tested the belief and found they actually fall at the same rate."

As our technology has moved from radio and TV broadcasts to cable and fiber optics, we have become less detectable to aliens. If the same is true of extraterrestrial civilizations, then artificial lights might be the best way to spot them from afar.

Loeb and Turner's work has been submitted to the journal Astrobiology.

[Description of Source: Tehran Fars News Agency in English -- hardline semi-official news agency, headed as of 24 July 2011 by Nezameddin Musavi; <http://www.english.farsnews.com>]

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Record - 2

DIALOG(R)
CITY LIGHTS COULD REVEAL EXTRATERRESTRIAL CIVILIZATION
US Federal News
Thursday, November 3, 2011

TEXT:
WASHINGTON, Nov.3 -- The Smithsonian Institution issued the following press release:

In the search for extraterrestrial intelligence, astronomers have hunted for radio signals and ultra-short laser pulses. In a new paper, Avi Loeb (Harvard-Smithsonian Center for Astrophysics) and Edwin Turner (Princeton University) suggest a new technique for finding aliens: look for their city lights.

"Looking for alien cities would be a long shot, but wouldn't require extra resources. And if we succeed, it would change our perception of our place in the universe," said Loeb.

As with other SETI methods, they rely on the assumption that aliens would use Earth-like technologies. This is reasonable because any intelligent life that evolved in the light from its nearest star is likely to have artificial illumination that switches on during the hours of darkness.

How easy would it be to spot a city on a distant planet? Clearly, this light will have to be distinguished from the glare from the parent star. Loeb and Turner suggest looking at the change in light from an exoplanet as it moves around its star.

As the planet orbits, it goes through phases similar to those of the Moon. When it's in a dark phase, more artificial light from the night side would be visible from Earth than reflected light from the day side. So the total flux from a planet with city lighting will vary in a way that is measurably different from a planet that has no artificial lights.

Spotting this tiny signal would require future generations of telescopes. However, the technique could be tested closer to home, using objects at the edge of our solar system.

Loeb and Turner calculate that today's best telescopes ought to be able to see the light generated by a Tokyo-sized metropolis at the distance of the Kuiper Belt - the region occupied by Pluto, Eris, and thousands of smaller icy bodies. So if there are any cities out there, we ought to be able to see them now. By looking, astronomers can hone the technique and be ready to apply it when the first Earth-sized worlds are found around distant stars in our galaxy.

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As our technology has moved from radio and TV broadcasts to cable and fiber optics, we have become less detectable to aliens. If the same is true of extraterrestrial civilizations, then artificial lights might be the best way to spot them from afar.

Loeb and Turner's work has been submitted to the journal *Astrobiology* and is available at arxiv.org. For any query with respect to this article or any other content requirement, please contact Editor at htsyndication@hindustantimes.com

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Record - 3

DIALOG(R)

Could city lights help locate alien civilisations?

Indo-Asian News Service

Friday, November 4, 2011

TEXT:

Washington, Nov.4 -- Scientists may have hit upon a new idea of tracking aliens, after years of seeking them through radio signals and ultra short laser pulses.

Avi Loeb, working with the Harvard-Smithsonian Centre for Astrophysics, proposes that searching for extraterrestrials' city lights could be one way of finding them.

"Looking for alien cities would be a long shot, but wouldn't require extra resources. And if we succeed, it would change our perception of our place in the universe," said Loeb, the journal *Astrobiology* reports.

As with other methods, astrophysicists rely on the assumption that aliens would use earth-like technologies, according to a Harvard-Smithsonian statement.

This is reasonable because any intelligent life that evolved in the light from its nearest star is likely to have artificial illumination that switches on during the hours of darkness.

How easy would it be to spot a city on a distant planet? Clearly, this light will have to be distinguished from the glare from the parent star.

As the planet orbits, it goes through phases similar to those of the Moon. When it's in a dark phase, more artificial light from the night side would be visible from earth than reflected light from the day side.

So the total flux from a planet with city lighting will vary in a way that is measurably different from a planet that has no artificial lights.

Spotting this tiny signal would require future generations of telescopes. However, the technique could be tested closer to home, using objects at the edge of our solar system.

Loeb and Edwin Turner from Princeton University calculate that today's best telescopes ought to be able to see the light generated by a Tokyo-sized megalopolis at the distance of the Kuiper Belt - the region occupied by Pluto, Eris and thousands of smaller icy bodies.

So if there are any cities out there, we ought to be able to see them now. By looking, astronomers can hone the technique and be ready to apply it when the first earth-sized worlds are found around distant stars in our galaxy. Published by HT Syndication with permission from Indo-Asian News Service. For any query with respect to this article or any other content requirement, please contact Editor at htsyndication@hindustantimes.com

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Record - 4

DIALOG(R)

'City lights' could help spot extraterrestrial civilisations in space

Hindustan Times

Friday, November 4, 2011

TEXT:

Washington, Nov.4 -- In a new study aimed at finding extraterrestrial intelligence, astronomers have suggested to look out for artificial lights in alien cities rather than using radio signals and ultra-short laser pulses to validate their existence.

Avi Loeb from the Harvard-Smithsonian Center for Astrophysics and Edwin Turner from the Princeton University rely on the assumption that aliens would use Earth-like technologies and are likely to have artificial illumination that switches on during hours of darkness.

'Looking for alien cities would be a long shot, but wouldn't require extra resources. And if we succeed, it would change our perception of our place in the universe,' Loeb said.

As the planet orbits, it goes through phases similar to those of the Moon, so when it's in a dark phase, more artificial light from the night side would be visible from Earth than reflected light from the dayside.

As a result the total flux from a planet with city lighting will vary in a way that is measurably different from a planet that has no artificial lights.

The researchers also calculate that today's best telescopes ought to be able to see the light generated by a Tokyo-sized metropolis at the distance of the Kuiper Belt, the region occupied by Pluto, Eris, and thousands of smaller icy bodies.

The study will be published in the journal *Astrobiology*. Published by HT Syndication with permission from Asian News International. For any query with respect to this article or any other content requirement, please contact Editor at htsyndication@hindustantimes.com

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Record - 5

DIALOG(R)

SETI search urged to look for city lights

UPI Science News

Thursday, November 3, 2011

TEXT:

Researchers should consider looking for city lights outside the solar system in the search for extraterrestrial life, two U.S. astronomers say.

Avi Loeb of the Harvard-Smithsonian Center for Astrophysics and Edwin Turner of Princeton University say they're going on the assumption aliens would use Earth-like technologies and that any intelligent life that evolved in the light from its nearest star is likely to have artificial illumination that switches on during the hours of darkness, a Harvard-Smithsonian release said Thursday.

"Looking for alien cities would be a long shot, but wouldn't require extra resources," Loeb said. "And if we succeed, it would change our perception of our place in the universe."

Distinguishing city lights on a planet from the glare of a parent star would be difficult, they acknowledge, and could require future generations of more sensitive telescopes.

As Earthly technology has advanced from radio and TV broadcasts to cable and fiber optics, we have become less detectable to aliens, and if the same is true of extraterrestrial civilizations then artificial lights might be the best way to spot them from afar, Loeb and Tuner say.

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Record - 6

DIALOG(R)

No injuries cited from space junk,

Press Wire Services

Grand Rapids Press, The, 1 and 2 and 3 and 4 ed, pA3

Sunday, September 25, 2011

TEXT:

No injuries cited from space junk

WASHINGTON -- It's as big as a bus and weighs 6 tons, but officials probably will never be able to pinpoint exactly where a massive NASA

satellite plummeted to Earth. NASA space junk scientists believe that all -- or nearly all -- of the parts of their 20-year-old dead satellite safely plunged into the Pacific Ocean, likely missing land. No injuries or damage have been reported on land, which NASA officials said was a good indication the satellite went into the ocean. That doesn't necessarily mean it all fell into the sea. Some debris might have fallen over areas such as Portland, Ore.; Seattle; Calgary, Alberta; and Saskatoon, Saskatchewan, said Jonathan McDowell of the Harvard-Smithsonian Center for Astrophysics. "Pieces are falling off of this flaming fireball, and some of it has enough momentum to go hundreds of miles," he said. There were no credible reports of debris on the ground, said Nick Johnson, NASA's chief scientist for orbital debris.

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Wolbach Library: CfA in the News ~ Week ending 13 November 2011

1. **Exoplanet hunters almost losing count.** Schilling, Govert, Sky & Telescope, v122, n6, p12 (1), Thursday, December 1, 2011
2. **Scientists at Harvard-Smithsonian Center for Astrophysics Report Research in Astronomy Research,** Science Letter, p697, Tuesday, November 15, 2011
3. **Findings from Harvard-Smithsonian Center for Astrophysics Broaden Understanding of Astronomy Research,** Science Letter, p110, Tuesday, November 15, 2011
4. **Girl Scouts redesign badges for new century,** Beth Teitell, Boston Globe (MA), p1, Tuesday, November 8, 2011

Record - 1

DIALOG(R)

Exoplanet hunters almost losing count.

Schilling, Govert,
Sky & Telescope, v122, n6, p12(1),
Thursday, December 1, 2011

TEXT:

"It's just amazing," remarked exoplanet pioneer Michel Mayor, looking around in a free moment during the Extreme Solar Systems II conference in Wyoming last September 12-16. "Fifteen years ago, there were just a handful of people working in this field. Now there are well over a thousand."

The number of extrasolar planets has risen even faster, if you count both the confirmed and likely ones. The canonical Extrasolar Planets Encyclopedia listed 687 confirmed as of the end of September. Then there's NASA's Kepler mission. Last February the Kepler team announced 1,235 planet "candidates" transiting the faces of stars in the spacecraft's field of view. Team members expect 90% to 95% of these to prove real. At the September conference, Natalie Batalha of the Kepler team announced more than 500 additional exoplanet candidates as part of Kepler's latest data release, bringing the new total to 1,781. (Of these, about 200 of all types lie within their stars' habitable zones.) And, she said, "There are many more in the pipeline. At the end of the mission, we may easily have found over 3,000 candidates."

Kepler represents the big-science end of the world's exoplanet searches. Elsewhere at the conference, Coel Hellier of Keele University, U.K., was presenting 23 new giant planets found by the WASP-South transit survey. This South Africa-based project watches star fields across wide areas of the sky using off-the-shelf telephoto camera lenses.

Most exciting among the Kepler finds are the so-called "multis"--stars with two, three, four, five, or six candidate planets crossing their faces, each at its own clockwork pace. "I just love these systems," said Darin Ragozzine (Harvard-Smithsonian Center for Astrophysics). "We've hit at an amazing treasure trove here." Kepler announced 170 multi systems last February. At the Wyoming conference, Jason Rowe (NASA/Ames Research Center) added 158 more. And, he said, "there are many more on the horizon."

[ILLUSTRATION OMITTED]

One reason why the multis are considered so exciting is that they're almost certainly all real planets, not just candidates, explained theorist Jack Lissauer (NASA/ Ames). It's virtually impossible that spurious signals could team up to produce the observed patterns--especially when transit timing variations (TTVs) reveal the planets' mutual gravitational tugs on one another, providing their masses in the process. "This is an extremely high-fidelity sample of candidates," Lissauer said.

The Quest for Terra II

A running theme throughout the conference was the quest for a holy-grail number: what fraction of main-sequence stars host Earth-like worlds? Determining this number is the Kepler mission's main goal.

At a lively panel discussion, the prevailing conclusion was that we don't know the number yet, despite the widely publicized conclusion by Wesley A. Traub (JPL/ Caltech) a few days later that, extrapolating from Kepler statistics, 20% to 50% of Sun-like stars (F, G, and K dwarfs) have at least one terrestrial planet in their habitable zones. Panelists pointed out that 80% to 90% of exoplanet systems seem to have gone through a period of early orbital chaos, leaving orbits a mess. Theorist Alessandro Morbidelli (Observatoire de la Cote d'Azur, France) said this uncertain dynamical history suggests that we can't be sure whether the so-called super-Earths now being confirmed--planets between 2 and 10 times Earth's mass--are rocky terrestrials or gassy mini-giants.

Explained planet hunter Geoff Marcy (University of California, Berkeley), "We can't just extrapolate from the Jupiters and the mini-Neptunes down to the real, rocky Earths."

NASA will decide this spring whether it can afford \$20 million per year to extend the Kepler mission for 4 years beyond its planned 3.5 years. An extended mission will be necessary if Kepler is to obtain good data on planets that are as small and far from their stars as Earth is. The problem is that most stars are turning out to show more microvariability than expected, adding noise to transit light curves (October issue, page 12). Batalha is worried about the outcome. "We live in difficult times," she said, "when scientific progress is not limited by technology, but by economics."

Asked whether the Kepler team has thought about private funding for a mission extension, she replied that the thought had crossed the team's mind. "We're talking about at most \$20 million per year," she said. "When I mentioned this while lecturing to a group of entrepreneurs, they just laughed--it's really not that much. On the other hand, we really feel the government should do this."

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Record - 2

DIALOG(R)

Scientists at Harvard-Smithsonian Center for Astrophysics Report Research in Astronomy Research,

Science Letter, p697,

Tuesday, November 15, 2011

TEXT:

According to the authors of a study from Cambridge, Massachusetts, "We present several molecular line emission arcsecond and subarcsecond observations obtained with the Submillimeter Array in the direction of the massive protostar IRAS 18162-2048, the exciting source of HH 80-81. The data clearly indicate the presence of a compact (radius approximate to 425-850 AU) SO₂ structure, enveloping the more compact (radius less than or similar to 150 AU) 1.4 mm dust emission (reported in a previous paper)."

"The emission spatially coincides with the position of the prominent thermal radio jet which terminates at the HH 80-81 and HH 80N Herbig-Haro objects. Furthermore, the molecular emission is elongated in the direction perpendicular to the axis of the thermal radio jet, suggesting a disk-like structure. We derive a total dynamic mass (disk-like structure and protostar) of 11-15 M_☉. The SO₂ spectral line data also allow us

to constrain the structure temperature between 120 and 160 K and the volume density greater than or similar to $2 \times 10^{(9)} \text{ cm}^{-3}$. We also find that such a rotating flattened system could be unstable due to gravitational disturbances. The data from (CO)-O-17 line emission show a dense core within this star-forming region," wrote M. Fernandez-Lopez and colleagues, Harvard-Smithsonian Center for Astrophysics (see also).

The researchers concluded: "Additionally, the H₂CO and SO emissions appear clumpy and trace the disk-like structure, a possible interaction between a molecular core and the outflows, and in part, the cavity walls excavated by the thermal radio jet."

Fernandez-Lopez and colleagues published the results of their research in *Astronomical Journal* (A Rotating Molecular Disk Toward Iras 18162-2048, The Exciting Source Of Hh 80-81. *Astronomical Journal*, 2011;142(4):7-19).

For additional information, contact M. Fernandez-Lopez, Harvard Smithsonian Center Astrophysics, Cambridge, MA 02138, United States.

The publisher of the *Astronomical Journal* can be contacted at: lop Publishing Ltd, Temple Circus, Temple Way, Bristol BS1 6BE, England. Copyright (c) 2011 Science Letter via NewsRx.com

Record - 3

DIALOG(R)

Findings from Harvard-Smithsonian Center for Astrophysics Broaden Understanding of Astronomy Research,

Science Letter, p110,

Tuesday, November 15, 2011

TEXT:

According to the authors of recent research published in the *Astronomical Journal*, "Redshift surveys are a powerful tool of modern cosmology."

"We discuss two aspects of their power to map the distribution of mass and light in the universe: (1) measuring the mass distribution extending into the infall regions of rich clusters and (2) applying deep redshift surveys to the selection of clusters of galaxies and to the identification of very large structures (Great Walls). We preview the HectoMAP project, a redshift survey with median redshift $z = 0.34$ covering 50 deg^2 to $r = 21$," wrote M.J. Geller and colleagues, Harvard-Smithsonian Center for Astrophysics (see also).

The researchers concluded: "We emphasize the importance and power of spectroscopy for exploring and understanding the nature and evolution of

structure in the universe."

Geller and colleagues published their study in *Astronomical Journal* (Mapping The Universe: The 2010 Russell Lecture. *Astronomical Journal*, 2011;142(4):504-510).

For additional information, contact M.J. Geller, Harvard Smithsonian Center Astrophysics, Cambridge, MA 02138, United States.

The publisher's contact information for the *Astronomical Journal* is: IOP Publishing Ltd, Temple Circus, Temple Way, Bristol BS1 6BE, England.

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Record - 4

DIALOG(R)

Girl Scouts redesign badges for new century,

Beth Teitell,

Boston Globe (MA), p1,

Tuesday, November 8, 2011

TEXT:

Ruth Bramson, the chief executive of Girl Scouts of Eastern Massachusetts, wants to make one thing clear. "We'll never give up the cookie badge." But as Girl Scouts of the USA prepares to celebrate its 100th anniversary, the organization has revamped its badge lineup, and some - Looking Your Best, and From Fitness to Fashion, among them - have gotten the ax. Others, such as the cookie badge, made the cut, albeit with makeovers

And some of the 136 badges sound more like topics trending on Twitter than something a fresh-faced girl would pin on her sash

There's a Good Credit badge and a Money Manager badge, Locavore, Website Designer, and Netiquette badges, a Science of Happiness badge, and, as a component of a cookie-badge program that has been expanded, a Customer Loyalty badge

At a time when girls have many extracurricular options, the wide-ranging revamp - the first in 25 years - is an attempt to stay relevant

MORE ONLINE

For a list of the 10 newest Girl Scout badges, go to www.bostonglobe.com "The girls said, 'We love the camping, we love the cookies, but we want the Girl Scouts to be more about what we're about,' " Bramson said

Badges have always reflected their times; in 1916 the Telegraph badge seemed cutting edge, and in 1920 a Canning badge was pertinent. But in the age of YouTube, the local food movement, and Occupy Wall Street, Girl Scouts have different concerns

"I don't want to be one of the people who have bad finances," said Shannon Leary, 17, a senior at the Woodward School in Quincy. She plans to start working toward a financial literacy badge as soon as she is done with college applications

"A lot of people go to college and open credit cards and spend a lot of money, and then you're in debt at a really early age and you have a poor credit score," she said. "No one really wants that."

Leary also plans to earn a badge for another headline-making subject - the environment. Her interest follows a Girl Scouts trip to Peru and Costa Rica. "The tour guide said the rain forests were being chopped down for cattle, or global warming was impacting them," she said. "I want to do my best to save the world, even though I know that sounds really cliché." In Reading, Kasey Cook, 16, is working toward an updated First Aid badge, and two of the steps involve educating herself about sports-related head injuries and drug and alcohol abuse

"Unfortunately in Reading in the past couple of months there have been a lot of drug or alcohol-related deaths," Cook said. "If you know the signs [of drug or substance abuse], maybe you'll be able to help. The worst thing is to be uneducated."

"It's not an official Girl Scouts motto," she added, "but one of the things they teach girls is that knowledge is power. They really try to prepare girls to be leaders of tomorrow."

Even if it means looking back to yesterday. Thirty-five of the new badges are in the "legacy" category, meaning they're modernized versions of favorite badges from the Girl Scouts' 100-year history. Dinner Party has essentially replaced Hostess, with the focus on figuring out where to obtain the ingredients rather than sending invitations

As for the From Fitness to Fashion badge, that has evolved into Science of Style. "Girls are still interested in how they look and what they wear," said Alisha Niehaus, executive editor of the new badge book, "but now we've given it a purposeful bent. They can look at the chemical makeup of sunscreen or makeup, or the use of nanotechnology in fabric."

Niehaus left her job as a children's book editor at Penguin Young Readers Group to oversee the second half of the two-year update of the "Girls Guide to Girl Scouting," which is six books, one for every Girl Scouting level, from Daisy to Ambassador, each around 150 pages long

Niehaus said the revamp comes at a time when the Girl Scouts have "turned the corner" on membership, which hit an all-time high of 3,921,403 members in 1969. "There was not a lot of other things for girls to do," she said in an e-mail, "and women were getting more involved and taking leadership roles - these are just two factors of many factors that affected membership at this time."

Membership, which dropped to a post-1969 low in the early 1980s, hit 3,193,502 this year, up from 3,182,142 in 2010

Ideas for the new badges came out of focus group discussions, with girls, volunteers, and staff from regional councils

The badges, which range from Comic Artist to Behind the Ballot to Car Care, cover the range of life itself, but they share a goal: to keep girls challenged and engaged, and in the process encourage them to be leaders - which the organization defines as anything from one who stands up for a bullying victim to becoming president of the United States

Sarah Leshay, a high school teacher and the leader of two troops in the Bedford-Hanscom area, said the update was needed. "Keeping the older girls engaged is really hard," she said, and the more current the badges, the better. "The old photography badge had nothing about digital - that's how old it was."

Another Bedford-Hanscom leader, Nancy Wolk, said her fourth-graders are particularly enthusiastic about the new Savvy Shopper badge - and she is, too

"Girls have more money than they did in the past," said Wolk, the mother of two scouts, and a scientist at the Harvard-Smithsonian Center for Astrophysics. "I've noticed a lot of the girls in my group, even the girls are on the lower end of the economic scale, still have more money than I did as a kid. I hear stories of parents borrowing from their kids' piggy banks to pay the cleaners. It's good at this age to talk about the fact that just because you have money, you don't have to go out and spend it." That's a lesson Wolk's 9-year-old Scout says she needs to learn. "I have a lot of trouble with my money," said Sylvia. She explained that impulsive purchases - of American Girl doll merchandise and Nintendo games - are making it hard for her to save for a new Nintendo 3DS

"I basically get a game and then I play it and then I see another one I want and then I run out of money," she said. "I want to learn how to save better."

Beth Teitell can be reached at bteitell@globe.com. Follow her on Twitter @bethteitell.

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Wolbach Library: CfA in the News ~ Week ending 20 November 2011

1. **UNIVERSITY OF VIRGINIA, CHARLOTTESVILLE ON CUSP OF REVOLUTION IN ASTROCHEMISTRY**, US Federal News, Thursday, November 17, 2011
2. **NASA's Chandra confirms birth of famous black hole millions of years ago**, Hindustan Times, Friday, November 18, 2011
3. **NASA's Chandra completes black hole description**, Hindustan Times, Friday, November 18, 2011
4. **New data reveals black hole's secrets**, UPI Science News, Thursday, November 17, 2011
5. **Harvard-Smithsonian Center for Astrophysics Details Research in Astronomy**, Science Letter, p182, Tuesday, November 22, 2011
6. **Boulder scientists build tool for NASA's Mars rover 'Curiosity'**, Esteban L. Hernandez For the Camera, Boulder Daily Camera (CO), Wednesday, November 16, 2011
7. **Michael Drake**, Daily Telegraph (UK), 01 ed, Tuesday, November 15, 2011
8. **On The Cover, Aviation Week & Space Technology**, v173, n38, p01, Monday, October 24, 2011
9. **STUDENTS' OUT-OF-SCHOOL-TIME SCIENCE PROJECTS LEAD TO INTEREST IN SCIENCE AND MATH CAREERS IN COLLEGE, UNIVERSITY OF VIRGINIA STUDY FINDS**, US Federal News, Tuesday, November 15, 2011

Record - 1

DIALOG(R)

UNIVERSITY OF VIRGINIA, CHARLOTTESVILLE ON CUSP OF REVOLUTION IN ASTROCHEMISTRY,
US Federal News,
Thursday, November 17, 2011

TEXT:

CHARLOTTESVILLE, Va., Nov.17 -- The University of Virginia issued the following news release:

Astronomy has always been about finding our place in the universe, about seeking origins. A new international astronomical observatory called ALMA will bring new insights to our understanding of the farthest reaches of space and answers to our most fundamental questions as to how the universe evolved and became what it is, and how the building blocks of life began.

University of Virginia astronomers and chemists are at the forefront of this adventure.

"We really are poised to lead the way on a hugely important aspect of this venture, which is to better understand the chemistry of the universe," said astronomer Kelsey Johnson of U.Va.'s College of Arts & Sciences, who chairs ALMA's science advisory committee. "Astrochemistry is an emerging field on the cusp of revolution, and U.Va. scientists have anticipated this and prepared for it."

ALMA is the Atacama Large Millimeter/submillimeter Array, a new \$1.3 billion radio telescope in the high desert of Chile. Decades in planning and years in construction, ALMA is the most technologically advanced astronomical observatory ever built, far exceeding the capabilities of any other, including the Hubble Space Telescope.

"It's really going to not only enhance our view of the universe, but also change the way we view it. The new science is going to be astounding," Johnson said.

ALMA made its first observations on Sept. 30, streaming startling images and reams of new data to scientists around the world. When construction is fully complete in 2013, the observatory will consist of 66 radio antennas configured to provide the observational capabilities of a single massive antenna that otherwise would be impossible to build.

The United States has contributed nearly \$500 million to its development through the National Science Foundation-funded National Radio Astronomy Observatory headquartered on the U.Va. Grounds in Charlottesville.

"U.Va. is uniquely positioned to establish an international leadership role in ALMA science," said U.Va. chemist Brooks Pate, also from the College, who leads a multidisciplinary effort in the chemistry of the universe at the University. "We have a world-class team of chemists, astronomers, physicists and engineers to direct the science, make observations, collect data and sort through it to bring new understanding to the makings of the universe."

ALMA will provide chemists and astronomers with high-resolution images of the way molecules are distributed in the universe. This will help scientists

develop a new and essentially first-time understanding of space chemistry - how the original simple elements of hydrogen and helium formed into more complex elements, how the chemistry of stars spread out across the universe and how planets formed, including Earth.

"We've really only obtained hints, up to this point, of the chemical processes that led to life on this planet," Pate said. "ALMA will allow us to move beyond our understanding of Earthbound chemistry to the very source chemistry in the universe that led to everything else, including amino acids, the precursors to DNA and life."

To further its pursuit of this understanding, U.Va. hired two astrochemists to sort through and give meaning to the mass of data that has begun to stream in from ALMA.

One is Eric Herbst, a preeminent pioneer in the emerging field of astrochemistry, who came to U.Va. earlier this year as the Commonwealth Professor of Chemistry from a distinguished career at The Ohio State University. He holds joint appointments in the chemistry, astronomy and physics departments. The other is Karin Oberg, currently a Hubble Postdoctoral Fellow at the Harvard-Smithsonian Center for Astrophysics, who will be appointed to the astronomy and chemistry departments.

"The chemistry of space is why we are here," Herbst noted. "The exotic chemistry out there relates to the everyday chemistry here, and so there is a lot to learn from astrochemistry about how all of this came together, from the stars to the planets. With ALMA we hope to identify regions of space with water, complex and pre-biotic molecules" - or molecules, like amino acids, that are building blocks for life.

Pate adds that areas of astrochemistry that currently are under speculation, such as how exotic molecules are formed, will now be tested, analyzed and re-evaluated. New understandings will emerge.

"We might begin to see the chemical processes that allowed for the forming of life on this planet, and can look to regions of space where the same conditions may be occurring or have already occurred," Pate said. "We hope to identify regions where there may be other life."

"There will be exponential growth in knowledge," Herbst added. "At present we can't identify a large fraction of the molecules in space. There are missing chunks of fundamental knowledge, and we're going to begin to fill in those gaps. There is so much new chemistry to learn."

One of the biggest challenges facing researchers will be sorting through the reams of data that will stream in non-stop from ALMA. "Extracting the

scientific content of the enormous data set will push the technological limits of large-scale computing and require scientists to develop new software tools to rapidly analyze data sets that are too large to directly view," Pate said.

He noted that the development of ALMA has been a driver for major technological advances in the field of terahertz spectroscopy, a rapidly moving field with deep connections to the science and technology community in Charlottesville. Solid-state terahertz devices are needed for ALMA's spectrographs for chemical sensing and imaging.

In addition to the National Radio Astronomy Observatory engineers who have designed and assembled ALMA's detectors, U.Va. electrical and computer engineering professors Art Lichtenberger and Robert Weikle, in the School of Engineering and Applied Science, are developing new devices for the emerging field of terahertz spectroscopy and imaging. Charlottesville-based Virginia Diodes Inc., a company that grew from the research program of U.Va. electrical and chemical engineering professor Thomas Crowe, is a world leader in the commercialization of solid-state terahertz light sources and detectors. The National Ground Intelligence Center and the Defense Intelligence Agency facility in Charlottesville also are users of this technology.

"Charlottesville is uniquely poised to become the leading research and development commercialization center for terahertz technology, and this should lead to local jobs in high-tech fields," Pate said.

ALMA research also will spin off public outreach and K-12 education initiatives. High-resolution images and findings from ALMA science will be used to educate the public on the newly discovered wonders of space, and the University will develop outreach programs to the local community and schools to highlight ways that Charlottesville is shaping up to be a premier national center for breakthroughs in our understanding of our place in the universe. For any query with respect to this article or any other content requirement, please contact Editor at htsyndication@hindustantimes.com

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Record - 2

DIALOG(R)

**NASA's Chandra confirms birth of famous black hole millions of years ago,
Hindustan Times,**

Friday, November 18, 2011

TEXT:

Washington, Nov. 18 -- A team of scientists has discovered new details about the birth of a famous black hole that took place millions of years ago using data from NASA's Chandra X-ray Observatory as well as from radio, optical and other X-ray telescopes.

Over three decades ago, Stephen Hawking placed ' and eventually lost ' a bet against the existence of a black hole in Cygnus X-1.

Today, astronomers are confident the Cygnus X-1 system contains a black hole, and with these latest studies they have remarkably precise values of its mass, spin, and distance from Earth.

'This new information gives us strong clues about how the black hole was born, what it weighed and how fast it was spinning,' said Mark Reid of the Harvard-Smithsonian Center for Astrophysics (CfA) in Cambridge, Mass, one of the researchers.

'This is exciting because not much is known about the birth of black holes,' he added.

Cygnus X-1 is a so-called stellar-mass black hole, a class of black holes that comes from the collapse of a massive star. The black hole is in close orbit with a massive, blue companion star.

Using X-ray data from Chandra, the Rossi X-ray Timing Explorer, and the Advanced Satellite for Cosmology and Astrophysics, the team was able to determine the spin of Cygnus X-1 with unprecedented accuracy, showing that the black hole is spinning at very close to its maximum rate.

Its event horizon - the point of no return for material falling towards a black hole - is spinning around more than 800 times a second.

Using optical observations of the companion star and its motion around its unseen companion, the team made the most precise determination ever for the mass of Cygnus X-1, of 14.8 times the mass of the Sun. It was likely to have been almost this massive at birth, because of lack of time for it to grow appreciably.

'It is amazing to me that we have a complete description of this asteroid-sized object that is thousands of light years away. This means astronomers have a more complete understanding of this black hole than any other in our Galaxy,' said Lijun Gou, also from CfA, who led one of the three studies.

The team also announced that they have made the most accurate distance estimate yet of Cygnus X-1 using the National Radio Observatory's Very Long Baseline Array (VLBA). The new distance is about 6,070 light years from Earth. This accurate distance was a crucial ingredient for making the precise mass and spin determinations.

The findings appeared in the November 10th issue of The Astrophysical Journal. Published by HT Syndication with permission from Asian News International. For any query with respect to this article or any other content requirement, please contact Editor at htsyndication@hindustantimes.com

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Record - 3

DIALOG(R)

NASA's Chandra completes black hole description,
Hindustan Times,
Friday, November 18, 2011

TEXT:

Washington, Nov.18 -- A team of astronomers has produced a complete description of a black hole and discovered new details about its birth hole that took place millions of years ago by using data from NASA's Chandra X-ray Observatory as well as from radio, optical and other X-ray telescopes.

Using several telescopes, both ground-based and in orbit, the scientists unravelled longstanding mysteries about the object called Cygnus X-1, a famous binary-star system discovered to be strongly emitting X-rays nearly a half-century ago.

The system consists of a black hole and a companion star from which the black hole is drawing material.

'Because no other information can escape from a black hole, knowing its mass, spin, and electrical charge gives a complete description of it,' Mark Reid, of the Harvard-Smithsonian Center for Astrophysics (CfA), said.

'The charge of this black hole is nearly zero, so measuring its mass and spin make our description complete,' he said.

Though Cygnus X-1 has been studied intensely since its discovery, previous attempts to measure its mass and spin suffered from lack of a precise

measurement of its distance from Earth.

Reid led a team that used the National Science Foundation's Very Long Baseline Array (VLBA), a continent-wide radio-telescope system, to make a direct trigonometric measurement of the distance.

Their VLBA observations provided a distance of 6070 light-years, while previous estimates had ranged from 5800-7800 light-years.

Armed with the new, precise distance measurement, scientists using the Chandra X-Ray Observatory, the Rossi X-Ray Timing Explorer, the Advanced Satellite for Cosmology and Astrophysics, and visible-light observations made over more than two decades, calculated that the black hole in Cygnus X-1 is nearly 15 times more massive than our Sun and is spinning more than 800 times per second. 'This new information gives us strong clues about how the black hole was born, what it weighed and how fast it was spinning.

'Getting a good measurement of the distance was crucial,' he added.

The study has been published in the Astrophysical Journal Letters. Published by HT Syndication with permission from Asian News International. For any query with respect to this article or any other content requirement, please contact Editor at htsyndication@hindustantimes.com

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Record - 4

DIALOG(R)

New data reveals black hole's secrets,

UPI Science News,

Thursday, November 17, 2011

TEXT:

Data from NASA's Chandra X-ray Observatory has revealed new details about the birth of a famous black hole millions of years ago, U.S. astronomers say.

More than 30 years ago, Stephen Hawking famously placed -- and eventually lost -- a bet against the existence of a black hole in Cygnus X-1.

He was eventually proved wrong, and astronomers say the new data has now given them remarkably precise values of the black hole's mass, spin and distance from Earth.

"This new information gives us strong clues about how the black hole was born, what it weighed and how fast it was spinning," study author Mark Reid of the Harvard-Smithsonian Center for Astrophysics in Cambridge, Mass., said in a release Thursday. "This is exciting because not much is known about the birth of black holes."

Cygnus X-1 is a so-called stellar-mass black hole that comes from the collapse of a massive star. The black hole is in close orbit with a massive, blue companion star.

"It is amazing to me that we have a complete description of this asteroid-sized object that is thousands of light years away," Harvard-Smithsonian researcher Lijun Gou said. "This means astronomers have a more complete understanding of this black hole than any other in our Galaxy."

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Record - 5

DIALOG(R)

Harvard-Smithsonian Center for Astrophysics Details Research in Astronomy,
Science Letter, p182,
Tuesday, November 22, 2011

TEXT:

"We provide precise fitting formulae for Faraday conversion and rotation coefficients in uniformly magnetized relativistic plasmas. The formulae are immediately applicable to rotation measure and circular polarization (CP) production in jets and hot accretion flows," scientists writing in the journal Monthly Notices of the Royal Astronomical Society report.

"We show the recipe and results for arbitrary isotropic particle distributions, in particular thermal and power law. The exact Faraday conversion coefficient is found to approach zero with the increasing particle energy," wrote L. Huang and colleagues, Harvard-Smithsonian Center for Astrophysics.

The researchers concluded: "The non-linear corrections of Faraday conversion and rotation coefficients are found essential for reliable CP interpretation of Sagittarius A*."

Huang and colleagues published their study in Monthly Notices of the Royal Astronomical Society (Faraday conversion and rotation in uniformly

magnetized relativistic plasmas. Monthly Notices of the Royal Astronomical Society, 2011;416(4):2574-2592).

Additional information can be obtained by contacting L. Huang, Harvard Smithsonian Center Astrophysics, Cambridge, MA 02138, United States.

The publisher of the journal Monthly Notices of the Royal Astronomical Society can be contacted at: Wiley-Blackwell, Commerce Place, 350 Main St., Malden 02148, MA, USA.

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Record - 6

DIALOG(R)

Boulder scientists build tool for NASA's Mars rover 'Curiosity',

Esteban L. Hernandez For the Camera,
Boulder Daily Camera (CO),
Wednesday, November 16, 2011

TEXT:

Scientists at the Southwest Research Institute in Boulder have constructed an instrument that they hope will help visions of humans on Mars grow from science fiction to something closer to reality.

The instrument is called the Radiation Assessment Detector, or RAD, and will be launched by NASA later this month inside the latest Mars rover, called Curiosity.

"This has been a major part of six years of my life, and it's become one of my defining projects," said Donald M. Hassler, who spearheaded the development of RAD and is a science program director at the Southwest Research Institute. "It is very important to me."

Hassler held a pre-launch colloquium at Southwest Research Institute headquarters in downtown Boulder on Wednesday to present RAD and the goals of Curiosity, the largest Mars rover to date.

"It's very exciting," Hassler said after his presentation. "It's a once in a lifetime opportunity and it's finally happening."

The official name of the mission is the Mars Science Laboratory. The rover is scheduled to launch atop an Atlas Rocket on Nov. 25 at the Cape Canaveral Air Force Station in Florida. The rover has a launch window of Nov. 25 to Dec. 18, and then will travel eight-and-a-half months to reach

Mars.

Curiosity's major objective will be to determine how hospitable the Red Planet is for humans. It will study both life-supporting and life-limiting factors of Mars, a monumental task calibrated with the assistance of 10 instruments on board, including RAD.

Hassler, who received an M.S. and Ph. D. in physics from the University of Colorado, said he and his team are breaking new ground in Mars research.

"Everyone is very excited," Hassler said. "We have tried to make instruments and send them to the surface of Mars three times before, and there have been problems each time."

Hassler, who has served as an adjunct professor at CU and was a physicist at the Harvard-Smithsonian Center for Astrophysics, said the mission is extremely important.

"We will learn about the possibilities for life to evolve and develop in another planet," Hassler said of the project. "Right now we believe that life is unique on Earth. We may learn in this mission that the building blocks of life are present through out the universe."

A multi-million dollar instrument, RAD is located on the top right corner of Curiosity, facing upward toward the Martian atmosphere. Two-and-half years worth of research and construction are packed with practical finesse inside an instrument the size of a coffee pot.

Hassler said the instrument was built in Boulder and Germany.

In addition to RAD, some of the other 10 instruments aboard Curiosity include three types of cameras and an infrared laser capable of vaporizing small areas of Martian rock to analyze its contents.

"I think all 10 instruments are important in their own way," Hassler said. "They are complementary as a set of instruments. It's a great payload."

Scot Rafkin is a project scientist and manager at Southwest Research Institute and said measuring radiation levels on Mars will help humans develop strategies for future exploration.

"I think it's critical both for future human exploration and understanding whether Mars has a sufficient environment that can support life or has supported life in the past," Rafkin said.

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Record - 7

DIALOG(R)

Michael Drake,

Daily Telegraph (UK), 01 ed,
Tuesday, November 15, 2011

TEXT:

MICHAEL DRAKE, who has died aged 65, was a British planetary scientist who worked for Nasa on two questions of fundamental importance to humans: where do we come from; and how do we stop ourselves from being obliterated, like the dinosaurs, by an asteroid impact?

The two questions were the subject of the mission on which he was working when he died: OSIRIS-REx, an \$800 million rendezvous somewhere between Mars and Jupiter with a lump of rock, 575 metres wide, known as RQ36. The mission finally got the green light in May this year, after a lifetime's lobbying from Drake, and is scheduled to blast off in 2016.

Almost four years later a probe will approach to within three miles of the asteroid and begin to map its surface. Six months on, mission control will select a target site, sidle the probe up to the rock's surface, extend its robot arm, and capture a 60-gram sample. So delicate is the planned operation that, Drake said, the craft will barely "kiss" the surface.

If so, it is hoped that OSIRIS-REx (which stands for Origins-Spectral Interpretation-Resource Identification-Security-Regolith Explorer) will kiss and tell, returning its tiny cargo safely to Earth in 2023, and shedding light on the origins of life on this planet.

Such lofty hopes are intrinsic to an increasingly favoured theory that Earth was a barren lump of rock before being "seeded" with the building blocks of life - like amino acids - by asteroids that smashed into our planet's surface. RQ36 is rich in carbon, making it more likely that it hosts such organic molecules; it is also untouched since the birth of our sun, and the planets that orbit it, 4.5 billion years ago. Seeds of life on RQ36, or asteroids like it, would - if found - almost certainly represent the origins of creation in our solar system.

Drake was keenly aware of the irony when he revealed that RQ36 might also represent the end of life, or at least human life, on Earth. The asteroid, only discovered in 1999, is scheduled to pass close to us in 2186. There is, Nasa says, a one in 1,800 chance that it will actually collide with Earth, causing devastation from which it is unlikely our species could

recover.

The "Security" element of the OSIRIS-REx mission, therefore, is aimed at refining our methods of plotting asteroid trajectories (which is hard to do accurately due to the so-called "Yarkovsky effect", an uneven impetus that changes depending on each object's shape and rotation). Asteroid impacts are, of course, staple Hollywood fare, and usually involve a heroic team of square-jawed astronauts saving the day at the last moment, possibly with the help of multiple nuclear devices. Though OSIRIS-REx is part of a real-life effort to deflect catastrophic collisions, Nasa will only say, somewhat vaguely, that "the probe will help devise future strategies to mitigate possible Earth impacts from celestial objects".

"OSIRIS-REx will explore our past and help determine our destiny," said Drake. "It will return samples of pristine organic material that scientists think might have seeded the sterile early Earth with the building blocks that led to life. It will also provide the knowledge that will guide humanity in deflecting any future asteroid that could collide with Earth, allowing humanity to avoid the fate of the dinosaurs."

Michael Julian Drake was born on July 8 1946 in Bristol. He read Geology at the Victoria University of Manchester and studied for his PhD at the University of Oregon, before a year as a postdoctoral research associate at the Smithsonian Astrophysical Observatory, near Tucson, Arizona.

He joined the University of Arizona itself in 1973 and remained for his entire career, meeting his wife in America, and eventually taking American citizenship.

There he played a significant part in some of Nasa's highest-profile space missions, including the Cassini mission to explore Saturn; the Mars Odyssey Orbiter; and the Phoenix Mars Lander, which touched down on the Red Planet in 2008 in search of traces of life (and which Drake operated on the surface of Mars from the Arizona campus). On the Orbiter mission, Drake was responsible for the Gamma Ray spectrometer, which first detected the presence of ice on Mars.

Drake, who published more than 100 peer-reviewed papers, was appointed head of the Planetary Sciences department at the university in 1994 (and Regents' Professor in 2005). He was named a fellow of the Meteoritical Society in 1980 (president in 1997); the American Geophysical Union in 2002; and the Geochemical Society in 2002. He served on a host of Nasa committees and was awarded the Leonard Medal of the Meteoritical Society in 2004.

Michael Drake, who had liver cancer, is survived by his wife, Gail, and their son and daughter.

His father also survives him, as does asteroid 9022 Drake, which was discovered on August 14 1988 by the astronomer Carolyn Shoemaker and named in his honour.

Michael Drake, born July 8 1946, died September 21 2011

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Record - 8

DIALOG(R)

On The Cover,

Aviation Week & Space Technology, v173, n38, p01,
Monday, October 24, 2011

TEXT:

Application of quantum physics to the development of new sensors to aid the search for life on other planets is one example of how our increasing understanding of the world of the very small is shaping the future of aerospace. The quantum revolution is also opening new frontiers in materials, manufacturing, energy and propulsion. The varied futures that could result are explored by invited authors in our Innovation Special on pages 56-83. The cover illustration by David A. Aguilar of the Harvard-Smithsonian Center for Astrophysics is an artist's concept of the Kepler-19 system in the constellation Lyra, showing the Sun-like star and its two planets-the Earth-sized Kepler-19b (foreground) and mysterious Kepler-19c-discovered earlier this year by NASA's Kepler spacecraft.

On The Cover

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Record - 9

DIALOG(R)

STUDENTS' OUT-OF-SCHOOL-TIME SCIENCE PROJECTS LEAD TO INTEREST IN SCIENCE AND MATH CAREERS IN COLLEGE, UNIVERSITY OF VIRGINIA STUDY FINDS,

US Federal News,

Tuesday, November 15, 2011

TEXT:

CHARLOTTESVILLE, Va., Nov.15 -- The University of Virginia issued the following news release:

Science clubs, camps and competitions, reading and watching science fiction and nonfiction - middle- and high-school students who engage in such out-of-school-time activities are more likely to have interests in science, technology, engineering and math, or STEM, careers as college students, a University of Virginia study finds.

"Out-of-School-Time Science Activities and Their Association with Career Interest in STEM" was published Oct.24 by the International Journal of Science Education.

Researcher Robert Tai, an associate professor in the Curry School of Education, said, "Millions of dollars each year are invested by both public and private agencies to support STEM education in the U.S.through out-of-school-time science programs. This study provides some support for these investments."

He also noted that "the trend in the United States in the past three decades has been a steady decline in the number of young Americans choosing a science-related career, eroding our nation's ability to compete on a global scale in terms of the scientific innovations that will be necessary to address large problems such a sustainable energy production."

Those students who reported participating in science clubs and competitions at least a few times a year were about 50 percent more likely to select a STEM-related career plan once in college than those not participating in such activities, said the study's lead author, Katherine Dabney, a doctoral candidate in the Curry School and a former elementary school teacher with five years of classroom experience.

Those who participated in science-related reading and science-related TV watching at least a few times a year were about 30 percent more likely to select a STEM-related career once in college, Dabney found.

Based on these findings, transforming an outside-school-time science activity into a school-time curriculum could be a sensible step in continuing efforts to engage students in STEM subjects, Dabney said."For instance, adding more science fiction literature to English or language arts class may serve to increase the probability that a greater number of students will choose STEM careers," she said.

The data used in the U.Va.study were collected in 2007 as part of the Persistence Research in Science and Engineering, or PRiSE, project, funded by the National Science Foundation and led by Philip M.Sadler, director of the Science Education Department of the Harvard-Smithsonian Center for

Astrophysics.

Project PRiSE surveyed a national representative sample of university students enrolled in introductory English courses to investigate and identify high school factors that influence the persistence of students, especially females, in STEM, Dabney explained. The selection of introductory English courses - a general education requirement for almost all students - made it possible to compare the experiences of those who had STEM-career intentions with those who had no STEM-career interests.

In total, 7,505 surveys were completed at 34 randomly selected U.S. universities.

Among the studied population, 46.9 percent were male, 53.1 percent female. Of these respondents, 72.7 percent identified themselves as Caucasian, 8.7 percent African-American, 6 percent East Asian, and the remainder identified themselves as members of less populous or other racial groups. On an additional question, 15 percent of the respondents identified themselves as being of Hispanic origin.

The study found that male university students are more likely than females to be interested in STEM careers. However, males and females appear to experience similar boosts in their STEM career interest from outside-school-time exposure to science, Dabney said.

"Students may not be developing a strong interest in science and mathematics simply because they have not been exposed to these disciplines in such a manner that engages and encourages their interest," Dabney said.

Tai added, "This also suggests that more research is needed in the area of outside-school-time science programs. What specific features or characteristics benefit student participants in terms of what outcomes? For example, recent research has shown that parental support can make a difference in outside-school-time activities and resulting student attitudes toward science."

Taking the results of this study into account, researchers should pursue further studies into how community- and home-based science activities might encourage student advancement and career interest in STEM, Dabney and Tai concluded.

The researchers cautioned against increasing outside-school-time science opportunities for students based solely on the study findings.

"This would be a reasonable interpretation in light of the association between outside-school-time science clubs and competitions,

outside-school-time science reading and writing and STEM-career interest," Tai said. "However, the results from the demographic, background and middle-school variables suggest that the number of outside-school-time programs may not be as significant an issue as the access to these programs for certain groups of students."

For example, a gender and socioeconomic status gap suggests that greater access to outside-school-time activities is important for females and low socioeconomic status students who may have the proclivity for activities that lead to the choice of STEM-related careers, but have not had the exposure to such programs to foster this interest.

"Strengthening the connection between outside-school-time programs and schools through targeted recruitment activities may prove to be the best solution to the problem of access among children in underserved communities," Tai said.

"As we move to face the persistent challenges to access in STEM education, it is becoming increasingly clear that outside-school-time science education plays a powerful role in myriad of science education experiences of youth, and that these experiences appear to have an association with long-range outcomes. It seems that the strengths of informal science education may help to overcome the weaknesses of formal science education, and vice versa.

"Therefore, collaboration between school-time and outside-school-time learning environments, each scaffolding the other, may indeed be a path with great promise for the future of STEM education," Tai said. For any query with respect to this article or any other content requirement, please contact Editor at htsyndication@hindustantimes.com

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Wolbach Library: CfA in the News ~ Week ending 27 November 2011

**1. Birth of black hole 'recorded'. PTI - The Press Trust of India Ltd.
Saturday, November 19, 2011**

**2. Birth of Famous Black Hole Unraveled, Fars News Agency (Iran)
Monday, November 21, 2011**

Record - 1

DIALOG(R)

Birth of black hole 'recorded'.

PTI - The Press Trust of India Ltd.,
Saturday, November 19, 2011

TEXT:

Birth of black hole 'recorded'

Washington, November 19 2011 (PTI) -- Astronomers have for the first time have produced a complete description of a black hole, a concentration of mass so dense that not even light can escape its powerful gravitational pull.

Using several telescopes, an international team yielded the most accurate measurements ever of the black hole's mass and spin rate -- in fact, their precise measurements allowed them to reconstruct the history of the object from its birth some six million years ago.

"Because no other information can escape from a black hole, knowing its mass, spin, and electrical charge gives a complete description of it. The charge of this black hole is nearly zero, so measuring its mass and spin make our description complete," said team leader Mark Reid of Harvard Smithsonian Center for Astrophysics.

Though Cygnus X-1 has been studied intensely since its discovery, previous attempts to measure its mass and spin suffered from lack of a precise measurement of its distance from Earth.

The team's observations provided a distance of 6070 lightyears, while previous estimates had ranged from 5800-7800 lightyears.

"This new information gives us strong clues about how the black hole was born, what it weighed and how fast it was spinning. Getting a good measurement of the distance was crucial," Reid said.

The findings have been published in the 'Astrophysical Journal Letters'.
PTI MOT MOT 11191615

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Record - 2

DIALOG(R)

Birth of Famous Black Hole Unraveled,

Fars News Agency (Iran),

Monday, November 21, 2011

TEXT:

Their precise measurements have allowed them to reconstruct the history of the object from its birth some six million years ago.

Using several telescopes, both ground-based and in orbit, the scientists unraveled longstanding mysteries about the object called Cygnus X-1, a famous binary-star system discovered to be strongly emitting X-rays nearly a half-century ago. The system consists of a black hole and a companion star from which the black hole is drawing material. The scientists' efforts yielded the most accurate measurements ever of the black hole's mass and spin rate.

"Because no other information can escape from a black hole, knowing its mass, spin, and electrical charge gives a complete description of it," said Mark Reid, of the Harvard-Smithsonian Center for Astrophysics (CfA). "The charge of this black hole is nearly zero, so measuring its mass and spin make our description complete," he added.

Though Cygnus X-1 has been studied intensely since its discovery, previous attempts to measure its mass and spin suffered from lack of a precise measurement of its distance from Earth. Reid led a team that used the National Science Foundation's Very Long Baseline Array (VLBA), a continent-wide radio-telescope system, to make a direct trigonometric measurement of the distance. Their VLBA observations provided a distance of 6070 light-years, while previous estimates had ranged from 5800-7800 light-years.

Armed with the new, precise distance measurement, scientists using the Chandra X-Ray Observatory, the Rossi X-Ray Timing Explorer, the Advanced Satellite for Cosmology and Astrophysics, and visible-light observations made over more than two decades, calculated that the black hole in Cygnus X-1 is nearly 15 times more massive than our Sun and is spinning more than 800 times per second.

"This new information gives us strong clues about how the black hole was born, what it weighed and how fast it was spinning," Reid said. "Getting a good measurement of the distance was crucial," Reid added.

"We now know that Cygnus X-1 is one of the most massive stellar black holes in the Milky Way," said Jerry Orosz, of San Diego State University. "It's spinning as fast as any black hole we've ever seen," he added.

In addition to measuring the distance, the VLBA observations, made during 2009 and 2010, also measured Cygnus X-1's movement through our Galaxy. That movement, the scientists, said, is too slow for the black hole to have been produced by a supernova explosion. Such an explosion would have given the object a "kick" to a much higher speed.

"There are suggestions that this black hole could have been formed without a supernova explosion, and our results support those suggestions," Reid said.

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Wolbach Library: CfA in the News ~ Week ending 4 December 2011

1. **Strange beasts in the stellar zoo.**, Braffman-Miller, Judith, USA Today (Magazine), v140, n2798, p36(3), Tuesday, November 1, 2011
2. **Strange red galaxies a 'missing link' in history of the universe?**, Pete Spotts Staff writer, Christian Science Monitor (USA), ALL ed, Friday, December 2, 2011
3. **Hot on Trail Of 'Just Right' Far-Off Planet**, DENNIS OVERBYE, New York Times (NY), Late Edition - Final ed, p1, Saturday, December 3, 2011
4. **STRANGE NEW 'SPECIES' OF ULTRA-RED GALAXY DISCOVERED**, US Federal News, Thursday, December 1, 2011
5. **Past meets future at AAVSO's centennial.**, Sky & Telescope, v123, n1, p20(2), Sunday, January 1, 2012
6. **Finally, a device that can touch the sun**, Carolyn Y. Johnson, Boston Globe (MA), p1, Monday, November 28, 2011

Record - 1

DIALOG(R)

Strange beasts in the stellar zoo.

Braffman-Miller, Judith,
USA Today (Magazine), v140, n2798, p36(3),
Tuesday, November 1, 2011

TEXT:

[ILLUSTRATION OMITTED]

WE ARE SUCH stuff as stars are made of. In fact, we owe our lives to those glittering flecks of lovely light that party around our night sky like twinkling sprinkles of confetti. The universe was born in the Big Bang about 14,000,000,000 years ago with only hydrogen, helium, and trace amounts of lithium. Everything else was formed in the heats of stars working their nuclear-fusing magic as they transformed these primordial

light elements into heavier ones. The oxygen we breathe, water we drink, and iron in our blood all were created from elements formed inside our universe's billions and billions of stars as they spun their supply of hydrogen fuel into heavier items. There perhaps are as many as 400,000,000,000 stars in our Milky Way alone. When a star reaches the end of its hydrogen-fusing (main-sequence) life, it blasts these heavier elements into space, where they then can fly off to become part of newborn baby stars and their resulting retinues of planets, moons, and living creatures. A starless universe would have been a lifeless one.

Our sun, at present, is a very ordinary main-sequence small star colored a lovely luminous golden yellow that dwells in the far suburbs of a typical, though majestic, barred spiral galaxy. There are planets and an assortment of other objects circling it. The sun, like all stars, will die eventually. Today, the sun is a middle-aged star. It has lived out approximately half of its life and, in another 5,000,000,000 years or so, will perish.

When the sun and other sunlike stars finally have used up most of their hydrogen fuel--and become elderly--their looks begin to change. In the heart of an elderly sunlike star resides a core of helium, encircled by a shell in which hydrogen still is being fused into helium. The shell starts to expand outward, and the core grows bigger as the star ages. The helium core itself starts to shrivel under its own weight, and it heats up until, at last, it becomes hot enough at the center for a new stage of nuclear burning to commence.

Now, it is the helium that is being fused to form the heavier element, carbon. Five billion years hence, the sun will have a small, intensely hot core that will be spewing out more energy than our still-vibrant sun is at the moment. The outer layers will have swollen up to monstrous proportions, and it no longer will be a small, yellow, ordinary star. It will have undergone a sea-change, becoming what is termed a red giant. The searing-hot, fiery-red, swollen elderly sun will swallow Mercury, then Venus, before it cannibalizes the Earth.

The core of our dying star will continue to shrivel and, because it no longer is able to chum out radiation via the process of nuclear fusion, all further evolution will be determined by gravitation alone. The sun ultimately will blow off its outer layers. The core, however, will remain intact, and all of the sun's mailer finally will collapse into this small relic body that only is about the size of our planet. In this way, the sun will become the type of stellar corpse known as a white dwarf.

The new white dwarf will be surrounded by a beautiful, multicolored, and expanding shell of shimmering gas termed planetary nebula, often referred to as a "butterfly of the cosmos" by astronomers who are enchanted by their

great beauty. However, great beauties often are very dangerous, and the sun in its white dwarf stage will be no exception. It will possess a hideously strong gravitational attraction while disgorging dangerous forms of radiation. Earthlings will have died out long before this has transpired, or else have evacuated to more hospitable regions elsewhere that are very, very far from our formerly life-giving sun.

Because a typical white dwarf possesses about 50% of our sun's current mass, yet is not much bigger than the Earth, it is a very dense object. However, the universe possesses much denser things. In fact, the fate of stars that are considerably larger than our sun is a real blast.

Although we often are told that the struggle between good and evil is the eternal battle, the one between gravitation and pressure is much older. Squeeze matter tightly enough and gravity will force it to implode, overwhelming the pressure that kept the star--or what was left of it--bouncy. A white dwarf is about 200,000 times as dense as planet Earth. This makes a white dwarf one of the densest collections of matter known. Yet, there are denser things suspected to be lurking in mysterious regions of space still not fully understood or explored.

Degenerate matter possesses such extremely high density that the normal atomic structure (a nucleus of protons and neutrons surrounded by a cloud of electrons) has disintegrated completely. It also exerts pressure. When a star dies, it has several possible fates, depending on its mass. When a sunlike star runs out of fuel, it swells up into a red giant, eventually puffing its outer layers into space, leaving a compact relic of electron degenerate matter behind, which exerts enough pressure to prevent the white dwarf from collapsing any further due to the relentless squeeze of gravity.

When heavier stars run out of fuel and die, their deaths are marked by a brilliant supernova blast that, albeit briefly, can outshine their entire host galaxy. These supernovas can leave behind a rapidly spinning neutron star (pulsar), composed primarily of neutron degenerate matter, which keeps this bizarre object bouncy against crushing gravity.

If the star is sufficiently massive, however, it loses it altogether in a supernova blast and implodes to form a black hole--a gravitational monstrosity. In this case, the force of gravity has won a total victory in its relentless and age-old battle against pressure. Where there once was a star, there is a star no more.

Neutron stars are the densest form of stellar-corpse known to inhabit the universe. However, there may be denser stellar-corpses haunting space, whose existence merely is hypothetical. Although such intermediate stages of collapse still are theoretical, these transitional objects may well be flitting around. Such stellar-corpses would be denser than a neutron star,

but not dense enough to be crushed out of existence by collapsing to a black hole. One such bizarre object is termed a strange quark star. It is "strange" because its supply of dense matter is composed primarily of strange quarks, which would represent a stage of collapse even denser than that characterizing a neutron star. This is because its neutrons literally have been squeezed out of existence by relentless gravity, leaving only the quarks that composed the shredded neutrons behind. This material is, of course, termed quark degenerate matter, and it keeps what is left of what once was a very massive star bouncy despite a heartless crush.

If strange quark stars really do exist, they are very weird objects. Single neutrons are made up of even more elementary particles called quarks. There are six known quarks: up, down, top, bottom, charm, and, of course, strange. Theory has it that, if a neutron star born after a supernova blast is too massive for neutron degeneracy pressure to keep it bouncy against the neutron star's own gravity, the quarks that composed the neutrons now can save the shriveling stellar-corpse from being squeezed out of existence. Single neutrons are made up of three quarks--two down and one up. When quark degeneracy pressure is produced, a quark star is born--and the free up and down quarks morph into strange quarks. This strange quark matter is believed to be the most stable form of matter that can possibly exist in the universe. Alas, this implies that all other forms of matter are relatively unstable.

Jeremy Drake of the Harvard-Smithsonian Center for Astrophysics explains in the Harvard Gazette that, "If strange quark matter really exists, it implies that normal matter is not ultimately stable. One would think that, given enough time, heavier normal matter, like iron, could eventually revert naturally to the more stable strange quark form. Then if a piece of this matter collides with normal stuff at high enough speed, it could convert it into strange quark matter."

Because it is so extremely stable, strange quark matter would survive collisions with neutron stars as well as the birth-throes and violent deaths of normal stars. However, it is unlikely that strange quark matter will convert everything in the universe into strange quarks. This is because it will take much longer than the age of the universe for such a catastrophic state of affairs to transpire.

There may be yet another stage beyond that of quark stars. A study led by De-Chang Dai of the University at Buffalo (N.Y.) claims that the deaths of very massive stars may lead to electroweak stars that approach even closer to the fatal black hole limit. The cores of such stellar corpses can reach the same density as that of the universe less than a second after the Big Bang. At that stage, quarks can morph into ghostly particles called neutrinos, releasing energy that keeps the star bouncy against further collapse. The necessary reactions would occur in an orange-sized region in

the core weighing twice as much as Earth.

Dimly lit stars

Electroweak stars cannot shine very brightly in visible light, which makes them very difficult to spot. However, if these extreme, and extremely bizarre, stars do indeed dwell in the universe, they can survive for as long as 10,000,000 years. "This is long enough to represent a new stage in the evolution of a star if stellar evolution can take it there," the researchers wrote.

Electroweak stars, if they really do haunt our universe, would be a very exciting new species of exotic beast inhabiting the stellar zoo. Under the weird conditions found in such hypothetical objects, two of the four known forces of nature, the electromagnetic and weak forces (the other two are the strong nuclear force and gravitation) would unite and become one single force--hence the name electroweak star. The only other time this union existed, scientists believe, was seconds after the Big Bang birth of the universe, at the instant just before the electromagnetic and weak force split up and went their separate ways, to become the two distinct fundamental forces physicists know of today.

On the darker side, if the strange matter theory is correct, that would mean a larger chunk of the weird stuff would be more stable than a smaller chunk. Such chunks are termed strangelets, and there is that worrisome notion suggesting that, if a strangelet bumps into an agglomeration of ordinary matter (the stuff of stars, planets, moons, and ourselves), it could change the ordinary matter into strange matter.

Kurt Vonnegut's *Cat's Cradle* tells of a bizarre, fictional material called ice-nine, which is supposed to be a more stable polymorph of water than the familiar ice we put in lemonade. In the 1974 novel, when this weird and dangerous form of ice comes into contact with liquid water, it behaves as a seed crystal, causing the entire body of water to solidify, rapidly crystallizing into ice-nine. A worldwide cataclysm, involving the freezing of all our planet's oceans by mere contact with ice-nine is the central plot of *Cat's Cradle*.

Nature, of course, is at least as crazy as fiction. When one strangelet collides with a nucleus of ordinary atomic matter, it can catalyze its rapid sea-change into strange matter. This liberates energy, which produces a larger and, hence, more stable strangelet, setting off a chain reaction as ever larger and more stable strangelets go on to collide with one nucleus after another, changing all of the ordinary matter that it comes in contact with into strange matter. Strangelets possess extremely mighty gravitational grips, and calculations indicate that strangelets colliding

with ordinary atomic matter would overwhelm this familiar matter with their extremely strong gravitational fields, breaking down the ordinary atomic matter into strange matter. The good news is that, according to most theoretical work, strangelets should change to ordinary atomic matter within a thousand-millionth of a second

Nonetheless, we must ask if it is possible for strangelets to wreak havoc by convening the ordinary atomic matter in our world into strange matter. This question first was considered before the start-up of the Relativistic Heavy Ion Collider (RHIC) in 2000 at Brookhaven in New York. A study at that time indicated that there was no cause for concern, and RHIC never did produce a strangelet. Similar concerns were more recently raised about the Large Hadron Collider (LHC) in Switzerland--but such fears are considered to be extremely far-fetched by most scientists.

Occasionally, LHC rims with beams of heavy atomic nuclei, just as RHIC does. LHC's beams, however, possess much more energy than RHIC. This makes it even less probable that strangelet will be able to form. It is not an easy task for bits of strange matter to stick together at the searing temperatures produced by such colliders--in the same way that ice cannot form in hot broth. Also, quarks are more dilute at LHC than RHIC, making it still more difficult for them to assemble into strangelets. Therefore, strangelet production at LHC is even less likely than at RHIC--and experience already has indicated that strangelets cannot be produced there.

Dead stars, though, may be able to do what colliders cannot. There may be many strangelets in the universe, existing independently of the quark stars that were able to produce them. If strangelets exist, it only may be a matter of time before they change all of the conventional matter in the universe into strange matter. However, the immense amount of time needed to accomplish this ice-nine-type feat makes this cataclysm not worth worrying about.

Good thing, too, because if it really could happen, the end would not be pretty--all of the nuclei of all the atoms of Earth would morph into strange matter, and our entire planet would be converted into an enormous and extremely hot glob. Unlike Vonnegut's vision, the world would not end in ice.

Judith Braffman-Miller is a freelance journalist.

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DIALOG(R)

Strange red galaxies a 'missing link' in history of the universe?,

Pete Spotts Staff writer,
Christian Science Monitor (USA), ALL ed,
Friday, December 2, 2011

TEXT:

A quartet of rarely observed, ruby-red galaxies from the dawn of the universe could provide a "missing link" in understanding how galaxies formed, according to a new study.

The galaxies, which researchers estimate formed before the 13.7 billion-year-old universe had reached its one billionth birthday, were a puzzle to the team that discovered them. Only one other galaxy like them had been spotted before, and researchers sought to understand why the four galaxies were as red and dim as they appear.

The data could help scientists trying to piece together the story of how the first galaxies formed, as well as how galaxies evolved from humble beginnings to form the variety of sizes, shapes, and star populations seen today in nearby regions of the universe.

These galaxies "might be a missing link in galactic evolution," notes Giovanni Fazio, a researcher at the Harvard-Smithsonian Center for Astrophysics in Cambridge, Mass., and a member of the team reporting the results, in a statement.

The galaxies appeared in data gathered by NASA's Spitzer Space Telescope, which observes at longer infrared wavelengths than Hubble. That means Spitzer is in a better position to snag objects "like these galaxies" that shine more brightly in the infrared than in visible wavelengths.

"Hubble has shown us some of the first protogalaxies that formed, but nothing that looks like this," said Dr. Fazio.

Still, the international team reporting the results pushed data-analysis techniques to their limit to tease out the dim galaxies. The team, headed by the Center for Astrophysics' Jiasheng Huang, also had to grapple with why the galaxies were so red and dim. Three options seemed possible:

The galaxies could host a large population of older, redder stars and be somewhat closer than the 12.7 billion light-year distance. They could be extremely dusty and even closer.

They could be so distant that the universe's expansion has stretched the

wavelengths of light they emit deep into the infrared portion of the electromagnetic spectrum.

After analyzing the possibilities, the team determined that a blend of the 12.7 billion light-year distance with lots of dust best fit the data. In other words, the redness was not a trick of the distance; these neighboring galaxies would still be red if observed by someone in their local patch of the cosmos.

Red and rockin'. The team notes that one of the four objects is an X-ray quasar, typically an indicator of an active supermassive black hole at its center. Another is a hyper-luminous infrared galaxy.

Both point to galaxies that are undergoing mergers, the team suggests. And where there are mergers, more stars are born.

Initial estimates put the galaxies' masses at roughly 10 to 30 percent of the Milky Way's mass, which itself estimated at between 1 trillion and 1.5 trillion times the sun's mass.

The data were gathered as part of the Great Observatories Origins Deep Survey. The international effort draws on US and European orbiting observatories as well as ground-based telescopes observing in a range of wavelengths. It is designed to study galaxies over a wide span of time scales, peering as deep into the universe's past as current technology allows.

The next step will be to follow up the Spitzer observations with views from telescopes that look at the universe with submillimeter views. These telescopes are specifically designed to see dusty and hidden objects that other telescopes can barely see, if at all.

For example, the Submillimeter Array near the summit of Hawaii's Mauna Kea discovered the only other known galaxy like those in the new quartet.

The researchers say they hope to gather more-accurate distance-related data for the newly found galaxies with the Atacama Large Millimeter/submillimeter Array (ALMA) high in Chile's Atacama Desert. The array began its first science operations in August.

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Record - 3

DIALOG(R)

Hot on Trail Of 'Just Right' Far-Off Planet,

DENNIS OVERBYE,

New York Times (NY), Late Edition - Final ed, p1,
Saturday, December 3, 2011

TEXT:

CAMBRIDGE, Mass. -- What does Goldilocks want?

At least four times in the last few years, astronomers have announced they have found planets orbiting other stars in the sweet spot known as the habitable zone -- not too hot, not too cold -- where water and thus perhaps life are possible. In short, a so-called Goldilocks planet fit to be inhabited by the biochemical likes of us.

None of these claims are without controversy, but astronomers who are making discoveries with NASA's Kepler spacecraft are meeting next week in California to review the first two years of their quest, which seems tantalizingly close to hitting pay dirt.

"Sooner or later, Kepler will find a lukewarm planet with a size making it probably Earthlike," said Geoffrey Marcy of the University of California, Berkeley, who spends his time tracking down candidates identified by Kepler. "We're no more than a year away" from such a discovery, he said.

Sara Seager, a planetary astronomer at the Massachusetts Institute of Technology, put it this way: "We are on the verge of being those people who will be remembered."

All this has brought to the fore a question long debated by geologists, chemists, paleontologists and cosmologists turned astrobiologists, namely: What does life really need to get going, flourish and evolve on some alien rock?

The answer depends of course on whom we expect to be living there. We might dream of green men with big eyes, ants with hive minds, or even cuddly octopuses as an antidote to cosmic loneliness, but what we are most likely to find, a growing number of scientists say, is alien pond slime.

Microbes can spring up anywhere that is wet and warm, astronomers say, although biologists are not so sanguine. But the emergence of large creatures, let alone intelligent ones, as evidenced by the history of the Earth, depends on a chain of events and accidents -- from asteroid strikes to plate tectonics -- that are unlikely to be repeated anytime soon. "If you reran Earth's history, how many times would you get animals?" asked Donald Brownlee, an astronomer at the University of Washington. He and a colleague, the paleontologist Peter Ward, made a case that we live on a lucky planet in their 1999 book, "Rare Earth."

Single-cell life might be common, given the right simple conditions, explained Dr. Marcy in an e-mail. "But the steady, long-term evolution toward critters that play improv saxophone, write alliteration poems, and build heavy-lifting rocket boosters may depend on a prohibitive list of planetary prerequisites," he added.

Even warm and wet is a rare condition, however, occurring now on only one of the eight official planets in our solar system and three of the several dozen moons. Mars was once wet, but it is now a desert. And after billions of dollars spent exploring Mars and the remains of space probes littering the planet, we still do not know if a single microbe ever lived there.

But nobody really knows how rare or common are planets like Earth and its brand of life. "I would be more comfortable with that argument if it were not so Earth-o-centric," Steven Benner, a chemist at the Foundation for Molecular Evolution, said in an e-mail.

For instance, he said, low-temperature water mixed with ammonia can substitute for water alone as the liquid necessary for life. So could liquid methane, which forms lakes on Titan, Saturn's slushy frigid moon, and Dr. Benner and others have advocated looking for life there. "We are limited by our imaginations," said Natalie Batalha, a leader of the Kepler team.

Some scientists deplore the emphasis on animals like us, saying it is hopelessly parochial and unimaginative -- the scientific equivalent of the drunk searching for his car keys under a street light because that's where the light is.

"Animals are overgrown microbes," said Paul Falkowski, a biophysicist and biologist from Rutgers. "We are here to ferry microbes across the planet. Plants and animals are an afterthought of microbes." So, we should hardly be disappointed if we find our neighbors are microbes. After all, on Earth, microbes were the whole story for almost four billion years, paleontologists say, and now inhabit our intestines as well as every doorknob.

Dimitar Sasselov, an astronomer turned astrobiologist at the Harvard-Smithsonian Center for Astrophysics, said he was all for the existence of a microbial planet. "Don't assume microbes are simple," he said, noting that 99 percent of the genes in our bodies belong to microbes inhabiting us and without which we could not live.
Looking for Goldilocks

A blue-ribbon committee of chemists convened by the National Academy of

Sciences concluded that there was only one ironclad requirement for life, besides energy: a place warm enough for chemical reactions to go on. So, determining how warm a planet's atmosphere keeps it -- through assumptions, calculations or just plain guesses -- has been crucial in reaching a verdict about its potential habitability.

This is how it has gone with the potential Goldilocks planets orbiting Gliese 581, a small cool red star about 20 light-years from here in the constellation Libra that has been at the center of exoplanet fantasies and speculation for the last few years. Depending on whom you talk to, it has five or six planets, three of which have at one time or another been claimed to be habitable.

The first in what would become a chain of potential Goldilocks planets, identified in 2007, was a presumably rocky ball about five times as massive as the Earth and orbiting only about seven million miles from Gliese 581, close enough within the small star's shrunken habitable zone to have a warm surface. "On the treasure map of the universe, one would be tempted to mark this planet with an X," Xavier Delfosse, one of the astronomers who discovered it, said at the time.

But before budding interstellar explorers could even begin conceiving of booking passage to Gliese 581c, as the planet is poetically called, other astronomers took a closer look and concluded that if the planet's geology and atmosphere resembled those of Earth, it would be a stifling greenhouse, no place to set solar sail for. Attention then shifted to a farther planet in the system, Gliese 581d, which had been dismissed as too cold. Could the same greenhouse effect that would torch the inner planet thaw the outer one and make it livable? The answer was yes, but only if it had "loads of carbon dioxide" and an atmosphere seven times thicker than Earth's, said Lisa Kaltenegger, a climate modeler at the Max Planck Institute for Astronomy in Heidelberg. Otherwise it would be freezing cold.

Meanwhile yet another planet was claimed for that system, smack between the other two, by a team led by R. Paul Butler of the Carnegie Institution and Steven S. Vogt of the University of California, Santa Cruz. "This is really the first Goldilocks planet," Dr. Butler said at a news conference last year organized by the National Science Foundation in Washington.

But the Geneva team that had discovered the earlier Gliese 581 planets could not find any evidence of the new planet's existence in their own data. For now, anyway, most astronomers have dismissed that planet. Pending the publication of new results by the Geneva team -- one of the most prolific in the planet-hunting business -- Dr. Butler said, "We are in a holding pattern."

In September, what some astronomers called the best and smallest Goldilocks candidate yet was announced by the Geneva team. About 3.6 times as massive

as the Earth, it circles a faint orange star in Vela known as HD 85512 at a distance of some 24 million miles, about a quarter of the Earth's distance from the Sun. Dr. Kaltenegger and her colleagues calculated that this planet would be habitable if it had an Earth-type geology and at least 50 percent cloud cover. "So, so far we only have two great targets to search for atmospheric signatures of life," Dr. Kaltenegger wrote.

So goes the history of astrobiology, as well as its future.

The problem, as many astronomers point out, is getting any more information about these planets. "Astronomers are going to have to learn to live with ignorance," Dr. Seager said.

Some exoplanets, like the Gliese worlds, were discovered by the "wobble method" -- looking at the motions they induce in their parent stars -- which allows their masses and orbits to be measured. Other planets, like the ones identified by Kepler, are found by watching for the blinks when they pass in front of their stars; that also allows their sizes to be determined.

If, if, if

To date, none of the Goldilocks candidates have been observed to transit their stars, and thus none have been assigned both masses and sizes, which would allow astronomers to calculate their densities and compositions and find out if they are water worlds, rocks or gassy fluff balls.

Kepler fixes its gaze on a patch of stars in Cygnus that are hundreds if not thousands of light-years away -- too far for any wobble detections that would assess the abundance of Earthlike planets in the galaxy or any other close scrutiny. We are liable to never know anymore about those planets than we know now, astronomers say. The brute reality, astronomers admit, is that even if there are thousands or millions of habitable planets in the galaxy, only a few hundred of them are within range of any telescope that will be built in the conceivable future.

Luckily there is some renewed hope for life on those nearby planets. David Charbonneau of the Harvard-Smithsonian Center for Astrophysics runs a project called MEarth that looks for planets around nearby stars. He pointed out that of the 300 stars within 25 light-years of here, 260 are red dwarfs like Gliese 581.

Until recently it was thought that habitable-zone planets around such stars would have to hug the star so closely that they would be tidally locked, like the Moon, keeping one face locked to the star and roasting, the other freezing.

But new studies have concluded that a proper atmosphere could spread the

heat around.

Which is good. "These stars," Dr. Charbonneau said, "are our only hope for studying life in the universe in the coming decades."

In the original scheme of things, Kepler was to be succeeded by a space observatory called the Terrestrial Planet Finder, which would be big enough to find and study planets up to 100 light-years distant.

But plans for that telescope have collapsed, because of NASA's continuing fiscal woes and disagreements among astronomers, as well as the technological challenges involved.

Some astronomers hope that some of these functions can be performed by the James Webb Space Telescope -- NASA's Hubble successor, overdue and over budget, now scheduled for a launch in 2018.

Equipped with a "starshade" that would blot out the glare of a planet's sun, the Webb could detect and study the pinpoint of light from an exoplanet itself.

But the starshade would be hostage to the same political and fiscal pressures that are threatening to decimate NASA's scientific programs. At best, scientists say, the search for life elsewhere has been postponed for decades.

"I'm beginning to despair that I will see it in my lifetime," said James Kasting of Pennsylvania State University.

Geology Is Destiny

Earth got lucky early. Fossil evidence suggests that microbial life was already inhabiting the Earth as early as 3.8 billion years ago -- only 700 million years after the planet collapsed into existence, and a geological instant after the end of a rain of comets and asteroids that brought just the right amount of precious water in the form of ice from the outer solar system to what would otherwise be a dry planet, astronomers say. "The question of whether the Earth is unique because of its water abundance is perhaps the most interesting one in the arsenal of Rare Earth arguments," said Dr. Kasting, who explained that calculations showed that the planet could have easily had too much or too little water.

The planet has remained comfortable ever since thanks to a geological feedback process, by which weather, oceans and volcanoes act as a thermostat. Known as the carbonate silicate cycle, it regulates the amount of carbon dioxide in the atmosphere, where it acts like a greenhouse --

trapping heat and keeping the planet temperate and mostly stable. Rain washes the gas out of the air and under the ocean; volcanoes disgorge it again from the underworld.

Without greenhouse gases and this cycle -- which Dr. Brownlee called "this magic thing" -- the Earth would have frozen into a snowball back in its early days when the Sun was only 70 percent as bright as it is now. Still, with all this magic, it took four billion years for animal life to appear on the Earth.

The seeds for animal life were sown sometime in the dim past when some bacterium learned to use sunlight to split water molecules and produce oxygen and sugar -- photosynthesis, in short. The results began to kick in 2.4 billion years ago when the amount of oxygen in the atmosphere began to rise dramatically.

The Great Oxidation Event, as it is called in geology, "was clearly the biggest event in the history of the biosphere," said Dr. Ward from Washington. It culminated in what is known as the Cambrian explosion, about 550 million years ago, when multicellular creatures, that is to say, animals, appeared in sudden splendid profusion in the fossil record. We were off to the Darwinian races. Whatever happened to cause this flowering of species helped elevate Earth someplace special, say the Rare Earthers. Paleontologists argue about whether it could have been a spell of bad climate known as Snowball Earth, the breakup of a previous supercontinent, or something else.

In other words, alien planets that have been lucky enough to be habitable in the first place might have to be lucky again. "The big hurdle" for other planets, said Dr. Brownlee, is to have some event or series of events to trigger their own "Cambrian-like" explosions.

Eventually though, Earth's luck will run out. As the Sun ages it will get brighter, astronomers say, increasing the weathering and washing away of carbon dioxide. At the same time, as the interior of the Earth cools, volcanic activity will gradually subside, cutting off the replenishing of the greenhouse gas.

A billion years from now, Dr. Brownlee said, there will not be enough carbon dioxide left to support photosynthesis, that is to say, the oxygen we breathe.

And so much for us.

"Even Earth, wonderful and special as it is, will only have animal life for one billion years," Dr. Brownlee said.

Life Out There: Articles in this series are examining the search for new forms of life in the universe.

PHOTOS: Mars may be on the edge of the habitable zone, but the image above, taken in 2004 by the Mars rover Opportunity at Endurance Crater, shows a barren landscape. It contrasts with lush life on the Adriatic island of Hvar, top. (PHOTOGRAPHS BY MICHAEL BENSON/CORNELL UNIVERSITY VIA NASA) (A14)

GRAPHICS: Habitable Zones: Astronomers are searching for planets orbiting distant stars at the right distance to support surface water and life. (Sources: "How to Find a Habitable Planet," by James Kasting; Annual Review of Astronomy and Astrophysics; Astronomy & Astrophysics; "Life in the Universe," by Jeffrey O. Bennett and Seth Shostak; NASA) (GRAPHICS BY JONATHAN CORUM/THE NEW YORK TIMES) (A14)

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Record - 4

DIALOG(R)

STRANGE NEW 'SPECIES' OF ULTRA-RED GALAXY DISCOVERED,

US Federal News,

Thursday, December 1, 2011

TEXT:

WASHINGTON, Dec.1 -- The Smithsonian Institution issued the following press release:

In the distant reaches of the universe, almost 13 billion light-years from Earth, a strange species of galaxy lay hidden. Cloaked in dust and dimmed by the intervening distance, even the Hubble Space Telescope couldn't spy it. It took the revealing power of NASA's Spitzer Space Telescope to uncover not one, but four remarkably red galaxies. And while astronomers can describe the members of this new "species," they can't explain what makes them so ruddy.

"We've had to go to extremes to get the models to match our observations," said Jiasheng Huang of the Harvard-Smithsonian Center for Astrophysics (CfA). Huang is lead author on the paper announcing the find, which was published online by the Astrophysical Journal.

Spitzer succeeded where Hubble failed because Spitzer is sensitive to infrared light - light so red that it lies beyond the visible part of the spectrum. The newfound galaxies are more than 60 times brighter in the infrared than they are at the reddest colors Hubble can detect.

Galaxies can be very red for several reasons. They might be very dusty. They might contain many old, red stars. Or they might be very distant, in which case the expansion of the universe stretches their light to longer wavelengths and hence redder colors (a process known as redshifting). All three reasons seem to apply to the newfound galaxies.

All four galaxies are grouped near each other and appear to be physically associated, rather than being a chance line-up. Due to their great distance, we see them as they were only a billion years after the Big Bang - an era when the first galaxies formed.

"Hubble has shown us some of the first protogalaxies that formed, but nothing that looks like this. In a sense, these galaxies might be a 'missing link' in galactic evolution" said co-author Giovanni Fazio of the CfA.

Next, researchers hope to measure an accurate redshift for the galaxies, which will require more powerful instruments like the Large Millimeter Telescope or Atacama Large Millimeter Array. They also plan to search for more examples of this new "species" of extremely red galaxies.

"There's evidence for others in other regions of the sky. We'll analyze more Spitzer and Hubble observations to track them down," said Fazio. For any query with respect to this article or any other content requirement, please contact Editor at htsyndication@hindustantimes.com

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Record - 5

DIALOG(R)

Past meets future at AAVSO's centennial.

Sky & Telescope, v123, n1, p20(2),

Sunday, January 1, 2012

TEXT:

With speeches, cake, memories of decades long gone, and excitement about the very different data-rich decades to come, more than 100 people celebrated the 100th birthday of the American Association of Variable Star Observers (AAVSO) on October 6th. But hanging over the room was the knowledge that the old days and old ways are fast disappearing.

Eyeball estimates of variable stars' brightnesses, which most people at the gathering had done for much of their lives, are on their way to becoming as obsolete as vacuum-tube radios and rotary-dial telephones. Serious

variable-star observers now use CCD cameras or photometers to make measurements that are much more precise. But automated sky surveys promise even bigger changes. The day is in sight when, for instance, the planned 8.4-meter Large Synoptic Survey Telescope (LSST) should gather more star-brightness data each night than all the AAVSO's eyeball estimators have done in a century. The LSST is supposed to start work late this decade, but its construction is not yet fully funded.

Addressing this impending sea change was Charles Alcock, director of the Harvard-Smithsonian Center for Astrophysics a mile up the street. Alcock told the crowd that floods of sky-survey data already outstrip astronomers' ability to look for what they contain beyond the needs of a specific project. These data sets are full of objects that deserve the kind of individual follow-ups that well-equipped amateurs can study--if interesting objects can be recognized via the types of global data management that the AAVSO sees as a big part of its future. Many small-telescope users equipped with photometric CCD cameras and spectrographs will be needed to perform quick follow-ups and long-term studies on fast-paced or mysterious objects. "The amateurs of the world," Alcock said, "will have a great opportunity."

[ILLUSTRATION OMITTED]

Rick Fienberg, Sky & Telescope's former editor in chief and now the press officer for the American Astronomical Society (AAS) in Washington, D.C., informed the crowd that the AAS recently closed down its committee on amateur-professional collaborations. This, he explained, is good news. Amateur-professional collaborations on things such as variable stars have become so routine that there's no longer a need for a committee. "It astonishes me how many professional papers now routinely have amateur contributors as coauthors," Fienberg said. He closed by pointedly congratulating the AAVSO for "the bright future you have as you move wholeheartedly into the digital age."

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Record - 6

DIALOG(R)

Finally, a device that can touch the sun,

Carolyn Y. Johnson,

Boston Globe (MA), p1,

Monday, November 28, 2011

TEXT:

CAMBRIDGE - Astrophysicist Justin Kasper's hand can easily hold the shallow cup - a solid, heavy hunk of gray metal with a grand purpose: to touch the sun.

The cup, being built at an office park near the Alewife T station in Cambridge, is a prototype of the instrument NASA plans to launch in 2018 aboard the Solar Probe Plus, the first mission intended to provide an extreme close-up of our sun. The cup will scoop the superheated, turbulent solar atmosphere, measuring the direction, density, charge, and speed of the particles flowing away from the sun

Some of the biggest remaining mysteries in the solar system regard the sun. Though astronauts have walked on the moon, rovers have traversed Mars, and spacecraft are now nearing the brink of our solar system, the inferno at the center has simply been too darn hot to visit

Or, as Kasper puts it, "the equipment will react negatively - by melting." Kasper, an astrophysicist at the Harvard-Smithsonian Center for Astrophysics who leads a team building the solar probe cup and another instrument that will ride on the solar mission, said sending a mission to the sun has been discussed since the 1950s.

"It's just the technology has had to catch up with the desire," he said

Now, advances in heat-shielding materials and an innovative use of the planet Venus's gravity to slow the spacecraft down and get it to the sun more quickly have enabled a mission that can withstand repeated encounters with the sun, coming closer with each orbit.

Among the mysteries scientists would like to solve are why the sun's atmosphere is many times hotter than its surface. How exactly does the solar wind of hot, charged particles flowing from the sun accelerate to faster than the speed of sound and then blow outward, forming a vast protective bubble that surrounds the solar system? Is it possible to predict and understand the activity on the sun, including solar flares and eruptions that can knock out communications satellites, endanger astronauts, and even wreak havoc on power grids on the earth? Such questions can be answered only with an up-close view. Trying to make observations of some properties of the sun from afar is something Marco Velli, a senior research scientist at NASA's Jet Propulsion Laboratory, likens to "looking through fog - you can't tell what's coming from where."

Over the decades, the ideas for a solar probe mission have evolved. One early version included an enormous heat shield that would burn up faster than it would conduct heat, Kasper said. But the most recent plans,

reviewed by NASA last month, include a new heat shield that uses a carbon foam and liquid-cooled radiator to shield four sets of instruments built by different teams. Two instruments will peek out from behind the main heat shield - including the small cup being designed in Cambridge.

The questions the spacecraft will answer date back at least a century, when it first became apparent to scientists that something weird was happening at the sun. One observation led scientists to think that a previously unknown form of matter had been discovered - one a thousand times lighter than hydrogen, called "coronium."

Eventually it became clear that the surface was about 10,000 degrees, but the corona, the crown of heat and light that is visible during an eclipse, was hundreds of times hotter

The idea of a supersonic solar wind made up of hot charged particles was put forward in the late 1950s by Eugene Parker, now an 84-year-old emeritus professor of physics at the University of Chicago.

Parker pays close attention to the new work unfolding. Solar Probe Plus, he said, will answer important basic questions about the sun, including practical problems such as understanding solar activity that can endanger astronauts and communications satellites. But perhaps more exciting, he said, it is an opportunity to visit and understand a star

"The sun controls space all the way out through the solar system with the solar wind . . . and what's more, it's the only star in the sky where you can measure that kind of activity," Parker said.

To do that, teams are working on an array of instruments. In Cambridge, in a caged-in work area protected from static that could harm the electronics, Kasper and his team are working on the cup design and electronics that will measure the sun's wind.

To ensure that the equipment can withstand the extreme conditions, they are testing equipment at a "solar furnace" in France that focuses sunlight onto a chamber, heating it up to 5,000 degrees - twice as hot as the researchers anticipate needing. They are also working with a team at NASA's Marshall Space Flight Center to recreate in a particle accelerator the conditions the probe will encounter.

Once the instruments are built, they will be shipped to Johns Hopkins University Applied Physics Laboratory, the primary contractor for the mission, to be mounted on the spacecraft. After launch in 2018, the spacecraft will swing around Venus, using the gravity of the planet to slow it down and head toward the sun, passing closer and closer to the sun with each orbit, until it gets within 3.7 million miles of the surface - well

into the solar corona and nearly seven times closer than any previous mission

"This is really a mission of discovery. We don't know how the sun generates the solar wind" and the protective bubble that surrounds the solar system, Velli said. "We just don't know how, and there's stuff that could be happening we have no clue about."

Carolyn Y. Johnson can be reached at cjohnson@globe.com. Follow her on Twitter [@carolynyjohnson](https://twitter.com/carolynyjohnson).

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Wolbach Library: CfA in the News ~ Week ending 11 December 2011

1. **SHOW BRINGS THE UNIVERSE TO LIFE**, Cathy Welch Special to the Daily Press, Daily Press (Newport News, VA), Final ed, pG1, Thursday, December 8, 2011
2. **Studies from Harvard-Smithsonian Center for Astrophysics Reveal New Findings on Astronomy Research**, Science Letter, p670, Tuesday, December 13, 2011
3. **Lockheed Martin Physicist Honored With 2011 American Geophysical Union John Adam Fleming Medal**, AP Alert - Business, Thursday, December 8, 2011
4. **Astronaut, economist are among SciFest speakers**, DIANE TOROIAN KEAGGY, dkeaggy@post-dispatch.com > 314-340-8343, St. Louis Post-Dispatch (MO), Fourth Edition ed, pE7, Sunday, October 9, 2011
5. **NASA discovers planet that could sustain life; Distant orb exhibits temperatures like a day in the spring**, Brian Vastag, Star-Ledger, The (Newark, NJ), Update ed, p014, Tuesday, December 6, 2011
6. **Hot on the trail of exoplanets that are right for life**, Overbye, Dennis, Honolulu Star-Advertiser (Honolulu, HI), pn/a, Saturday, December 3, 2011

Record - 1

DIALOG(R)

SHOW BRINGS THE UNIVERSE TO LIFE,
Cathy Welch Special to the Daily Press,
Daily Press (Newport News, VA), Final ed, pG1,
Thursday, December 8, 2011

TEXT:

"That's a waxing crescent. It's about three days old," Lawrence "Bird" Taylor told Newport News Mayor McKinley L. Price as he looked through Taylor's Astroscan reflector telescope set up outside the Virgil I. Grissom Library.

Taylor is a member of the Virginia Peninsula Astronomy Stargazers who partnered with the Newport News library system in hosting an astronomy

series at the library.

Price was there to introduce the series and participate in its first event, a ribbon-cutting ceremony to introduce "Visions of the Universe: Four Centuries of Discovery," a traveling exhibit created to commemorate the International Year of Astronomy in 2009. Its travels have been extended and the exhibit is still traveling throughout the country.

"We have several guys who have built their own telescopes," Taylor said. Members range from school-age kids to novice adults to astrophysicists.

On Nov. 29, the Newport News Public Library System hosted city residents for a grand opening of its astronomy series. In partnership with the American Library System, the Smithsonian Astrophysical Observatory, the National Aeronautics and Space Administration, the Space Telescope Science Institute, the Virginia Living Museum, and the Virginia Peninsula Astronomy Stargazers, "Visions of the Universe: Four Centuries of Discovery" opened at Grissom.

Judy Condra, grant writer for the city's library system, said the library does these kinds of programs often.

"The exhibit is the background for us to do programs," she said. "Kids can actually make telescopes so we have a lot of exciting stuff for kids and parents."

The library system's director, Izabela M. Cieszynski, says the program achieves a goal of the Newport News Public Libraries.

"Part of why we are doing this is because one of our goals is life-long learning, which means we start with preschool and go all the way through senior adults," she said. "This allows us to bring more people into the library and introduce them to other resources that are available to them."

Cieszynski stressed that "all of these programs are done either through the Friends of the Library who give us monetary support for all of our programs or through a grant that Judy's found for us. There is almost no city funding used for these programs."

Vice Mayor Madeline McMillan unveiled a refurbished display in honor of Lt. Col. Virgil "Gus" Grissom. Grissom died in a flash fire during a launch pad test at the Kennedy Space Center in 1967. The city honored him posthumously by naming the library after him to honor his service as a distinguished Air Force pilot during the Korean War and his contribution and sacrifice as one of NASA's original seven Mercury astronauts.

"NASA was very generous in that they helped set up the original display

over 15 years ago," said Cieszynski.

"Our library is a natural choice for this astronomy series as we were named for Grissom," said Deborah Wright, branch manager for Grissom. "The Loosely Knit Group, a group of knitters who have been meeting here weekly for four years, sold some of their items to pay for the renovated display."

McMillan said, "For those of us who have lived here awhile and have seen the old display, this really is refreshing in the truest sense of the word. Thank you to everybody who made this possible."

One of those people was Condra's husband, Ed, an artist, who assisted in refurbishing Grissom's portrait.

The culminating event of the evening was a presentation by Ron Shaneyfelt, a full-time astronomy teacher in Virginia Beach and part of NASA's speaker bureau. Shaneyfelt spoke on the last 400 years of modern telescope exploration of outer space.

"The idea of astronomy as compared to other sciences is first of all it is the oldest science in the world," he said. "When you go out at night, you may not understand what you are looking at, but you can't miss what's over your head.

"So it has a natural interest since it is always there and mysterious," he said. "Now, because of technology, it seems like you can't go a day without something coming out in the news that they've made a brand-new discovery."

Kelly Herbst, astronomy curator for the Virginia Living Museum, said, "We're coming out to the Grissom Library on Jan. 12 and one of the main things we're going to do is have a lot of telescopes with us and we're hoping for a clear night. We will also have one of our astronomers in the library and have a kind of 'Stump the Astronomer' game."

WANT TO KNOW MORE?

Events schedule: Turn to Page 6

Stargazers club: vpas@yahoogroups.com

Virginia Living Museum's Abbitt Planetarium: www.vlm.org

PHOTO: Seven-year-old Abdalla Elrahhah peers into a telescope as part of the opening event for the "Visions of the Universe" exhibit Nov. 30 at the Virgil I. Grissom Library.

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Record - 2

DIALOG(R)

Studies from Harvard-Smithsonian Center for Astrophysics Reveal New Findings on Astronomy Research,

Science Letter, p670,

Tuesday, December 13, 2011

TEXT:

"We present similar to 1 " resolution 1.3 mm dust continuum and spectral line ((CO)-C-12 and (CO)-C-13 J = 2-1) observations of the transitional disk system HD 135344B obtained with the Submillimeter Array. The disk shows a Keplerian rotation pattern with an inclination of similar to 11 degrees, based on the spatially and spectrally resolved (CO)-C-12 and (CO)-C-13 emission," scientists in Cambridge, Massachusetts report (see also).

"The data show clear evidence for both dust and gas surface density reductions in the inner region of the disk (radius less than or similar to 50 AU) from the continuum and (CO)-C-13 J = 2-1 data, respectively. The presence of this inner cavity in both the dust and gas is more consistent with clearing by giant planet formation than by photoevaporation or by grain growth," wrote A.R. Lyo and colleagues, Harvard-Smithsonian Center for Astrophysics.

The researchers concluded: "There is also an indication of global CO gas depletion in the disk, as the mass estimated from (CO)-C-13 emission (similar to 3.8×10^{-4} M-circle dot) is about two orders of magnitude lower than that derived from the 1.3mm continuum (similar to 2.8×10^{-2} M-circle dot)."

Lyo and colleagues published their study in *Astronomical Journal* (Millimeter Observations Of The Transition Disk Around Hd 135344b (sao 206462). *Astronomical Journal*, 2011;142(5):85-93).

For additional information, contact A.R. Lyo, Harvard Smithsonian Center Astrophys, Cambridge, MA, United States.

The publisher's contact information for the *Astronomical Journal* is: IOP Publishing Ltd, Temple Circus, Temple Way, Bristol BS1 6BE, England.

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Record - 3

DIALOG(R)

Lockheed Martin Physicist Honored With 2011 American Geophysical Union John Adam Fleming Medal,

AP Alert – Business,

Thursday, December 8, 2011

TEXT:

/FROM PR NEWSWIRE DALLAS 888-776-3971/

STK NYSE:LMT

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TO BUSINESS EDITORS:

Lockheed Martin Physicist Honored With 2011 American Geophysical Union

John Adam Fleming Medal

PALO ALTO, Calif., Dec. 8, 2011 /PRNewswire/ -- Dr. Alan M. Title,

physicist at the Lockheed Martin (NYSE: LMT) Space Systems Advanced

Technology Center (ATC) in Palo Alto, was honored last evening with

the 2011 John Adam Fleming Medal, at a ceremony at the 2011 Fall

Meeting of the American Geophysical Union (AGU) in San Francisco. The

Fleming Medal is awarded not more than once annually to an individual

"for original research and technical leadership in geomagnetism,

atmospheric electricity, aeronomy, space physics, and related

sciences."

Established in 1960, the Fleming Medal is named in honor of John Adam

Fleming, who made important contributions to the establishment of

magnetic standards and measurements. Fleming served as AGU officer in a number of positions, including: secretary of the Terrestrial

Magnetism and Atmospheric Electricity section (1920-1929), Union

General Secretary (1925-1947), and honorary president (1947-1956).

John Adam Fleming was associated with the science of geomagnetism

throughout his career, and with the American Geophysical Union from

its founding until his death.

As a scientist, Alan Title studies the Sun. His primary research

interest is the generation, distribution, and effects of the solar

magnetic field throughout the Sun's interior and outer atmosphere.

Using spectral imaging techniques we now can map both horizontal and

vertical flows in the solar interior and surface. Flow maps have shown

among other things how the solar interior rotates as a function of radius. This profile is essential for any understanding of interior

magnetic field generation - dynamo action. Magnetic fields can be

measured in the photosphere and inferred in the interior and outer

atmosphere. Using these techniques it has been discovered that

magnetic field emerges everywhere on the solar surface at a rate

sufficient to completely replace the fields outside of active regions

in less than a day, and even active region fields are replaced in at

most a few weeks. The detailed mechanisms by which magnetic energy is

released is currently the focus of his research. At present, he has

169 articles in refereed journals. Building on accumulated knowledge,

through observation and experimentation, he asks new questions of the

Sun and formulates hypotheses on how it might work. As an engineer, Alan Title designs, develops, builds, and flies new instruments that will gather the data necessary to test those hypotheses. He led the development of tunable bandpass filters for space-based solar observations, a version of which is currently operating on the JAXA/ISAS Hinode spacecraft. He also invented a tunable variation of the Michelson Interferometer that has been employed on the SOHO spacecraft, the Solar Dynamics Observatory (SDO), the Global Oscillations Network Group of the National Solar Observatory as well as other ground-based systems.

Extraordinarily dedicated to advancing public awareness of science,

Dr. Title has supported activities at the Tech Museum, Chabot

Observatory, Boston Museum of Science, the National Air and Space Museum, and the Hayden Planetarium. In addition, his educational

outreach funding has supported a yearly summer program for Stanford undergraduates, and the Stanford Hass Center activities that develop science programs for K-12 classrooms. And for two decades, promising students from the Palo Alto High School District have come to work in his laboratory.

Dr. Title has been with the company since 1971. He is currently the

Principal Investigator for NASA's next solar mission called the

Interface Region Imaging Spectrograph (IRIS), which will launch in

late 2012. Both the instrument and spacecraft are under construction

at the ATC. Title was the Principal Investigator responsible for the

Atmospheric Imaging Assembly on NASA's Solar Dynamics Observatory (SDO) launched in 2010, and is a Co-Investigator for another instrument on SDO, the Helioseismic Magnetic Imager. He was also the Principal Investigator for NASA's solar telescope on the Transition Region and Coronal Explorer (TRACE) mission, launched in 1998, and the Focal Plane Package on the JAXA/ISAS Hinode mission launched in 2006. Additionally, Title serves as a Co-Investigator responsible for the Michelson-Doppler Imager (MDI) science instrument on the NASA-European Space Agency Solar and Heliospheric Observatory (SOHO), launched in 1995. All of these instruments were built under Alan Title's direction at the ATC.

Dr. Title was born in Los Angeles and went to local schools and attended UCLA as an undergraduate. After graduating with a degree in mathematics he attended Columbia University in New York City for a year, then transferred to the California Institute of Technology and graduated in 1966 with a PhD in physics. Upon graduation he was a National Research Fellow at the Smithsonian Astrophysical Observatory in Cambridge, Mass. After a year he became a Research Fellow at Harvard University where he was responsible for the development of the optical solar telescopes on Skylab. At Harvard, Dr. Title met his wife to be, Dr. Ruth Peterson.

Dr. Title joined Lockheed in 1971 to take over the direction of its Solar Observatory. Except for six months in 1989 where he was a visiting Professor at the Max Planck Institute for Astrophysics in

Garching, Germany and six months in 1993 where he was a visiting Professor at Tokyo University, Japan, he has remained at Lockheed

Martin as leader of the solar group. In 1994, Professor Phillip

Scherer of Stanford and Dr. Title formed the Stanford-Lockheed

Institute for Space Research.

The Solar and Astrophysics Laboratory at the ATC conducts basic

research into understanding and predicting space weather and the

behavior of our Sun, including its impacts on Earth and climate. It

has a 48-year-long heritage of spaceborne solar instruments including

the Soft X-ray Telescope on the Japanese Yohkoh satellite, the

Michelson Doppler Imager on the ESA/NASA Solar and Heliospheric

Observatory, the solar telescope of NASA's Transition Region and

Coronal Explorer, the Focal Plane Package on the Japanese Hinode satellite, the Solar X-ray Imagers on GOES-N, -O and -P, the Extreme

Ultraviolet Imager instruments on NASA's twin STEREO spacecraft, and

the Helioseismic and Magnetic Imager and the Atmospheric Imaging

Assembly on NASA's Solar Dynamics Observatory. The ATC is currently

building both the science instrument and spacecraft for NASA's

Interface Region Imaging Spectrograph (IRIS), a Small Explorer Mission

scheduled for launch in late 2012.

The ATC is the research and development organization of Lockheed

Martin Space Systems Company (LMSSC). LMSSC, a major operating unit of

Lockheed Martin Corporation, designs and develops, tests, manufactures

and operates a full spectrum of advanced-technology systems for

national security and military, civil government and commercial customers. Chief products include human space flight systems; a full range of remote sensing, navigation, meteorological and communications satellites and instruments; space observatories and interplanetary spacecraft; laser radar; ballistic missiles; missile defense systems; and nanotechnology research and development.

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The Corporation's 2010 sales from continuing operations were \$45.8 billion.

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Record - 4

DIALOG(R)

Astronaut, economist are among SciFest speakers,

DIANE TOROIAN KEAGGY dkeaggy@post-dispatch.com > 314-340-8343,
St. Louis Post-Dispatch (MO), Fourth Edition ed, pE7,
Sunday, October 9, 2011

TEXT:

0 - Shuttle Atlantis astronaut Sandra Magnus and world-renowned environmental economist Graciela Chichilnisky will be among the guest speakers at the St. Louis Science Center's SciFest, a six-day festival that probes topics from the physics of football to carbon markets.

The public is invited to about 40 sessions Oct. 22-23 and evening programs Oct. 18, 21-22. Weekday sessions are reserved for school groups. Day passes are \$10, \$6 for children.

Special programs include "Science With the Symphony" on Oct. 18, a family fun night Oct. 22 and a SciFest Extravaganza cocktail party Oct. 21.

SciFest visitors also will get an advance peek at a new show, "Star Trek: The Exhibition." For a complete schedule, visit scifeststl.org.

Highlights:

Oct. 22

"A Star Is Born and Dies" - Giovanni Fazio, senior physicist at the Harvard Smithsonian Center for Astrophysics, discusses stars' life cycles and violent deaths as well as black holes, white dwarfs and neutron stars.

"Global Efforts Address Climate Change" - Graciela Chichilnisky, author of the carbon market of the UN Kyoto Protocol, discusses ways to foster the development of green technologies while halting climate change and narrowing the gap between rich and poor nations.

"Cupcake Science" - Nicole Puyear, co-owner of bakery The Cup, will prepare cupcakes while explaining what happens in the mixing and baking process.

"Football Physics" - Author Timothy Gay explains the physics behind some of football's greatest plays.

Oct. 23

"Don't Miss This Opportunity!" - Washington University professor Raymond Arvidson discusses the groundbreaking scientific discoveries of Opportunity, the Mars rover.

"Scratch that Itch" - Zhou-Feng Chen, director of the Washington University School of Medicine's new Center for the Study of Itch, reveals why we itch and how chronic sufferers can be helped.

"Fabulous Fermentation" - Experts from Barefoot Wine explain enology - the science of wine.

"Beyond Shuttle: The Future of Human Spaceflight" - X PRIZE Foundation co-founder Gregg Maryniak discusses the dawn of the commercial space age.

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Record - 5

DIALOG(R)

NASA discovers planet that could sustain life Distant orb exhibits temperatures like a day in the spring,

Brian Vastag,

Star-Ledger, The (Newark, NJ), Update ed, p014,

Tuesday, December 6, 2011

TEXT:

The search for Earth-like planets circling other stars is heating up, but the latest discovery is not too hot at all. It's not too cold, either.

Instead, the temperature on the newly announced planet Kepler-22b could be just right for life -- about 72 degrees, a perfect spring day on Earth.

Spied by NASA's Kepler space telescope, Kepler-22b marks the best candidate for a life-bearing world beyond our solar system, project scientists said yesterday.

"If it has a surface, it ought to have a nice temperature," said Kepler's lead scientist, Bill Borucki, during a teleconference yesterday.

"It's right in the middle of the habitable zone," said Natalie Batalha, a Kepler scientist, referring to the narrow, balmy band of space around any

star where water can be liquid. "The other exciting thing is that it orbits a star very, very similar to our own sun."

The actual temperature on Kepler-22b hinges on whether the planet has an atmosphere, which, like a blanket, would warm the surface.

Even without an atmosphere, Borucki said, the planet would likely be warm enough to host liquid water on its surface.

If it has a surface.

At 2.4 times wider than Earth, the composition of Kepler-22b is a puzzle. It could be rocky, a "super-Earth" much like our planet but bigger.

It might also be a water world covered with deep oceans, said Dimitar Sasselov, a Kepler scientist at the Harvard-Smithsonian Center for Astrophysics. Or it could be gaseous like Neptune or Uranus.

Determining the planet's composition rests in part on measuring its mass -- how heavy it is. The Kepler telescope is unable to make this measurement, but ground-based telescopes can by watching the planet tugging on its star. Telescopes in Hawaii and elsewhere will attempt these measurements when the star comes into view next summer, Borucki said.

Besides its balmy temperature, Kepler-22b shares other intriguing similarities with Earth.

The planet's home star, some 600 light years away and near the constellation Cygnus, is "almost a solar twin," Batalha said. That means the light hitting the planet's surface would be almost the same color as the light hitting Earth. And Kepler-22b's year is almost the same length as an Earth year: 290 days instead of 365.

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Record - 6

DIALOG(R)

Hot on the trail of exoplanets that are right for life,

Overbye, Dennis,

Honolulu Star-Advertiser (Honolulu, HI), p/n/a,

Saturday, December 3, 2011

TEXT:

CAMBRIDGE, Mass. -- What does Goldilocks want?

At least four times in the last few years, astronomers have announced they have found planets orbiting other stars in the sweet spot known as the habitable zone -- not too hot, not too cold -- where water and thus perhaps life are possible. In short, a planet fit to be inhabited by the biochemical likes of us, a so-called Goldilocks planet.

None of these planets is known to be habitable -- let alone inhabited -- yet, but astronomers who are making the discoveries with NASA's Kepler spacecraft are meeting next week in California to review the first two years of their quest, which seems tantalizingly close to hitting pay dirt. It is only a matter of time, they say, before the inventory of potentially usable real estate in the galaxy begins to dramatically increase.

"Sooner or later, Kepler will find a lukewarm planet with a size making it probably Earthlike," said Geoffrey Marcy of the University of California, Berkeley, who spends his time tracking down candidates identified by Kepler. "We're no more than a year away" from such a discovery, he said.

Sara Seager, a planetary astronomer at the Massachusetts Institute of Technology, put it this way: "We are on the verge of being those people who will be remembered."

All this has brought to the fore a question long debated by geologists, chemists, paleontologists and cosmologists turned astrobiologists, namely: What does life really need to get going, flourish and evolve on some alien rock?

The answer depends of course on whom we expect to be living there. We might dream of green men with big eyes, ants with hive minds, or even cuddly octopuses as an antidote to cosmic loneliness; but what we are most likely to find, a growing number of scientists say, is alien pond slime.

Microbes can spring up anywhere that is wet and warm, astronomers say, although biologists are not so sanguine. But the emergence of large creatures, let alone intelligent ones, as evidenced by the history of the Earth, depends on a chain of events and accidents -- from asteroid strikes to plate tectonics -- that are unlikely to be repeated anytime soon.

"If you reran Earth's history, how many times would you get animals?" asked Donald Brownlee, an astronomer at the University of Washington. He and a colleague, the paleontologist Peter Ward, made a case that we live on a lucky planet in their 1999 book, "Rare Earth."

Single-cell life might be common, given the right simple conditions, explained Marcy in an email.

"But the steady, long-term evolution toward critters that play improv saxophone, write alliteration poems and build heavy-lifting rocket boosters may depend on a prohibitive list of planetary prerequisites," he added.

Even warm and wet is a rare condition, however, occurring now on only one of the eight official planets in our solar system and three of the several dozen moons. Mars was once wet, but it is now a desert. And after billions of dollars spent exploring Mars and the remains of space probes littering the planet, we still do not know if a single microbe ever lived there.

But nobody really knows how rare or common are planets like Earth and its brand of life.

"I would be more comfortable with that argument if it were not so Earth-o-centric," Steven Benner, a chemist at the Foundation for Molecular Evolution, said in an email.

For instance, he said, low-temperature water mixed with ammonia can substitute for water alone as the liquid necessary for life. So could liquid methane, which forms lakes on Titan, Saturn's slushy frigid moon, and Benner and others have advocated looking for life there.

"We are limited by our imaginations," said Natalie Batalha, a leader of the Kepler team.

Some scientists decry the emphasis on animals like us, saying it is hopelessly parochial and unimaginative -- the scientific equivalent of the drunk searching for his car keys under a street light because that's where the light is.

"Animals are overgrown microbes," said Paul Falkowski, a biophysicist and biologist from Rutgers. "We are here to ferry microbes across the planet. Plants and animals are an afterthought of microbes."

So, we should hardly be disappointed if we find our neighbors are microbes. After all, on Earth, microbes were the whole story for almost 4 billion years, paleontologists say, and now inhabit our intestines as well as every doorknob. Had alien astronomers spied the Earth at almost any time during its history, they would have found no indication that it was to blossom into such a fabulous place.

Dimitar Sasselov, an astronomer turned astrobiologist at the Harvard-Smithsonian Center for Astrophysics, said he was all for the

existence of a microbial planet.

"Don't assume microbes are simple," he said, noting that 99 percent of the genes in our bodies belong to microbes inhabiting us and without which we could not live.

LOOKING FOR GOLDILOCKS

A blue-ribbon committee of chemists convened by the National Academy of Sciences concluded that there was only one ironclad requirement for life, besides energy: a place warm enough for chemical reactions to go on. So, determining how warm a planet's atmosphere keeps it -- through assumptions, calculations or just plain guesses -- has been crucial in reaching a verdict about its potential habitability.

This is how it has gone with the potential Goldilocks planets orbiting Gliese 581, a small cool red star about 20 light-years from here in the constellation Libra that has been at the center of exoplanet fantasies and speculation for the last few years. Depending on whom you talk to, it has five or six planets, three of which have at one time or another been claimed to be habitable. (Wilhelm Gliese, for whom the star was named, was a Danish astronomer who cataloged nearby stars, most of them dim red dwarfs like this one.)

The first in what would become a chain of potential Goldilocks planets, identified in 2007, was a presumably rocky ball about five times as massive as the Earth and orbiting only about 7 million miles from Gliese 581, close enough within the small star's shrunken habitable zone to have a warm surface.

"On the treasure map of the universe, one would be tempted to mark this planet with an X," Xavier Delfosse, one of the astronomers who discovered it, said at the time.

But before budding interstellar explorers could even begin conceiving of booking passage to Gliese 581c, as the planet is poetically called, other astronomers took a closer look and concluded that if the planet's geology and atmosphere resembled those of Earth, it would be a stifling greenhouse, no place to set solar sail for.

Attention then shifted to a farther planet in the system, Gliese 581d, which had been dismissed as too cold. Could the same greenhouse effect that would torch the inner planet thaw the outer one and make it livable? The answer was yes, but only if it had "loads of carbon dioxide" and an atmosphere seven times thicker than Earth's, said Lisa Kaltenegger, a climate modeler at the Max Planck Institute for Astronomy in Heidelberg.

Otherwise it would be freezing cold.

"So it would be a bit different from Earth," Kaltenegger said.

Meanwhile yet another planet was claimed for that system, smack between the other two, by a team led by R. Paul Butler of the Carnegie Institution and Steven S. Vogt of the University of California, Santa Cruz.

"This is really the first Goldilocks planet," Butler said at a news conference last year organized by the National Science Foundation in Washington.

But the Geneva team that had discovered the earlier Gliese 581 planets could not find any evidence of the new planet's existence in their own data. For now, anyway, most astronomers have dismissed that planet. Pending the publication of new results by the Geneva team -- one of the most prolific in the planet-hunting business -- Butler said, "We are in a holding pattern."

In September, what some astronomers called the best and smallest Goldilocks candidate yet was announced by the Geneva team. About 3.6 times as massive as the Earth, it circles a faint orange star in Vela known as HD 85512 at a distance of some 24 million miles, about a quarter of the Earth's distance from the Sun. The star was also cataloged by the Danish astronomer as Gliese 370. Kaltenegger and her colleagues calculated that this planet would be habitable if it had an Earth-type geology and at least 50 percent cloud cover.

"So, so far we only have two great targets to search for atmospheric signatures of life," Kaltenegger wrote.

IF, IF, IF

So goes the history of astrobiology, as well as its future.

The problem, as many astronomers point out, is getting any more information about these planets.

"Astronomers are going to have to learn to live with ignorance," Seager said.

Some exoplanets, like the Gliese worlds, were discovered by the "wobble method" -- looking at the motions they induce in their parent stars -- which allows their masses and orbits to be measured. Other planets, like the ones identified by Kepler, are found by watching for the blinks when they pass in front of their stars; that also allows their sizes to be

determined.

To date, none of the Goldilocks candidates have been observed to transit their stars, and thus none have been assigned both masses and sizes, which would allow astronomers to calculate their densities and compositions and find out if they are water worlds, rocks or gassy fluff balls.

Kepler fixes its gaze on a patch of stars in Cygnus that are hundreds if not thousands of light-years away -- too far for any wobble detections that would assess the abundance of Earthlike planets in the galaxy or any other close scrutiny. We are liable to never know any more about those planets than we know now, astronomers say.

The brute reality, astronomers admit, is that even if there are thousands or millions of habitable planets in the galaxy, only a few hundred of them are within range of any telescope that will be built in the conceivable future.

Luckily there is some renewed hope for life on nearby planets. David Charbonneau of the Harvard-Smithsonian Center for Astrophysics runs a project called MEarth that looks for planets around nearby stars. He pointed out that of the 300 stars within 25 light-years of here, 260 are red dwarfs like Gliese 581. Until recently it was thought that habitable-zone planets around such stars would have to hug the star so closely that they would be tidally locked, like the Moon, keeping one face locked to the star and roasting, the other freezing. But new studies have concluded that a proper atmosphere could spread the heat around.

Which is good. "These stars," Charbonneau said, "are our only hope for studying life in the universe in the coming decades."

In the original scheme of things, Kepler was to be succeeded by a space observatory called the Terrestrial Planet Finder, which would be big enough to find and study planets up to 100 light-years distant. But plans for that telescope have collapsed, because of NASA's continuing fiscal woes and disagreements among astronomers, as well as the technological challenges involved.

Some astronomers hope that some of these functions can be performed by the James Webb Space Telescope -- NASA's Hubble successor, overdue and over budget, now scheduled for a launch in 2018. Equipped with a "starshade" that would blot out the glare of a planet's sun, the Webb could detect and study the pinpoint of light from an exoplanet itself.

But the starshade would be hostage to the same political and fiscal pressures that are threatening to decimate NASA's scientific programs. At

best, scientists say, the search for life elsewhere has been postponed for decades.

"I'm beginning to despair that I will see it in my lifetime," said James Kasting of Pennsylvania State University.

GEOLOGY IS DESTINY

Earth got lucky early.

Fossil evidence suggests that microbial life was already inhabiting the Earth as early as 3.8 billion years ago -- only 700 million years after the planet collapsed into existence, and a geological instant after the end of a killer rain of comets and asteroids that brought just the right amount of precious water in the form of ice from the outer solar system to what would otherwise be a dry planet, astronomers say.

"The question of whether the Earth is unique because of its water abundance is perhaps the most interesting one in the arsenal of Rare Earth arguments," said Kasting, who explained that calculations showed that the planet could have easily been swamped with too much water or parched with too little.

The planet has remained comfortable ever since thanks to a geological feedback process, by which weather, oceans and volcanoes act as a thermostat. Known as the carbonate silicate cycle, it regulates the amount of carbon dioxide in the atmosphere, where it acts like a greenhouse -- trapping heat and keeping the planet temperate and mostly stable. Rain washes the gas out of the air and under the ocean; volcanoes disgorge it again from the underworld.

Without greenhouse gases and this cycle -- which Brownlee called "this magic thing" -- the Earth would have frozen into a snowball back in its early days when the Sun was only 70 percent as bright as it is now.

Still, with all this magic, it took 4 billion years for animal life to appear on the Earth.

The seeds for animal life were sown sometime in the dim past when some bacterium learned to use sunlight to split water molecules and produce oxygen and sugar -- photosynthesis, in short. The results began to kick in 2.4 billion years ago when the amount of oxygen in the atmosphere began to rise dramatically. The Great Oxidation Event, as it is called in geology, "was clearly the biggest event in the history of the biosphere," said Ward from Washington.

It culminated in what is known as the Cambrian explosion, about 550 million years ago, when multicellular creatures, that is to say, animals, appeared in sudden splendiferous profusion in the fossil record. We were off to the Darwinian races.

Whatever happened to cause this flowering of species helped elevate Earth from a run-of-the-mill Planet of the Microbes into someplace special, say the Rare Earthers. Paleontologists argue about whether it could have been a spell of bad climate known as Snowball Earth, the breakup of a previous supercontinent, or something else.

In other words, alien planets that have been lucky enough to be habitable in the first place might have to be lucky again.

"The big hurdle" for other planets, said Brownlee, is to have some event or series of events to trigger their own "Cambrian-like" explosions and then nurture the results.

Eventually though, Earth's luck will run out. As the sun ages it will get brighter, astronomers say, boosting the weathering and washing away of carbon dioxide. At the same time, as the interior of the Earth cools, volcanic activity will gradually subside, cutting off the replenishing of the greenhouse gas.

A billion years from now, Brownlee said, there will not be enough carbon dioxide left to support photosynthesis, that is to say, the oxygen we breathe.

And so much for us.

"Even Earth, wonderful and special as it is, will only have animal life for 1 billion years," Brownlee said.

Credit: Dennis Overbye

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Wolbach Library: CfA in the News ~ Week ending 18 December 2011

1. Milwaukee Journal Sentinel, **Jim Stingl Column**, Jim Stingl, Sunday, December 11, 2011

Record - 1

DIALOG(R)

Milwaukee Journal Sentinel, **Jim Stingl Column**,
Jim Stingl, Sunday, December 11, 2011

TEXT:

Dec. 11--While the NASA telescope he helped create scans the galaxy for stirrings of life on distant planets, David Koch fights for his own.

Born in Milwaukee 66 years ago, Koch returned to Wisconsin last year to be close to family during his struggle with ALS, or Lou Gehrig's disease, which affects the nerve cells in the brain and spinal cord controlling muscle movement.

He was too weak to travel to California last week for the announcement of the mission's first big success -- the discovery of planet Kepler-22b, a rock with similarities to Earth and a sweet-spot distance from its star that creates temperatures and other conditions that could support life. "From what we have measured so far, we say water could exist. We don't say it's there," Koch said, tempering my excitement over when we get to meet our new neighbors.

ALS affects everyone differently. It was in December 2008 that Koch was putting up Christmas lights and found he couldn't lift his arm.

His condition grew progressively worse to where he has difficulty holding his head up, turning the pages of a book, speaking and even breathing, though he still can stand. As a person accustomed to making things happen, he feels frustrated.

Doctors made the ALS diagnosis in March 2009, the same month a rocket carried the Kepler telescope into space to begin its mission of staring at the stars. We can detect planets trillions of miles away, but so far the cause and cure for his disease are unknown.

As we talked last week at the Elm Grove home where Koch lives with his wife, Diane, he would occasionally rest his head on two pillows on the dining room table or support it with his left hand.

But his mental acuity still shines through, even when discussing complicated aspects of space exploration.

Born the day the atomic bomb was dropped on Hiroshima, Koch grew up near 18th and Capitol in Milwaukee and attended Milwaukee Lutheran High School.

Last Sunday, the school honored him as a distinguished grad with its Cum Deo Award, meaning "with God."

"This might be the smartest guy I've ever met and talked to, with all due respect to everyone I've ever met," said Paul Bahr, who was principal at Milwaukee Lutheran for 21 years before becoming the school's senior vice president of development in June.

Koch's son, Philip, now teaches and coaches at the school.

Koch received a degree in applied math and engineering physics from UW-Madison and went on to graduate school at Cornell University. He remained out east working on X-ray astronomy and then on telescope projects at the Smithsonian Astrophysical Observatory.

He went to work for NASA in 1988 at the Ames Research Center in California.

It was there he met William Borucki, who first developed the idea for the project. Koch eventually came up with the name for the mission, honoring Johannes Kepler, the 17th-century astronomer who discovered the laws of planetary motion.

Borucki, I've learned, also was a Wisconsin guy, attending Delavan High School and then UW before joining NASA 49 years ago.

He came up with the transit method of studying planets, which involves measuring dips in the brightness of a star when a planet crosses in front of it. The planet itself is not seen, only its effect on the star.

"Nobody believed it was going to work. I was never going to get it accepted. Dave Koch heard about this and said, 'I believe. And I will work with you,' " Borucki said in a telephone interview Friday. "He had lots of experience in space missions and projects. I didn't have any. I just basically had the idea."

They began working on the project in 1992 and pitched it to NASA unsuccessfully several times before getting approval in 2001.

A telescope the size and weight of a VW bus trails the Earth in its orbit around the sun. With rocklike steadiness, it gazes at about 150,000 stars and so far has discovered more than 2,300 new planet candidates, including 48 that exist in the so-called habitable zone, meaning life could be possible there.

As recently as 1995, there were no confirmed planets at all outside our own solar system.

"The mission is working so well that we're finding planets faster than we can confirm them," Borucki said.

Kepler-22b, which is more than twice as wide as Earth and orbits its star every 290 days, is the first to be confirmed. Its surface and atmosphere are unknown. Hold off on your travel plans. It is 600 light years away. At 6 trillion miles per light year, that sounds far until you consider that the galaxy where our own solar system and Kepler-22b reside is 100,000 light years across.

The mission is approved for four years, but the Kepler team is hoping to get it extended. His failing health forced Koch to retire in August, but he still keeps up on the project.

"I thank the Lord for what I can still do," he said. "I look at God as the greatest physicist."

A lifetime of scientific discovery has reinforced Koch's faith in God. He treasures his Lutheran faith, and he taught Bible classes until this year.

Borucki compared their Kepler project to building a cathedral. They laid in the floor, and it will be up to future generations to erect the walls and roof.

Humans need to stay curious, Koch said, and we must keep exploring our own world and others. As a scientist, he hesitated to speculate about whether there are creatures like us elsewhere in the universe.

"Maybe we're unique," he said. "Maybe we're the only place where there is intelligent life. We don't know. That's what is so important about this first step."

Call Jim Stingl at (414) 224-2017 or email at jstingl@journal sentinel.com

STINGL ON THE RADIO

Jim Stingl talks about his column at 7:35 a.m. every Sunday on WTMJ-AM (620).

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Wolbach Library: CfA in the News ~ Week ending 25 December 2011

1. **2 Earth-size planets spotted around distant star**, AP Science NewsBrief at 3:46 p.m. EST, AP Online, Sunday, December 25, 2011

2. **NASA excited after spacecraft finds two Earth-size planets**, Dennis Overbye, New York Times, St. Paul Pioneer Press (MN), St. Paul ed, pB12, Wednesday, December 21, 2011

3. **Chance of finding alien life gets a boost**, Malcolm Ritter, Waterloo Region Record, v2011122118275477, First ed, pD10 Wednesday, December 21, 2011

4. **Getting closer in search for Earth 'twin'**, Dale McFeatters, The Intelligencer, pA13, Friday, December 23, 2011

5. **Two Earth-Size Planets Are Discovered**, DENNIS OVERBYE, New York Times (NY), Late Edition - Final ed, p18, Wednesday, December 21, 2011

6. **NASA MAKES MAJOR FINDING**, Lisa M. Krieger, lkrieger@mercurynews.com, San Jose Mercury News (CA), Valley Final ed, p1B Wednesday, December 21, 2011

7. **Earth-like planets: How will we know if they can sustain life?** (VIDEO), Pete Spotts Staff writer, Christian Science Monitor (USA), ALL ed, Thursday, December 22, 2011

8. **HIGH RECOGNITION: AMERICAN PHYSICAL SOCIETY ELECTS THUMM, LAW AS FELLOWS FOR CONTRIBUTIONS TO PHYSICS**, US Federal News, Tuesday, December 20, 2011

9. **2 Earth-size planets spotted around distant star**, Ritter, Malcolm, Honolulu Star-Advertiser (Honolulu, HI), pn/a, Tuesday, December 20, 2011

10. **NASA finds Earth-size planets outside of our universe**, Al Arabiya, Thursday, December 22, 2011

11. **Two distant planets**, KIRO-7 MORNING NEWS 2011-12-21 06:24:30, CBS, 7 KIRO-WA, Wednesday, December 21, 2011

12. **NASA discovers two Earth-sized planets**, Kuwait News Agency (KUNA), Thursday, December 22, 2011

13. **First Earth-size planets detected**, Anonymous; News services, Journal - Gazette, p10A, Wednesday, December 21, 2011

14. **Pair of Earth sized planets found orbiting sun-like star**, Hindustan Times, Wednesday, December 21, 2011

15. **Exoplanetes a la mesure de la Terre**, AFP,

Le Temps, Thursday, December 22, 2011

16. **Scientists seek life on Earth-sized planets**, THE ASSOCIATED PRESS
Charleston Daily Mail (WV), pP3A,
Wednesday, December 21, 2011

17. **Two Earth-size planets spotted around distant star**,
Statesman (Calcutta, India), Wednesday, December 21, 2011

18. **Astronomers find 2 Earth-size planets**, Times, The (Trenton, NJ), Trenton Full Run ed, pA04
Wednesday, December 21, 2011

19. **KEPLER SPACECRAFT DISCOVERS TWO EARTH-SIZE PLANETS SMALLEST FOUND BEYOND SOLAR SYSTEM**, Dennis Overbye, The New York Times,
Pittsburgh Post-Gazette (PA), SOONER ed, pA-3,
Wednesday, December 21, 2011

20. **NASA finds first two Earth-size planets**, Lisa M. Krieger lkrieger@mercurynews.com,
Contra Costa Times (Walnut Creek,CA), Tuesday, December 20, 2011

21. **Earth's 'twin' is discovered**, Daily Mail (UK), 01 ed,
Wednesday, December 21, 2011

22. **Deux " Terre " decouvertes a 1 000 annees-lumiere de notre systeme solaire**,
Le Monde, p7, Thursday, December 22, 2011

23. **Decouverte de deux planetes de la taille de la Terre pres d'une etoile**,
MALCOLM RITTER, La Presse Canadienne,
Tuesday, December 20, 2011

24. **DECOUVERTE-PLANTES**, Voici le bulletin de 5 heures, La Presse Canadienne - Le fil radio,
Wednesday, December 21, 2011

25. **Decouverte de deux planetes de la taille de la Terre pres d'une**,
La Presse Canadienne - Le fil radio, Tuesday, December 20, 2011

26. **US-SCI-Alien-Planets**, Top News Advisory as of 6 p.m. Tuesday, Dec. 20, 2011,
Canadian Press, Tuesday, December 20, 2011

27. **2 Earth-size planets spotted around distant star**,
International News Advisory as of 3 p.m. Tuesday, Dec. 20, 2011,
Canadian Press, Tuesday, December 20, 2011

28. **2 Earth-size planets spotted around distant star, a boost for prospects of finding alien life**, MALCOLM RITTER, Canadian Press,
Tuesday, December 20, 2011

29. **Astronomers discover the first 'Earth twin'**, Daily Telegraph (UK), 01 ed,
Wednesday, December 21, 2011

30. **Scientists discover planet the same size as Earth**,
Herald (Glasgow, Scotland), 1 ed, p7, Wednesday, December 21, 2011

31. **An Earth-size planet, at last**, Carolyn Y. Johnson,
Boston Globe (MA), p1, Wednesday, December 21, 2011

32. **Earth-size planet duo orbit star**, Windsor Star (Canada), Final ed, pD8, Wednesday, December 21, 2011

33. **Astronomers discover two Earth-sized worlds; New advance in search for exoplanets**, AGENCE FRANCE-PRESSE, Montreal Gazette (Canada), Final ed, pA20, Wednesday, December 21, 2011

34. **Astronomers find two Earth-sized worlds**, Eric Berger, Houston Chronicle, Wednesday, December 21, 2011

35. **You wait 4.5bn yrs for another Earth then three come along all at once..**, MIKE SWAIN, Mirror (UK), Ulster ed, p28, Wednesday, December 21, 2011

36. **YOU WAIT 4.5BN YEARS FOR ANOTHER EARTH THEN 3 COME ALONG ALL AT ONCE**, MIKE SWAIN, Mirror (UK), Eire ed, p24, Wednesday, December 21, 2011

37. **First Earth-size planets found around distant star in a bizarre solar system**, Pete Spotts, Staff writer, Christian Science Monitor (USA), ALL ed, Tuesday, December 20, 2011

38. **Astronomers find two Earth-size planets**, UPI Science News, Tuesday, December 20, 2011

39. **NASA descubre primeros planetas de tamaño de la Tierra más allá de sistema solar**, Xinhua Spanish, Tuesday, December 20, 2011

40. **NASA discovers first Earth-size planets beyond solar system**, Xinhua News Agency, Tuesday, December 20, 2011

41. **Nasa encontra 2 planetas com o tamanho da Terra**, EFE Portuguese, Tuesday, December 20, 2011

42. **Orbitan estrella distante dos planetas del tamaño de la Tierra**, Por MALCOLM RITTER, AP Online Regional - Latin America/Caribbean, Tuesday, December 20, 2011

43. **NASA'S KEPLER TO ANNOUNCE NEWLY CONFIRMED PLANETS**, US Federal News, Sunday, December 18, 2011

44. **Kerala Center honors six**, Anonymous, India Abroad; New York edition, v42, n9, pA58, Friday, December 2, 2011

Record - 1

DIALOG(R)

2 Earth-size planets spotted around distant star, AP Science NewsBrief at 3:46 p.m. EST,

AP Online,
Sunday, December 25, 2011

TEXT:

LONDON (AP) _ The loose-knit hacking movement "Anonymous" claimed Sunday to have stolen thousands of credit card numbers and other personal information belonging to clients of U.S.-based security think tank Stratfor. One hacker said the goal was to pilfer funds from individuals' accounts to give away as Christmas donations, and some victims confirmed unauthorized transactions linked to their credit cards. Anonymous boasted of stealing Stratfor's confidential client list, which includes entities ranging from Apple to the U.S. Air Force to the Miami Police Department, and mining it for more than 4,000 credit card numbers, passwords and home addresses.

MOSCOW (AP) _ A Soyuz spacecraft safely delivered a Russian, an American and a Dutchman to the International Space Station on Friday, restoring the permanent crew to six members for the first time since September. But just as concerns over the reliability of the Soyuz have eased, a different version of the Soyuz rocket failed Friday during an unmanned launch. It was the latest in a string of spectacular launch failures that have raised questions about the state of Russia's space industry.

'Anonymous' hackers target US security think tank

Russian spacecraft delivers 3 to orbiting station

Asteroid named for 'disappeared' Argentine student

BUENOS AIRES, Argentina (AP) _ For 35 years, Zaida Franz has not been able to find her daughter, a girl who dreamed of becoming an astronomer and then disappeared without a trace. Now she at least has an address she can think about _ out in space. "My dearest daughter, at last I can write to you, now that I have a place to find you: Asteroid 11441, between Mars and Jupiter," she wrote in an open letter this month.

Ethicist: 18th century 'giant' should be buried

LONDON (AP) _ The skeleton of an 18th-century celebrity nicknamed the 'Irish Giant' should be removed from a museum and buried at sea in keeping with his last wishes, two experts have argued, reviving a debate about the ethics of handling human remains. Writing in the British Medical Journal, medical ethicist Len Doyal and legal researcher Thomas Muinzer said there is no good scientific reason to display the skeleton of Charles Byrne, who died in 1783, and a strong moral case against it.

Study linking virus and chronic fatigue retracted

NEW YORK (AP) _ A prestigious scientific journal is retracting a controversial 2009 report that linked chronic fatigue syndrome to a virus. In an unusual move, the journal Science is taking that step on its own. Normally, authors retract their own research papers when serious problems arise after publication.

Dawn spacecraft beams back new images of asteroid

LOS ANGELES (AP) _ NASA's Dawn spacecraft has been a fervent photographer, snapping more than 10,000 pictures of the asteroid Vesta since it slipped into orbit around the giant space rock last summer. The views were taken from a distance away _ until now. On Wednesday, the space agency released new images of the hummocky surface as Dawn circled from an average altitude of 130 miles above the surface _ the closest it'll get.

Soyuz bound for space station blasts off

MOSCOW (AP) _ A Soyuz spacecraft carrying a Russian, an American and a Dutchman to the International Space Station blasted off flawlessly from Russia's launch facility in Kazakhstan on Wednesday. Mission commander Oleg Kononenko and his colleagues, American Don Pettit and European Space Agency astronaut Andre Kuipers are to dock with the space station on Friday.

2 Earth-size planets spotted around distant star

NEW YORK (AP) _ Scientists have found two Earth-sized planets orbiting a star outside the solar system, an encouraging sign for prospects of finding life elsewhere. The discovery shows that such planets exist and that they can be detected by the Kepler spacecraft, said Francois Fressin of the Harvard-Smithsonian Center for Astrophysics in Cambridge, Mass. They're the smallest planets found so far that orbit a star resembling our sun.

Brain strain: Christmas shopping when money tight

NEW YORK (AP) _ Chennel King, a nurse from Norwalk, Conn., went Christmas shopping the other day with a new holiday companion: a budget. Despite a tough economic situation _ her husband was laid off almost a year ago _ King didn't want to disappoint her five children. So she still went to a mall in suburban New Jersey, but with a limit of \$200 per child.

Comet defies death, brushes up to sun and lives

WASHINGTON (AP) _ A small comet survived what astronomers figured would be a sure death when it danced uncomfortably close to the broiling sun. Comet Lovejoy, which was only discovered a couple of weeks ago, was supposed to

melt Thursday night when it came close to where temperatures hit several million degrees. Astronomers had tracked 2,000 other sun-grazing comets make the same suicidal trip. None had ever survived.

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Record - 2

DIALOG(R)

NASA excited after spacecraft finds two Earth-size planets,

Dennis Overbye, New York Times,
St. Paul Pioneer Press (MN), St. Paul ed, pB12,
Wednesday, December 21, 2011

TEXT:

In what amounts to a kind of holiday gift to the cosmos, astronomers from NASA's Kepler spacecraft announced Tuesday that they had discovered a pair of planets the size of Earth orbiting a distant star. The new planets, one about as big as Earth and the other slightly smaller than Venus, are the smallest planets yet found beyond the solar system.

Astronomers said the discovery showed that Kepler could indeed find planets as small as our own and was an encouraging sign that planet hunters would someday succeed in the goal of finding Earth-like abodes in the heavens.

Since the first Jupiter-size exoplanets, as they are known, were discovered nearly 15 years ago, astronomers have been chipping away at the sky, finding smaller and smaller planets.

"We are finally there," said David Charbonneau, an astronomer at the Harvard-Smithsonian Center for Astrophysics, who was a member of the team that made the observations, led by colleague Francois Fressin.

The team reported its results in an online news conference Tuesday and in a paper being published in the journal Nature.

"This demonstrates for the first time that Earth-size planets exist around other stars and that we can detect them," Fressin said.

The announcement doubled the number of known Earth-size planets in the galaxy to four from two - Earth and Venus.

The next major goal in the planetary hunt, astronomers say, is to find an Earth-size planet in the so-called Goldilocks zone of a star, where

conditions are temperate for water and thus life.

The two new planets, Kepler 20e and Kepler 20f, are far outside the Goldilocks zone - so close to the star, termed Kepler 20, that one of them is roasting at up to 1,400 degrees Fahrenheit - and thus unlivable.

Although the milestone of an Earth-size planet had long been anticipated, astronomers on and off the Kepler team were jubilant. Geoffrey Marcy of the University of California, Berkeley, another Kepler team member, called the new result "a watershed moment in human history."

Debra Fischer, a planet hunter from Yale, who was not part of the team, said, "This technological feat is incredibly important because it means that the detection of Earth-size planets at larger distances is technically possible."

Kepler 20e, the closer and hotter planet, is also the smaller - about 6,900 miles across, or slightly smaller than Venus - and it resides about 5 million miles from its star. The more distant planet, Kepler 20f, also broiling at around 800 degrees, is 10 million miles out from its star. It is 8,200 miles in diameter, about the size of Earth. The two planets are presumed to be rocky orbs that formed in the outskirts of their planetary system and then migrated inward.

Their star, which is slightly smaller and cooler than the Sun, is about 950 light years away from us. Kepler had previously found three larger Neptune-like planets around it, so the new observations bring the total to five, so far. All the planets are well inside where Mercury would be in our own solar system, presenting a bounteous system of unlivable planets.

"This is Venus and Earth in a five-planet system," Fischer said in an email. "There's no place like home, and the Kepler data are starting to uncover some mighty familiar architectures."

Kepler detects planets by watching for blinks when they move in front of their stars. Since it was launched in 2009, it has found 2,326 potential planets, 207 that would be Earth-size, if confirmed as the two reported Tuesday have been.

Confirmation of a planet, however, requires additional observations, usually of its star's wobbles as it gets tugged by the planet going around. The gravitational pull of planets as small as the Earth on their parent star is too small to measure with the current spectrographs. And so the astronomers resorted to a statistical method called Blender, developed by Fressin and Guillermo Torres of the Harvard-Smithsonian Center, in which millions of computer simulations of background stars try to mimic the Kepler signal. A FOUND_UTF8_E2(euro) They concluded that Kepler 20e was 3,400

times more likely to be a planet than background noise, while the odds in favor Kepler 20f being real were 1,370 to 1.

They join the other planets already known to orbit the star.

In a surprise for astronomers who thought they knew how planetary systems form, the orbits of the new planets are sandwiched between the orbits of the older bigger gassier ones, a configuration that does not occur in our own solar system.

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Record - 3

DIALOG(R)

Chance of finding alien life gets a boost,

Malcolm Ritter,

Waterloo Region Record, v2011122118275477, First ed, pD10,

Wednesday, December 21, 2011

TEXT:

NEW YORK - Scientists have found two Earth-sized planets orbiting a star outside the solar system, an encouraging sign for prospects of finding life elsewhere.

The discovery shows that such planets exist and that they can be detected by the Kepler spacecraft, said Francois Fressin of the Harvard-Smithsonian Center for Astrophysics in Cambridge, Mass.. They're the smallest planets found so far that orbit a star resembling our sun.

Scientists are seeking Earth-sized planets as potential homes for extraterrestrial life, said Fressin, who reports the new findings in a paper published online Tuesday by the journal Nature. One planet's diameter is only three per cent larger than Earth's, while the other's diameter is about nine-10ths that of Earth. They appear to be rocky, like our planet.

But they are too hot to contain life as we know it, with calculated temperatures of about 760 C and 425 C, he said.

Any life found on another plant may not be intelligent; it could be bacteria or mould or some completely unknown form.

Since it was launched in 2009, NASA's planet-hunting Kepler telescope has found evidence of dozens of possible Earth-sized planets. But Fressin's

report is the first to provide confirmation, said Alan Boss of the Carnegie Institution for Science in Washington. He's a member of the Kepler science team but not an author of the paper.

The researchers ruled out a possible alternative explanation for the signals that initially indicated the planets were orbiting the star Kepler-20. The star is 950 light-years from Earth in the direction of the constellation Lyra.

The planets, called Kepler-20e and Kepler-20f, are part of a five-planet system around the star, and their location challenges current understanding of how planets form, scientists said.

In our own solar system, the small rocky planets are closest to the sun, while gaseous giants are on the periphery. But the five-planet system has no such dividing line; big and small planets alternate as one moves away from the star.

That's "crazy," and unexplained by current understanding of how planets form around stars, said study co-author and Harvard scientist David Charbonneau.

Earlier this month, scientists said they'd found a planet around another distant star with a life-friendly surface temperature of about 22 C. But it was too big to suggest life on its surface. At 2.4 times the size of Earth, it could be more like the gas-and-liquid Neptune with only a rocky core and mostly ocean, scientists said.

Online: Nature: <http://www.nature.com/nature>

The Associated Press

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Record - 4

DIALOG(R)

Getting closer in search for Earth 'twin',

Dale McFeatters,

The Intelligencer, pA13,

Friday, December 23, 2011

TEXT:

One astronomer called it "the beginning of an era."

Scientists at the Harvard-Smithsonian Center have identified the smallest, most Earth-size planets yet found outside our solar system.

The discoveries were made by the Kepler space telescope, on a par with the Hubble as one of mankind's most remarkable scientific instruments for the exploration of space. Since its launch in 2009, Kepler has found 28 planets and identified 2,326 candidate planets waiting to be confirmed.

Not only are the two most recent discoveries Earth-size, they orbit a star, Kepler-20, that is remarkably like our sun. The smaller of the two planets, Kepler20-e, is 87 percent the size of Earth; the other, Kepler20-f, is 3 percent larger. And the planets appear to be rock, rather than the inhospitable gas and liquid of larger planets.

Unfortunately, for the chances of life and habitability, the two planets have surface temperatures of 700 to 1,400 degrees. The 20-e planet has an orbit of 6.1 days; 20-f of 19.6 days, but even it is 20 times closer to its star than the Earth is to the sun.

Kepler-20 is 950 light years away in the direction of the constellation Lyra.

From 1,200 B.C., when the Babylonians began systematically cataloging heavenly bodies, no one had seen, or been able to prove, the existence of an extra-solar planet until 1996. At first, we discovered mostly gas giants on the order of Jupiter, but then found planets that were smaller and smaller until earlier this month astronomers hit upon a planet with a just-right surface temperature of 72 degrees. However, at 2.4 times the size of Earth, it is likely mostly gas and liquid.

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Record - 5

DIALOG(R)

Two Earth-Size Planets Are Discovered,

DENNIS OVERBYE,

New York Times (NY), Late Edition - Final ed, p18,

Wednesday, December 21, 2011

TEXT:

In what amounts to a kind of holiday gift to the cosmos, astronomers from NASA's Kepler spacecraft announced Tuesday that they had discovered a pair

of planets the size of Earth orbiting a distant star. The new planets, one about as big as Earth and the other slightly smaller than Venus, are the smallest yet found beyond the solar system.

Astronomers said the discovery showed that Kepler could indeed find planets as small as our own and was an encouraging sign that planet hunters would someday succeed in the goal of finding Earth-like abodes in the heavens.

Since the first Jupiter-size exoplanets, as they are known, were discovered nearly 15 years ago, astronomers have been chipping away at the sky, finding smaller and smaller planets.

"We are finally there," said David Charbonneau, an astronomer at the Harvard-Smithsonian Center for Astrophysics, who was a member of the team that made the observations, led by his colleague Francois Fressin. The team reported its results in an online news conference Tuesday and in a paper being published in the journal Nature.

Dr. Fressin said, "This demonstrates for the first time that Earth-size planets exist around other stars and that we can detect them."

The announcement doubled the number of known Earth-size planets in the galaxy to four from two -- Earth and Venus.

The next major goal in the planetary hunt, astronomers say, is to find an Earth-size planet in the so-called Goldilocks zone of a star, where conditions are temperate for water and thus life. We are not there yet.

The two new planets, Kepler 20e and Kepler 20f, are far outside the Goldilocks zone -- so close to the star, termed Kepler 20, that one of them is roasting at up to 1,400 degrees Fahrenheit -- and thus unlivable.

Although the milestone of an Earth-size planet had long been anticipated, astronomers on and off the Kepler team were jubilant. Geoffrey Marcy of the University of California, Berkeley, another Kepler team member, called the new result "a watershed moment in human history."

Debra Fischer, a planet hunter from Yale, who was not part of the team, said, "This technological feat is incredibly important because it means that the detection of Earth-size planets at larger distances is technically possible."

Kepler 20e, the closer and hotter planet, is also the smaller -- about 6,900 miles across, or slightly smaller than Venus -- and it resides about 5 million miles from its star. The more distant planet, Kepler 20f, also broiling at around 800 degrees, is 10 million miles out from its star. It is 8,200 miles in diameter, about the size of Earth. The two planets are presumed to be rocky orbs that formed in the outskirts of their planetary

system and then migrated inward.

Their star, which is slightly smaller and cooler than the Sun, is about 950 light years away from us. Kepler had previously found three larger Neptune-like planets around it, so the new observations bring the total to five so far. All the planets are well inside where Mercury would be in our own solar system, presenting a bounteous system of unlivable planets.

"This is Venus and Earth in a five-planet system," Dr. Fischer said in an e-mail. "There's no place like home, and the Kepler data are starting to uncover some mighty familiar architectures."

Kepler detects planets by watching for blinks when they move in front of their stars. Since it was launched in 2009, it has found 2,326 potential planets, 207 that would be Earth-size, if confirmed as the two reported Tuesday have been.

Confirmation of a planet, however, requires additional observations, usually of its star's wobbles as it gets tugged by the planet going around. The gravitational pull of planets as small as the Earth on their parent star is too small to measure with the current spectrographs. And so the astronomers resorted to a statistical method called Blender, developed by Dr. Fressin and Guillermo Torres of the Harvard-Smithsonian Center, in which millions of computer simulations of background stars try to mimic the Kepler signal. They concluded that Kepler 20e was 3,400 times more likely to be a planet than background noise, while the odds in favor Kepler 20f being real were 1,370 to 1.

Confirmed (or validated, as the Kepler team likes to say), they join the other planets already known to orbit the star. In a surprise for astronomers who thought they knew how planetary systems form, the orbits of the new planets are sandwiched between the orbits of the older, bigger, gassier ones, a configuration that does not occur in our own solar system.

In an e-mail, Dr. Charbonneau noted: "In the solar system, rocky worlds and gas giants don't mingle. But in the Kepler 20 system they apparently do."

GRAPHICS: Two Small Planets: Astronomers have discovered a pair of Earth-size planets orbiting the star Kepler 20. The planets, named Kepler 20e and 20f, join three other larger planets in close orbit around the distant star. (Sources: Nature; NASA)

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Record - 6

DIALOG(R)

NASA MAKES MAJOR FINDING,

Lisa M. Krieger, lkrieger@mercurynews.com,
San Jose Mercury News (CA), Valley Final ed, p1B,
Wednesday, December 21, 2011

TEXT:

NASA's Kepler mission has found the first Earth-size planets orbiting a sun-like star outside our solar system. But they're too hot to support liquid water - or life.

This latest discovery marks a milestone that takes scientists one step closer to finding a planet like our own.

Two weeks ago, Kepler found a planet that was the perfect temperature. But this planet, Kepler-22b, is too big to have a rocky surface.

The new discoveries, Kepler-20e and Kepler-20f, are the right size. But they're close to their star, making them fiery hot worlds.

So now the hunt is on to find a "Goldilocks" planet with the best of both worlds: a hospitable place.

"In the cosmic game of hide and seek, finding planets with just the right size and just the right temperature seems only a matter of time," said Natalie Batalha, a contributing author to the new research who oversees the Kepler's scientific investigations at NASA's Ames Research Center in Mountain View's Moffett Field.

"We are on the edge of our seats knowing that Kepler's most anticipated discoveries are still to come," said Batalha, also a professor of astronomy and physics at San Jose State University.

The Kepler space telescope detects planets and planet candidates by measuring dips in brightness - a blink, essentially - when a planet crosses in front of a star. Additional evidence, such as a gravitational wobble, is required to confirm that the orb is a real planet.

Mountain View scientists manage Kepler's ground system development and mission operations. They're responsible for the software pipeline that analyzes the data - identifying the best planet candidates to forward to the Kepler team.

The first planet, a Jupiter-sized giant, was found about 15 years ago. Kepler's tally of confirmed planets is now beyond 700 - with 2,326

"candidate planets," awaiting study.

Tuesday's news, published in the journal Nature and announced by teleconference, shows that the telescope is getting better at finding small Earth-sized places.

The new planets reside within a curious five-planet solar system. It's unlike our solar system, where small, rocky worlds circle close to the sun and large, gaseous worlds are farther away.

Instead, the planets that circle star Kepler-20 are organized in alternating sizes: large, small, large, small and large.

"The architecture of that solar system is crazy," said David Charbonneau of Harvard University. "In our solar system, the two different kinds of planets don't mingle. This is the first time we've seen anything like this."

Kepler-20e and 20f are rocky places, made of silica and iron - Earthlike, but without an atmosphere.

But the surface temperature of Kepler-20e, which orbits its sun every 6 days, is more than 1,400 degrees Fahrenheit - hot enough to melt glass. Kepler-20f orbits every 19.6 days and is 800 degrees - as hot as Mercury.

Researchers can't rule out the possibility that the planets had liquid water after their creation, when they might have been farther from the sun. Perhaps there was a window of time - several billion years long - when they were habitable.

Now, they'll just keep looking.

"This is the first time that we've crossed the Earth-sized threshold," said Francois Fressin, an astronomer at the Harvard-Smithsonian Center for Astrophysics, who led the discovery team.

"It demonstrates for the first time that Earth-size planets exist, and that we can detect them.

Contact Lisa M. Krieger at 408-920-5565.

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DIALOG(R)

Earth-like planets: How will we know if they can sustain life? (VIDEO),
Christian Science Monitor (USA), ALL ed,
Thursday, December 22, 2011,

TEXT:

What makes for a potentially livable planet? That question moved center stage this month as NASA's Kepler mission passed two milestones.

On Tuesday, the Kepler team announced the discovery of two truly Earth-size planets orbiting another star a(euro)" but too close to the star for life to emerge. This followed an announcement on Dec. 5 that the Kepler team had found a planet in the host star's habitable zone, but 2.4 times larger than Earth.

The findings move the Kepler team closer to its goal of finding other planets like ours. The spacecraft is searching 150,000 stars to see how many are like the sun and have planets roughly the same size and distance away as Earth.

But researchers caution that even when Kepler eventually scores a direct hit, that will not be the end of the story. Astronomers will have to answer many more questions about such planets before they can suggest that any of them may be Earth-like, let alone livable for some form of life.

According to Yale University astronomer Debra Fischer, three important pieces of this habitability puzzle begin with: a planet's distance from its sun, its mass, and the shape of its orbit.

Watch video about the newly discovered habitable planet Kepler-22b here:

newslook

Other traits come into play, but "if we can find 100 planets that meet the three conditions, we will have gone a long way in our search for life," she writes in an e-mail exchange.

Distance is most straightforward for Kepler to gauge. The distance from the sun to the Earth is about 93 million miles, or 1 Astronomical Unit (AU). By some estimates, the habitable zone around a sun-like star a(euro)" where with a little help from an atmosphere, water can exist on the surface as solid, liquid, and gas a(euro)" is between 0.95 and 1.37 AU.

The planet announced Dec. 5, Kepler 22b, is almost exactly 1 AU from its star. But its mass has yet to be confidently established.

Mass is important, because if a planet is a lightweight, with less than about half Earth's mass, it won't have enough gravity to retain much of an atmosphere. Mars, at 10 percent of Earth's mass, has had much of its atmosphere stripped away.

"Too big is harder to quantify," Dr. Fischer adds.

If a planet has only a few times Earth's mass, it might still be potentially habitable. But if a planet becomes too massive, its gravity could be too strong, meaning that it builds a thick, deep atmosphere, resulting in crushing atmospheric pressures on the surface.

For Kepler 22b, the best the Kepler team can do at the moment is give an upper limit to the mass a(euro)" 124 times Earth's mass. The reason: Kepler's technique for pinpointing planets. It does this by gauging how they briefly dim the light of their host star when they pass in front of it.

While the team can make some rough estimates about a planet's mass from this technique, the best information on mass, as well as the shape of the orbit, comes from a different technique used by ground-based astronomers. This approach measures the wobble the planet imposes on host star's spectrum as it orbits.

Knowing the planet's mass and its volume, researchers can also estimate its density, and so glean something about the planet's general composition by comparing its density with that of water. If the density is relatively small, it could be more gaseous, like a mini-Neptune. If the density is larger, it could suggest a denser, rocky planet.

Kepler's preliminary results suggest that Kepler 22b could be on the less-dense side of that spectrum a(euro)" a water world or a mini-Neptune.

"Once a planet gets above say, two Earth radii, we could imagine scenarios where it's basically a water world, but most likely what you have is an envelop of hydrogen and helium," says David Charbonneau, a researcher at the Harvard-Smithsonian Center for Astrophysics in Cambridge, Mass., and a member of the Kepler team. "There might be a solid surface, but the surface would exist at very high pressure. It would be very difficult to imagine how life would survive there."

Even if Kepler could find an Earth-mass planet at Earth-like distances from its star, however, scientists couldn't declare victory a(euro)" at least not immediately. First, they would need to confirm the shape of the planet's orbit.

When it comes to orbits, shape matters, Fichser says. Earth's orbit is

nearly circular a(euro)" the slightly oval shape never leaves the habitable zone. But a highly elliptical orbit would place a planet within a star's habitable zone for only part of its year. The rapid freeze-thaw cycles wouldn't preclude life, but it might make it tough for life to gain a foothold.

Planets in a multiplanet system tend to assume increasingly circular orbits with time, Dr. Charbonneau adds. But if a sun-like star has a single planet, that allows for a range of eccentric orbits that might bring the planet into the habitable zone only briefly during its year.

Even then, Kepler and its ground-based counterparts can't detect other factors that could render seemingly habitable planets uninhabitable.

For instance, a magnetic field is a decided plus. Even if a planet has enough mass to retain an atmosphere, it could still lose its gassy envelope to collisions from cosmic rays unless it has a sufficient magnetic field, Charbonneau says.

The presence or absence of an appreciable magnetic field also signals the level of tectonic activity within a planet. Earth, with a highly radioactive iron core for heat, as well as a crust constantly being recycled, has a protective magnetic sheath. Mars, with little or no tectonic activity, does not.

That recycling serves as a planetary thermostat, partitioning the Earth's inventory of heat-trapping carbon dioxide between the atmosphere and the interior. Venus, with about the same total inventory, has no tectonics. Volcanoes over the eons have deposited the planet's CO₂ into the atmosphere, leading to a torrid, cloud-covered environment where surface temperatures can melt lead.

Tectonics, magnetic fields, and other traits are features Kepler's data, even backed by ground-based observations, can't characterize.

In the end, Charbonneau says, Kepler is not about finding other livable Earths, per se. Instead, it is conducting a cosmic nose-count of Earth-size planets in habitable zones in order to allow the team to confidently project the number of similar planets much closer to home.

Any such planets in the solar system's general neighborhood would fall within range of planned ground- and space-based telescopes capable of characterizing their atmospheres, establishing their masses, orbits, and densities to very high precision, and even image some of them.

Moreover, sun-like stars are only one set of potential homes for habitable

planets. Smaller, cooler red-dwarf stars, which are more numerous, also have grown in favor with planet-hunters.

Much of what scientists have figured out so far regarding the criteria for potential habitability has been based on a survey with a sample size of one: our own solar system.

"The field of exoplanets has been mostly a field of surprises rather than confirmations," Charbonneau says, referring to the range of planetary systems quite unlike our own or defying theoretical predictions.

"If we were not able to predict how planets form" in these other systems, he says, "we probably should be very careful" about using our own solar system as a model for what makes for a habitable planet.

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Record - 8

DIALOG(R)

HIGH RECOGNITION: AMERICAN PHYSICAL SOCIETY ELECTS THUMM, LAW AS FELLOWS FOR CONTRIBUTIONS TO PHYSICS,

US Federal News,
Tuesday, December 20, 2011

TEXT:

MANHATTAN, Kan., Dec.20 -- Kansas State University issued the following news release:

Two Kansas State University physicists known for their work in theoretical atomic and liquid surface physics have been named fellows of the American Physical Society.

The society's council elected Uwe Thumm and Bruce Law, both professors of physics, for fellow status, which recognizes outstanding contributions to physics. The honor is limited to no more than one-half of 1 percent of the society's membership. The American Physical Society represents 48,000 members, including physicists in academia, national laboratories and industry in the United States and throughout the world.

Eight faculty members from the department of physics currently hold fellow status. Fellow status is a key distinction for faculty to obtain as Kansas State University works toward becoming a top 50 public research university by 2025.

Thumm is being recognized for his work with relativistic calculations for electron-atom collision and the elucidation of interactions of multiply charged ions and photons with atoms, molecules, clusters, surfaces, thin films and carbon nanotubes. This work has been essential to the field. Thumm has collaborated with numerous researchers worldwide and holds several patents. He has published more than 80 original research articles in refereed journals and books, and more than 190 reports and abstracts.

Thumm's current research, conducted at Kansas State University's physics department and J.R. Macdonald Laboratory, models the interaction of very intense and ultrashort laser pulses with matter. These laser pulses allow physicists at a few leading laboratories to follow and control the motion of electrons in atoms, molecules and solids in time. The combination of such laser experiments and theoretical modeling of how laser light interacts with electrons and probes their motion is part of the new research branch called attosecond physics. The field derives its names from the time it typically takes an atomic electron to circle the atomic nucleus -- a few attoseconds, or a few billionths of one billionth of a second.

"Laser technology has been making extraordinary progress in the past decade. It enables us to make stroboscopic pictures of the redistribution of electrons in atoms and molecules," Thumm said. "Experimentals can observe how electrons move in real time; that is, on their natural time scale, tens of attoseconds, and theorists help in understanding these 'electronic movies' by providing computer models, based on quantum mechanical calculations. Attosecond physics promotes our understanding of the dynamics of the making and breaking of chemical bonds and is thus at the very basis of chemistry and, more broadly speaking, life in general."

Thumm joined K-State in 1992. He studied physics and mathematics at the universities of Freiburg and Heidelberg in Germany and in Paris, France. He earned the equivalent of a master of science degree and a doctorate from the University of Freiburg. He has spent sabbaticals at the University of Freiburg, the Max-Planck Institute for Nuclear Physics in Heidelberg and at the Harvard-Smithsonian Center for Astrophysics. Thumm has also organized physicist meetings held at Harvard and Kansas State University.

Law is being recognized for his work with liquid surfaces and the structural phase transitions that can occur on them. He began researching liquids and surfaces as a doctoral student in his native New Zealand. Law began examining a problem that was already regarded as solved related to mixing different liquids and the effect on the surface structure when he arrived at K-State in 1989. He focused on molecules and their adsorption at the liquid-air surface and how that influences the surface composition and their orientation.

"It's sort of what you might call an esoteric subject," Law said. "But

unless you understand liquids, you won't understand living things. You're 95 percent water. Liquids are a part of life."

Law discovered that the molecule with the lowest energy covers the surface. But when two molecules have similar energies they then compete for surface sites -- and the surface composition becomes a complex function of their energies. If the molecules' surface orientation is also included, then the situation rapidly becomes extremely complicated. Since the 1970s scientists worldwide had attempted to solve this liquid adsorption problem. Law's group only arrived at a definitive solution around 2000 after more than a decade of research. His selection as a fellow by the American Physical Society is in recognition for this body of research.

Solution of the molecule adsorption problem at liquid surfaces has assisted Law in his latest research on nanoparticles and how they organize on different surfaces. Gold nanoparticles have potential uses in killing cancer cells.

"This ability may well arise due to nanoparticle adsorption at the cell surface, but this is a speculation that needs to be tested," Law said. "If we can solve nanoparticle adsorption at liquid surfaces then we will understand mineral flotation, a multibillion dollar a year process used extensively in the mining industry. Mineral flotation is like magic, it works but no one knows why."

Air bubbles are bubbled through a finely crushed liquid slurry of rock particles. Mineral particles, such as copper, collect at the arising bubble surface and are concentrated in froth above this slurry, similar to beer froth, where they can be skimmed off for further processing. Thus, this process directly involves nanoparticle adsorption at liquid surfaces.

Law received his bachelor's and doctorate degree in physics from Victoria University in Wellington, New Zealand.

Amit Chakrabarti, professor and head of the department of physics, says being named a fellow of the American Physical Society is a big honor and reflects well on the department.

"You must be a top-level physicist to be honored as an APS fellow," he said. "Your work has to have a huge impact on the field. For our department to have eight fellows among current faculty is remarkable." For any query with respect to this article or any other content requirement, please contact Editor at htsyndication@hindustantimes.com
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Record - 9

DIALOG(R)

2 Earth-size planets spotted around distant star,

Ritter, Malcolm,

Honolulu Star-Advertiser (Honolulu, HI), pn/a,

Tuesday, December 20, 2011

TEXT:

Ads by Google Images & Photos Getty Images Carries Stock Footage, Music, & Stills. Find What You Need GettyImages.com Boeing Model Airplanes Unique Model Airplanes from The Boeing Company Store www.BoeingStore.com/Models Honolulu Resort Hotels Great Hotel Near Waikiki Beach. Book Your Hawaiian Vacation Today! www.HolidayInn.com

NEW YORK >> Scientists have found two Earth-sized planets orbiting a star outside the solar system, an encouraging sign for prospects of finding life elsewhere.

The discovery shows that such planets exist and that they can be detected by the Kepler spacecraft, said Francois Fressin of the Harvard-Smithsonian Center for Astrophysics in Cambridge, Mass. They're the smallest planets found so far that orbit a star resembling our sun.

Scientists are seeking Earth-sized planets as potential homes for extraterrestrial life, said Fressin, who reports the new findings in a paper published online today by the journal Nature. One planet's diameter is only 3 percent larger than Earth's, while the other's diameter is about nine-tenths that of Earth. They appear to be rocky, like our planet.

But they are too hot to contain life as we know it, with calculated temperatures of about 1,400 degrees and 800 degrees Fahrenheit, he said.

Any life found on another planet may not be intelligent; it could be bacteria or mold or some completely unknown form.

Since it was launched in 2009, NASA's planet-hunting Kepler telescope has found evidence of dozens of possible Earth-sized planets. But Fressin's report is the first to provide confirmation, said Alan Boss of the Carnegie Institution for Science in Washington. He's a member of the Kepler science team but not an author of the paper.

The researchers ruled out a possible alternative explanation for the signals that initially indicated the planets were orbiting the star Kepler-20. The star is 950 light-years from Earth in the direction of the

constellation Lyra.

The planets, called Kepler-20e and Kepler-20f, are part of a five-planet system around the star, and their location challenges current understanding of how planets form, scientists said. In our own solar system, the small rocky planets are closest to the sun, while gaseous giants are on the periphery. But the five-planet system has no such dividing line; big and small planets alternate as one moves away from the star.

That's "crazy," and unexplained by current understanding of how planets form around stars, said study co-author and Harvard scientist David Charbonneau.

Earlier this month, scientists said they'd found a planet around another distant star with a life-friendly surface temperature of about 72 degrees. But it was too big to suggest life on its surface. At 2.4 times the size of Earth, it could be more like the gas-and-liquid Neptune with only a rocky core and mostly ocean, scientists said.

Credit: Malcolm Ritter

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Record - 10

DIALOG(R)

NASA finds Earth-size planets outside of our universe,

Al Arabiya,

Thursday, December 22, 2011

TEXT:

NASA's Kepler mission has discovered the first Earth-size planets orbiting a sun-like star outside our solar system, a milestone in the search for planets like the earth, the space agency said on Tuesday.

The planets, called Kepler-20e and Kepler-20f, are the smallest planets outside the solar system confirmed around a star like the Sun, NASA said in a statement.

The planets are too close to their star to be in the so-called habitable zone where liquid water could exist on a planet's surface.

"This discovery demonstrates for the first time that Earth-size planets exist around other stars, and that we are able to detect them," Francois Fressin of the Harvard-Smithsonian Center for Astrophysics in Cambridge,

Massachusetts, said in the statement.

The new planets are thought to be rocky. Kepler-20e is slightly smaller than Venus, measuring 0.87 times the radius of Earth.

Kepler-20f is slightly larger than Earth, measuring 1.03 times its radius. Both planets are in a five-planet system called Kepler-20, about 1,000 light-years away in the constellation Lyra.

Kepler-20e orbits its parent star every 6.1 days and Kepler-20f every 19.6 days.

Kepler-20f, at 800 degrees Fahrenheit, is similar to an average day on the planet Mercury. The surface temperature of Kepler-20e, at more than 1,400 degrees Fahrenheit, would melt glass.

The Kepler space telescope detects planets and planet candidates by measuring dips in the brightness of more than 150,000 stars as planets cross in front their stars.

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Record - 11

DIALOG(R)

Two distant planets,

KIRO-7 MORNING NEWS 2011-12-21 06:24:30,

7 KIRO-WA

Wednesday, December 21, 2011

TEXT:

Seattle, WA

CBS

7 KIRO

KIRO-7 MORNING NEWS

2011-12-21

06:24:30

SCIENTISTS ARE CELEBRATING THE SUCCESSES OF THE KEPLER SPACECRAFT AFTER IT DISCOVERED TWO DISPLANT PLANETS ABOUT THE SIZE OF THE EARTH. THIS ILLUSTRATION FROM THE HARVARD SMITHSONIAN CENTER FOR ASTROPHYSIC SHOWS US HOW BIG THE PLANETS ARE COMPARED TO EARTH AND VENUS AND WHILE THE DISCOVERY IS EXCITING FOR SCIENTISTS, THEY SAY THE PLANETS COULDN'T SUPPORT INTELLIGENT LIFE BECAUSE SURFACE TEMPERATURES ARE JUST TOO HOT.

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Record - 12

DIALOG(R)

NASA discovers two Earth-sized planets,

Kuwait News Agency (KUNA),

Thursday, December 22, 2011

TEXT:

Scientists late Tuesday unveiled they have found two Earth-sized planets orbiting a star outside the solar system, an encouraging sign for prospects of finding life elsewhere.
 The discovery shows that such planets exist and that they can be detected by NASA's Kepler spacecraft, said Francois Fressin of the Harvard-Smithsonian Center for Astrophysics in Cambridge, Mass. They're the smallest planets found so far that orbit a star resembling our sun.
 Scientists are seeking Earth-sized planets as potential homes for extraterrestrial life, said Fressin, who reports the new findings in a paper published online Tuesday by the journal Nature.
 One planet's diameter is only 3 percent larger than Earth's, while the other's diameter is about nine-tenths that of Earth. They appear to be rocky, like our planet.
 But they are too hot to contain life as we know it, with calculated temperatures of about 1,400 degrees and 800 degrees Fahrenheit, he said.
 Any life found on another plant may not be intelligent; it could be bacteria or mold or some completely unknown form.
 Since it was launched in 2009, NASA's planet-hunting Kepler telescope has found evidence of dozens of possible Earth-sized planets.

But Fressin's report is the first to provide confirmation, said Alan Boss of the Carnegie Institution for Science in Washington. He's a member of the Kepler science team but not an author of the paper.
 The researchers ruled out a possible alternative explanation for the signals that initially indicated the planets were orbiting the star Kepler-20.

The star is 950 light-years from Earth in the direction of the constellation Lyra.
 The planets are called Kepler-20e and Kepler-20f. All KUNA right are reserved (c) 2011.

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Record - 13

DIALOG(R)

First Earth-size planets detected,

Anonymous; News services,

Journal - Gazette, p10A,

Wednesday, December 21, 2011

TEXT:

First Earth-size planets detected

In a milestone hailed by scientists as a key step toward finding another Earth-like world, astronomers Tuesday announced the discovery of two blazingly hot planets roughly the size of Earth some 950 light years distant.

The discovery "demonstrates for the first time that Earth-size planets exist around other stars, and that we can detect them," said Francois Fressin at the Harvard-Smithsonian Center for Astrophysics.

The planets orbit their sun so fast and so close, their surfaces sizzle like frying pans.

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Record - 14

DIALOG(R)

Pair of Earth sized planets found orbiting sun-like star,

Hindustan Times,

Wednesday, December 21, 2011

TEXT:

London, Dec.21 -- Scientists have for the first time discovered two Earth-sized planets outside the solar system, orbiting a distant star resembling our sun.

This discovery marks a milestone in the hunt for alien worlds, since it brings scientists one step closer to their ultimate goal of finding a twin Earth.

'The goal of Kepler is to find Earth-sized planets in the habitable zone. Proving the existence of Earth-sized exoplanets is a major step toward achieving that goal,' said Francois Fressin of the Harvard-Smithsonian Center for Astrophysics (CfA).

The two planets, dubbed Kepler-20e and 20f, are the smallest planets found to date. They have diameters of 6,900 miles and 8,200 miles - equivalent to 0.87 times Earth (slightly smaller than Venus) and 1.03 times Earth. These worlds are expected to have rocky compositions, so their masses should be less than 1.7 and 3 times Earth's.

Both worlds circle Kepler-20: a G-type star slightly cooler than the Sun and located 950 light-years from Earth. (It would take the space shuttle 36 million years to travel to Kepler-20.)

Kepler-20e orbits every 6.1 days at a distance of 4.7 million miles. Kepler-20f orbits every 19.6 days at a distance of 10.3 million miles. Due to their tight orbits, they are heated to temperatures of 1,400 degrees Fahrenheit and 800 degrees F.

In addition to the two Earth-sized worlds, the Kepler-20 system contains three larger planets. All five have orbits closer than Mercury in our solar system.

They also show an unexpected arrangement. In our solar system small, rocky worlds orbit close to the Sun and large, gas giant worlds orbit farther out. In contrast, the planets of Kepler-20 are organized in alternating size: big, little, big, little, big. 'We were surprised to find this system of flip-flopping planets,' said co-author David Charbonneau of the CfA. 'It's very different than our solar system.'

The three largest planets are designated Kepler-20b, 20c, and 20d. They have diameters of 15,000, 24,600, and 22,000 miles and orbit once every 3.7, 10.9, and 77.6 days, respectively. Kepler-20b has 8.7 times the mass of Earth; Kepler-20c has 16.1 times Earth's mass. Kepler-20d weighs less than 20 times Earth.

Fressin and Willie Torres of CfA used Blender, a custom software developed by them, to confirm the existence of Kepler-22b, a planet in the habitable zone of its star that was announced by NASA earlier this month. However, that world was much larger than Earth.

'These new planets are significantly smaller than any planet found up till now orbiting a Sun-like star,' added Fressin.

The study will be published in the journal Nature. Published by HT Syndication with permission from Asian News International. For any query with respect to this article or any other content requirement, please contact Editor at htsyndication@hindustantimes.com

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Record - 15

DIALOG(R)

Exoplanetes a la mesure de la Terre,

AFP,

Le Temps,

Thursday, December 22, 2011

TEXT:

Des astronomes ont annonce mardi la decouverte des deux plus petites exoplanetes jusque-la detectees: elles ont une taille similaire a celle de la Terre et tournent autour d'une etoile semblable au Soleil, selon une etude publiee en ligne par la revue Nature.

Le perfectionnement des methodes de detection a permis au satellite americain Kepler de reperer ces petites planetes extrasolaires en orbite autour d'une etoile baptisee Kepler-20.

Le diametre de l'une d'elles (Kepler-20f) depasse de tres peu (+3%) celui de la Terre. Quant a Kepler-20e, son rayon est un peu plus petit (-13%) que celui de notre planete, voire meme legerement inferieur a celui de Venus. Auparavant, l'exoplanete la moins grosse detectee etait environ 1,4 fois plus large que la Terre, relevent Francois Fressin (Centre d'astrophysique Harvard Smithsonian, Cambridge, Etats-Unis) et les autres signataires de l'etude.

Beaucoup plus proches de leur etoile que la Terre du Soleil, les deux nouvelles exoplanetes parcourent leur orbite en moins d'un mois (19,6 jours pour Kepler-20 f), voire moins d'une semaine (6,1 jours pour Kepler-20e).

Elles pourraient être rocheuses comme la Terre, selon les déductions des astronomes, mais les températures à leur surface sont trop élevées pour qu'elles puissent abriter la vie.

Le système de l'étoile Kepler-20, situé à un millier d'années-lumière (une année-lumière = 9460 milliards de km) compte trois autres planètes, d'une taille voisine de celle de Neptune, qui étaient déjà connues.

Depuis la découverte de la première exoplanète en 1995, plus de 700 planètes en orbite autour d'autres étoiles que le Soleil ont été détectées. La plupart sont des géantes gazeuses semblables à Jupiter.

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Record - 16

DIALOG(R)

Scientists seek life on Earth-sized planets,

THE ASSOCIATED PRESS,

Charleston Daily Mail (WV), pP3A,

Wednesday, December 21, 2011

TEXT:

NEW YORK - Scientists have found two Earth-sized planets orbiting a star outside the solar system, an encouraging sign for prospects of finding life elsewhere.

The discovery shows that such planets exist and that they can be detected by the Kepler spacecraft, said Francois Fressin of the Harvard-Smithsonian Center for Astrophysics in Cambridge, Mass. They're the smallest planets found so far that orbit a star resembling our sun.

Scientists are seeking Earth-sized planets as potential homes for extraterrestrial life, said Fressin, who reports the new findings in a paper published online Tuesday by the journal Nature. One planet's diameter is only 3 percent larger than Earth's, while the other's diameter is about nine-tenths that of Earth. They appear to be rocky, like our planet.

But they are too hot to contain life as we know it, with calculated temperatures of about 1,400 degrees and 800 degrees Fahrenheit, he said.

Any life found on another planet may not be intelligent; it could be bacteria or mold or some completely unknown form.

Since it was launched in 2009, NASA's planet-hunting Kepler telescope has found evidence of dozens of possible Earth-sized planets. But Fressin's report is the first to provide confirmation, said Alan Boss of the Carnegie Institution for Science in Washington. He's a member of the Kepler science team but not an author of the paper.

The researchers ruled out a possible alternative explanation for the signals that initially indicated the planets were orbiting the star Kepler-20. The star is 950 light-years from Earth in the direction of the constellation Lyra.

The planets, called Kepler-20e and Kepler-20f, are part of a five-planet system around the star, and their location challenges current understanding of how planets form, scientists said. In our own solar system, the small rocky planets are closest to the sun, while gaseous giants are on the periphery. But the five-planet system has no such dividing line; big and small planets alternate as one moves away from the star.

That's "crazy," and unexplained by current understanding of how planets form around stars, said study co-author and Harvard scientist David Charbonneau.

Earlier this month, scientists said they'd found a planet around another distant star with a life-friendly surface temperature of about 72 degrees. But it was too big to suggest life on its surface. At 2.4 times the size of Earth, it could be more like the gas-and-liquid Neptune with only a rocky core and mostly ocean, scientists said.

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Record - 17

DIALOG(R)

Two Earth-size planets spotted around distant star,
Statesman (Calcutta, India),
Wednesday, December 21, 2011

TEXT:

Associated Press NEW YORK, 21 DEC: Scientists have found two Earth- sized planets orbiting a star outside the solar system, an encouraging sign for prospects of finding life elsewhere. The discovery shows that such planets exist and that they can be detected by the Kepler spacecraft, said Mr Francois Fressin of the Harvard-Smithsonian Center for Astrophysics in

Cambridge, Massachusetts. They're the smallest planets found so far that orbit a star resembling our sun. Scientists are seeking Earth-sized planets as potential homes for extraterrestrial life, said Fressin, who reports the new findings in a paper published online yesterday by the journal Nature. One planet's diameter is only 3 per cent larger than Earth's, while the other's diameter is about nine-tenths that of Earth. They appear to be rocky, like our planet. But they are too hot to contain life as we know it, with calculated temperatures of about 760 Celsius and 425 Celsius, he said. Any life found on another planet may not be intelligent; it could be bacteria or mold or some completely unknown form. Since it was launched in 2009, Nasa's planet-hunting Kepler telescope has found evidence of dozens of possible Earth-sized planets. But Mr Fressin's report is the first to provide confirmation, said Mr Alan Boss of the Carnegie Institution for Science in Washington. He's a member of the Kepler science team but not an author of the paper. The researchers ruled out a possible alternative explanation for the signals that initially indicated the planets were orbiting the star Kepler-20. The star is 950 light-years from Earth in the direction of the constellation Lyra. The planets, called Kepler-20e and Kepler-20f, are part of a five-planet system around the star, and their location challenges current understanding of how planets form, scientists said. In our own solar system, the small rocky planets are closest to the sun, while gaseous giants are on the periphery. But the five-planet system has no such dividing line; big and small planets alternate as one moves away from the star. That's crazy, and unexplained by current understanding of how planets form around stars, said study co-author and Harvard scientist Mr David Charbonneau. Earlier this month, scientists said they'd found a planet around another distant star with a life-friendly surface temperature of about 72 degrees Fahrenheit (22 Celsius). But it was too big to suggest life on its surface. At 2.4 times the size of Earth, it could be more like the gas-and-liquid Neptune with only a rocky core and mostly ocean, scientists said.

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Record - 18

DIALOG(R)

Astronomers find 2 Earth-size planets,

Times, The (Trenton, NJ), Trenton Full Run ed, pA04,
Wednesday, December 21, 2011

TEXT:

By Dennis Overbye

&source;New York Times

In what amounts to a kind of holiday gift to the cosmos, astronomers from NASA's Kepler spacecraft announced yesterday that they had discovered a pair of planets the size of Earth orbiting a distant star. The new planets, one about as big as Earth and the other slightly smaller than Venus, are the smallest planets yet found beyond the solar system.

Astronomers said the discovery showed that Kepler could indeed find planets as small as our own and was an encouraging sign that planet hunters would someday succeed in the goal of finding Earth-like abodes in the heavens. Since the first Jupiter-size exoplanets, as they are known, were discovered nearly 15 years ago, astronomers have been chipping away at the sky, finding smaller and smaller planets.

"We are finally there," said David Charbonneau, an astronomer at the Harvard-Smithsonian Center for Astrophysics, who was a member of the team that made the observations, led by colleague Francois Fressin.

The team reported its results in an online news conference yesterday and in a paper being published in the journal Nature.

"This demonstrates for the first time that Earth-size planets exist around other stars and that we can detect them," Fressin said.

The announcement doubled the number of known Earth-size planets in the galaxy to four from two -- Earth and Venus. The next major goal in the planetary hunt, astronomers say, is to find an Earth-size planet in the so-called Goldilocks zone of a star, where conditions are temperate for water and thus life.

The two new planets, Kepler 20e and Kepler 20f, are far outside the Goldilocks zone -- so close to the star, termed Kepler 20, that one of them is roasting at up to 1,400 degrees Fahrenheit "" and thus unlivable. Although the milestone of an Earth-size planet had long been anticipated, astronomers on and off the Kepler team were jubilant. Geoffrey Marcy of the University of California, Berkeley, another Kepler team member, called the new result "a watershed moment in human history."

Debra Fischer, a planet hunter from Yale, who was not part of the team, said, "This technological feat is incredibly important because it means that the detection of Earth-size planets at larger distances is technically possible."

Kepler 20e, the closer and hotter planet, is also the smaller -- about 6,900 miles across, slightly smaller than Venus -- and it resides about 5

million miles from its star. The more distant planet, Kepler 20f, also broiling at around 800 degrees, is 10 million miles out from its star.

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Record - 19

DIALOG(R)

KEPLER SPACECRAFT DISCOVERS TWO EARTH-SIZE PLANETS SMALLEST FOUND BEYOND SOLAR SYSTEM,

Dennis Overbye, The New York Times,
Pittsburgh Post-Gazette (PA), SOONER ed, pA-3,
Wednesday, December 21, 2011

TEXT:

In what amounts to a kind of holiday gift to the cosmos, astronomers from NASA's Kepler spacecraft announced Tuesday that they had discovered a pair of planets the size of Earth orbiting a distant star. The new planets, one about as big as Earth and the other slightly smaller than Venus, are the smallest planets yet found beyond the solar system.

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"This demonstrates for the first time that Earth-size planets exist around other stars, and that we can detect them," Mr. Fressin said.

The team reported its results in an online news conference Tuesday and in a paper being published in the journal Nature. The announcement doubled the number of known Earth-size planets in the galaxy, to four from two -- Earth and Venus.

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Kepler 20e, the closer and hotter planet, is also the smaller -- about 6,900 miles across, or slightly smaller than Venus -- and it resides about 5 million miles from its star. The more distant planet, Kepler 20f, also broiling at around 800 degrees, is 10 million miles out from its star. It is 8,200 miles in diameter, about the size of Earth. The two planets are presumed to be rocky orbs that formed in the outskirts of their planetary system and then migrated inward.

Their star, which is slightly smaller and cooler than the sun, is about 950 light years away from us. Kepler had previously found three larger Neptune-like planets around it, so the new observations bring the total to five, so far. All the planets are well inside where Mercury would be in our own solar system, presenting a bounteous system of unlivable planets.

"This is Venus and Earth in a five-planet system," Ms. Fischer said in an email. "There's no place like home, and the Kepler data are starting to uncover some mighty familiar architectures."

Kepler detects planets by watching for blinks when they move in front of their stars. Since it was launched in 2009, it has found 2,326 potential planets -- 207 that would be Earth-size, if confirmed as the two reported Tuesday have been. Confirmation of a planet, however, requires additional observations, usually of its star's wobbles as it gets tugged by the planet going around.

The gravitational pull of planets as small as the Earth on their parent star is too small to measure with the current spectrographs. And so the astronomers resorted to a statistical method called Blender, developed by Mr. Fressin and Guillermo Torres of the Harvard-Smithsonian Center, in which millions of computer simulations of background stars try to mimic the

Kepler signal.

They concluded that Kepler 20e was 3,400 times more likely to be a planet than background noise, while the odds in favor Kepler 20f being real were 1,370 to 1. Confirmed (or validated, as the Kepler team likes to say), they join the other planets already known to orbit the star.

In a surprise for astronomers who thought they knew how planetary systems form, the orbits of the new planets are sandwiched between the orbits of the older, bigger, gassier ones -- a configuration that does not occur in our own solar system.

In an email, Mr. Charbonneau noted: "In the solar system, rocky worlds and gas giants don't mingle. But in the Kepler 20 system, they apparently do."

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Record - 20

DIALOG(R)

NASA finds first two Earth-size planets,

Lisa M. Krieger lkrieger@mercurynews.com,

Contra Costa Times (Walnut Creek,CA),

Tuesday, December 20, 2011

TEXT:

NASA's Kepler mission has found the first Earth-size planets orbiting a sunlike star outside our solar system. But they're too hot to support liquid water -- or life.

This latest discovery marks a milestone that takes scientists one step closer to finding a planet like our own.

Two weeks ago, Kepler found a planet that was the perfect temperature. But this planet, Kepler-22b, is too big to have a rocky surface.

The new discoveries, Kepler-20e and Kepler-20f, are the right size. But they're close to their star, making them fiery hot worlds.

So now the hunt is on to find a "Goldilocks" planet with the best of both worlds: a hospitable place.

"In the cosmic game of hide and seek, finding planets with just the right size and just the right temperature seems only a matter of time," said Natalie Batalha, a contributing author to the new research who oversees the

Kepler's scientific investigations at NASA's Ames Research Center in Mountain View's Moffett Field.

"We are on the edge of our seats knowing that Kepler's most anticipated discoveries are still to come," said Batalha, also a professor of astronomy and physics at San Jose State.

The \$600 million Kepler space telescope detects planets and planet candidates by measuring dips in brightness -- a blink, essentially -- when a planet crosses in front of a star. Additional evidence, such as a gravitational wobble, is required to confirm that the orb is a real planet.

Mountain View scientists manage Kepler's ground system development and mission operations. They're responsible for the software pipeline that analyzes the data -- identifying the best planet candidates to forward to the Kepler team.

The first planet, a Jupiter-size giant, was found about 15 years ago. Kepler's tally of confirmed planets is now 33. Another 2,326 are possible planets -- of which 1,000 have been found just since February.

Tuesday's news, published in the journal *Nature* and announced by teleconference, shows that the telescope is getting better at finding small Earth-size places.

The new planets reside within a curious five-planet solar system. It's unlike our solar system, where small, rocky worlds circle close to the sun, and large, gaseous worlds are farther away.

Instead, the planets that circle star Kepler-20 are organized in alternating sizes: large, small, large, small and large.

"The architecture of that solar system is crazy," said David Charbonneau, of Harvard University. "In our solar system, the two different kinds of planets don't mingle. This is the first time we've seen anything like this."

And they're very far away -- 950 light years distant. If traveling the speed of the space shuttle, it would take millions of years to get there.

Kepler-20e and 20f are rocky places, made of silica and iron -- Earthlike, but without an atmosphere.

But the surface temperature of Kepler-20e, which orbits its sun every six days, is more than 1,400 degrees Fahrenheit -- hot enough to melt glass. Kepler-20f orbits every 19.6 days and is 800 degrees -- as hot as Mercury.

Researchers can't rule out the possibility that the planets had liquid water after their creation, when they might have been farther from the sun. Perhaps there was a window of time -- several billion years long -- when they were habitable.

Now, researchers will just keep looking.

"This is the first time that we've crossed the Earth-size threshold," said Francois Fressin, an astronomer at the Harvard-Smithsonian Center for Astrophysics, who led the discovery team.

"It demonstrates for the first time that Earth-size planets exist and that we can detect them.

Contact Lisa M. Krieger at 408-920-5565.

News from outer space

To learn more about the search for habitable planets, go to www.kepler.nasa.gov.
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Record - 21

DIALOG(R)

Earth's 'twin' is discovered,
Daily Mail (UK), 01 ed,
Wednesday, December 21, 2011

TEXT:

A ROCKY planet virtually identical in size to the Earth has been discovered orbiting a distant Sun-like star.

It is the first time such an Earth 'twin' in another solar system has been detected. Although the planet, Kepler-20f, could have a water-vapour atmosphere, its surface is believed to be too hot for life. A second planet in the same system, Kepler-20e, is slightly smaller than Earth and even hotter. Both closely circle a parent star, which is 945 light years away.

Kepler-20f has a radius just 1.03 times larger than Earth's, while Kepler-20e is 0.87 the size of the Earth.

Dr Francois Fressin, of the Harvard-Smithsonian Centre for Astrophysics in Cambridge, U.S., said: 'This could be an important milestone.'

Earlier this month the reported discovery of Kepler-22b, a planet 2.4 times the size of Earth, led to speculation about oceans and living creatures.

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Record - 22

DIALOG(R)

Deux " Terre " decouvertes a 1 000 annees-lumiere de notre systeme solaire,

Le Monde, p7,

Thursday, December 22, 2011

TEXT:

On cherchait une autre Terre. Ils en ont trouve deux. Dans un article publie, mardi 20 decembre, par la revue Nature, une equipe internationale de chercheurs exploitant les donnees de l'observatoire spatial Kepler de la NASA a annonce la decouverte de deux planetes extrasolaires d'une taille comparable a celle de la Terre.

" Pour la premiere fois de l'histoire de l'humanite, on peut se dire : "ca y est, on est capable de detecter une terre autour d'une autre etoile". C'est meme la premiere fois que l'on passe la barriere du plus petit que la Terre ", resume Francois Fressin. Ce jeune astronome francais de 33 ans, expatrie aux Etats-Unis au Harvard-Smithsonian Center for Astrophysics de Cambridge (Massachusetts), est le premier auteur de l'etude publiee dans Nature.

Depuis la decouverte en 1995 par une equipe suisse de 51 Pegasi b, la premiere planete tournant autour d'une autre etoile que notre Soleil, plus de 700 de ces astres fascinants ont ete detectes. Mais il manquait encore dans ce tableau de chasse des corps semblables a la Terre. C'est desormais du passe, pour les dimensions, sinon par leur habitabilite : tres chauds - plusieurs centaines de degres -, les deux objets n'ont aucune chance d'abriter la vie.

Ils font partie d'un systeme a cinq planetes tournant autour de Kepler-20, une etoile situee a un peu moins de 1 000 annees-lumiere et tres semblable a notre Soleil, quoique legerement moins massive, moins chaude et moins lumineuse que lui. Baptises Kepler-20e et Kepler-20f, ils ont des rayons respectifs de 87 % et 103 % de celui de la Terre.

Didier Queloz (Observatoire de Geneve), codecouvreur avec Michel Mayor de 51 Pegasi b, salue un " joli travail ". Mais il estime que la premiere planete decouverte ayant des proportions comparables a celles de la Terre (1,7 fois son diametre, 5 fois sa masse) est CoRot-7b, decouverte en 2009

par le satellite franco-europeen Corot.

La competition est rude, chez les chasseurs de planete. L'observatoire Kepler, en orbite autour du Soleil depuis 2009, a relance la course. Il observe un catalogue d'etoiles situees dans la constellation du Cygne et alentour. Son photometre mesure les infimes variations de leur lumiere. Son objectif principal consiste a detecter la tres faible baisse variation de luminosite due au passage - au transit disent les astronomes - d'une planete devant son etoile.

Comment s'assurer que ces fluctuations lumineuses ne sont pas dues aux mouvements d'etoiles plus eloignees ? " Tous les projets de recherche d'exoplanetes utilisant la methode du transit ont ce probleme, indique Francois Fressin. Pour certains, le ratio s'eleve a une planete pour huit faux signaux qui sont dus soit au fait que l'on est a la limite de la detection, soit a d'autres sources astrophysiques. "

Pour traiter les donnees de Kepler, il a donc fallu developper Blender, un simulateur testant tous les scenarios possibles. Ce programme tourne sur Pleiades, le plus gros ordinateur de la NASA et le septieme dans le monde par la puissance de calcul. " Tester un scenario requiert un million de calculs, decrit le chercheur francais. Et nous testons plus de 10 milliards de scenarios... "

Pour baptiser une exoplanete, il faut que son signal soit mille fois plus probable que n'importe quelle autre configuration. Cela a ete le cas avec Kepler-20e et Kepler -20f... mais pas du premier coup. En 2010, avec la premiere annee de donnees de Kepler, les signaux etaient deja la mais, explique Francois Fressin, " la premiere etude avec Blender n'a pas permis de tirer une conclusion ".

Tandis que Kepler moissonnait la lumiere du ciel pendant une annee supplementaire, les chercheurs ont raffine leurs methodes et techniques d'analyse. Avec un total de 670 jours de mesures, tout le systeme solaire de Kepler-20 s'est revele, et notamment ses deux petites planetes.

Elles ont donc la bonne taille pour etre qualifiees de soeurs de la Terre. Mais on ne parlera pas de jumelles. En effet, elles sont beaucoup trop proches de leur etoile pour qu'on puisse les comparer au havre de douceur et de vie qu'est notre globe. La premiere fait le tour de Kepler-20 en seulement 6,1 de nos jours et la seconde accomplit sa revolution en 19,6 jours. Autant dire qu'une temperature infernale regne a leur surface. Aucune des cinq planetes n'est d'ailleurs situee dans la zone habitable, celle ou les temperatures sont suffisamment clementes pour que l'eau, si elle existe, se trouve sous forme liquide.

Pour le moment, le Saint-Graal des chasseurs de planetes extrasolaires, une

planete de la taille de la Terre situee dans cette precieuse zone, reste invisible. " Etre dans la zone habitable ne dit rien sur la question de l'habitabilite ", previent Didier Queloz : une foule d'autres facteurs sont necessaires pour qu'une planete soit propice a la vie. Trouver une planete " habitable " n'est-il desormais qu'une question de chance, plus que de technique ? " Aujourd'hui, c'est surtout une question de moyen et de priorite ", pense M. Queloz.

Les astronomes esperent beaucoup de la prochaine generation des telescopes geants. Comme l'European Extremely Large Telescope, un " monstre " dote d'un miroir de pres de 40 metres de diametre que l'Observatoire europeen austral (ESO) compte mettre en service au debut de la prochaine decennie au Chili.

Il y a dix ans, l'Americain Geoffrey Marcy, un des plus prolifiques decouvreurs d'exoplanetes (cosignataire de l'etude de Nature), se voyait, lui et ses collegues et concurrents, comme des navigateurs approchant de la terre ferme : " C'est comme si nous etions sur un bateau, loin de la plage, ou l'on ne distingue que les gros rochers. (...) Un jour, avec une autre technologie, nous verrons les galets et les grains de sable. " La prophetie s'est accomplie, les grains de sable sont en vue.

Pierre Barthelemy et Herve Morin

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Record - 23

DIALOG(R)

Decouverte de deux planetes de la taille de la Terre pres d'une etoile,
MALCOLM RITTER,
La Presse Canadienne,
Tuesday, December 20, 2011

TEXT:

NEW YORK _ Des scientifiques ont decouvert deux planetes d'une taille semblable a celle de la Terre qui orbitent autour d'une etoile situee a l'exterieur du systeme solaire, signe qu'il y a peut-etre de la vie ailleurs dans l'univers.

Selon Francois Fressin du Centre d'astrophysique Harvard-Smithsonian, cette decouverte prouve que de telles planetes existent et qu'elle peuvent etre detectees. Celles-ci sont les plus petites planetes tournant autour d'une etoile a avoir ete trouvees jusqu'a present.

M. Fressin, qui a rapporte la nouvelle dans un article publie mardi sur le site du journal Nature, a explique que les scientifiques cherchaient des planetes de la grosseur de la Terre en esperant qu'elles abritent une forme de vie extraterrestre.

Les deux planetes sont sensiblement de la meme taille que la Terre et leur surface semble aussi rocheuse que la sienne.

La temperature qui y regne est toutefois trop elevee pour accueillir une forme de vie telle que nous la connaissons puisqu'elle est de 426 degres Celsius sur l'une et de 815 degres Celsius sur l'autre.

La vie qui pourrait etre trouvee sur une autre planete ne serait pas necessaire intelligente. Il pourrait s'agir de bacteries ou d'une forme de vie completement inconnue.

Depuis son lancement par la NASA en 2009, le telescope Kepler a permis de recoller des preuves de l'existence d'une dizaine de planetes de la grosseur de la Terre.

Le rapport de Francois Fressin est toutefois le premier a confirmer ces resultats, a indique Alain Boss de l'Institut pour la science Carnegie a Washington.

Les chercheurs ont ecarte toutes les autres hypotheses possible pour expliquer les signaux detectes anterieurement au sujet des planetes orbitant autour de l'etoile Kepler-20, situee a 950 annees-lumiere de la Terre en direction de la constellation de la Lyre.

Les planetes ont ete baptisees Kepler-20e et Kepler-20f.

Plus tot en decembre, des scientifiques avaient annonce la decouverte d'une planete tournant autour d'une autre etoile eloignee avec une temperature de 22 degres Celsius, mais trop grosse pour que la vie se soit developpee a sa surface.

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Record - 24

DIALOG(R)

DECOUVERTE-PLANETES,

Voici le bulletin de 5 heures

La Presse Canadienne - Le fil radio

Wednesday, December 21, 2011

TEXT:

MONTREAL _ -

COLLISION-MORTS

Trois personnes ont perdu la vie et deux autres ont été gravement blessées dans une collision frontale à haute vitesse survenue sur la route 148 dans la municipalité de Pontiac, à l'ouest de Gatineau, peu après 18 h hier.

Selon le sergent Dominic Gallant, de la Sécurité publique de la MRC des Collines, c'est une manœuvre de dépassement, d'un conducteur de 51 ans de Pontiac, qui est à l'origine de l'impact qui l'a tué.

Quatre membres d'une famille reconstituée prenaient place à bord du véhicule qui a été frappé. La mort du conducteur de 51 ans de Shawville et celle de son fils de quatre ans ont été constatées sur les lieux. Les deux autres enfants, âgés de 12 et 14 ans, reposent dans un état stable à l'hôpital après avoir lutté pour leur vie.

RECHERCHES-SUSPENDUES

Les recherches reprendront ce matin afin de tenter de retrouver un petit garçon de six ans qui aurait disparu, lundi, dans les eaux de la rivière Noire, à Upton, en Montérégie.

Hier, deux bottes ont été retrouvées par les plongeurs de la Sécurité du Québec. La première appartient au grand frère et la seconde au petit garçon de six ans qui est disparu. Les bottes ont été retrouvées à environ 150 et 200 mètres du point de chute.

Le garçonnet serait disparu alors qu'il marchait sur la glace. Il aurait glissé à l'eau après avoir perdu pied. Son frère plus âgé a tenté de le secourir et un chien a sauté à l'eau, mais il est disparu avec le jeune garçon.

TRABELSI-PERQUISITION

Une perquisition a récemment eu lieu au bureau de l'avocat de Belhassen Trabelsi, un ancien "parrain" du clan mafieux qui a dirigé la Tunisie jusqu'à la récente révolution, rapporte La Presse.

Le 6 décembre, des enquêteurs de la GRC sont débarqués à Westmount dans les bureaux de l'avocat Donald Kattan, soupçonné de gérer les affaires de M. Trabelsi depuis son arrivée au Canada, le 20 janvier.

En vertu de la nouvelle Loi sur le blocage des biens de dirigeants étrangers corrompus, Me Kattan risque jusqu'à cinq ans de pénitencier s'il s'avère qu'il a administré les avoirs de M. Trabelsi, beau-frère de l'ancien président Ben Ali.

La fortune du clan a été évaluée de 7 à 10 milliards \$.

LEGAULT-ECONOMIE

Un gouvernement dirigé par François Legault reverrait l'ensemble de l'intervention de l'État dans l'économie.

En entrevue à La Presse Canadienne, le chef de la Coalition avenir Québec a parlé longuement de sa volonté de centraliser tous les pouvoirs à Investissement Québec, en matière de développement économique, s'il devient premier ministre.

La société, dont le mandat serait complètement revu, deviendrait alors le pivot gouvernemental, un guichet unique chargé de soutenir le démarrage d'entreprises et aussi d'attirer des entreprises étrangères.

BAIRD-POLITIQUE-ETRANGERE

La Presse Canadienne a appris que les nouvelles lignes directrices d'Ottawa en matière d'Affaires étrangères ciblent une dizaine de pays, dont la Chine, qui feront l'objet d'une attention particulière de la part du gouvernement.

Les fonctionnaires du ministère des Affaires étrangères ont complété une ébauche du plan, et selon certaines sources, celui-ci pourrait être présenté au conseil des ministres de cette semaine.

Le document serait assez peu volumineux et il mettrait de l'avant quatre priorités: la prospérité économique, l'importance de la démocratie ainsi que la défense des droits humains et de la liberté religieuse.

SOMMET-FRANCOPHONE*

Le gouvernement Harper est toujours en faveur de la tenue du prochain sommet de la Francophonie en République démocratique du Congo, en dépit de la fraude qui a marqué la récente élection présidentielle dans ce pays et de la répression dont font l'objet les dissidents politiques.

Plus tôt cet automne, M. Harper a prévenu qu'il boycottera une rencontre du Commonwealth au Sri Lanka en 2013 si le gouvernement de ce pays n'enquête pas sur les violations des droits de la personne dont auraient été victimes

des citoyens a la fin de la guerre civile.

Le gouvernement conservateur estime que le sommet d'octobre 2012 sera une excellente occasion de dialoguer avec ce pays. Le Parti liberal croit lui aussi qu'il serait premature de s'en retirer maintenant.

USA-REJET

La Chambre des representants des Etats-Unis a rejete un plan soutenu par Barack Obama qui aurait prolonge de deux mois la reduction des cotisations sociales pour des millions d'Americains, et qui aurait permis de poursuivre les negociations pour renouveler le plan une annee entiere.

Les republicains, majoritaires a la Chambre des representants, demandent plutot des negociations immediates avec le Senat a majorite democrate pour adopter un plan sur un an.

Si le Congres n'adopte pas le projet de loi d'ici la fin de l'annee, quelque 160 millions d'Americains verront leur cotisation sociale augmenter a partir du 1er janvier. Quelque deux millions de personnes pourraient aussi perdre leurs prestations de chomage a partir du mois de janvier.

PHILIPPINES-TEMPTE-BILAN

Les violentes tempetes qui ont frappe deux villes du sud des Philippines la semaine derniere ont fait plus de 1000 morts, un nombre qui pourrait continuer d'augmenter, selon les autorites.

Le chef du Bureau de la Defense civile a devoile le plus recent bilan de la catastrophe, qui se chiffre maintenant a 1002 victimes. Du nombre, 650 personnes ont succombe a Cagayan de Oro et 283 autres dans la ville d'Iligan, situee non loin. Les autres victimes residaient dans plusieurs autres provinces du sud et du centre du pays.

MERCOSUR-PALESTINE-LIBRE-ECHANGE

Le Mercosur, un marche commun qui lie quatre pays d'Amerique du Sud, a annonce la signature d'un accord de libre-echange avec l'Autorite palestinienne.

Il s'agit du premier accord de libre-echange conclu entre les Territoires palestiniens et un groupe de pays non arabes.

Mais l'accord reste symbolique parce qu'Israel controle etroitement les importations et les exportations en Cisjordanie et dans la bande de Gaza.

DECOUVERTE-PLANETES

Des scientifiques ont decouvert deux planetes d'une taille semblable a celle de la Terre qui orbitent autour d'une etoile situee a l'exterieur du systeme solaire, signe qu'il y a peut-etre de la vie ailleurs dans l'univers.

Selon Francois Fressin du Centre d'astrophysique Harvard-Smithsonian, cette decouverte prouve que de telles planetes existent et qu'elle peuvent etre detectees. Celles-ci sont les plus petites planetes tournant autour d'une etoile a avoir ete trouvees jusqu'a present.

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N B 5

(La Presse Canadienne)

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Record - 25

DIALOG(R)

Decouverte de deux planetes de la taille de la Terre pres d'une,

La Presse Canadienne - Le fil radio,

Tuesday, December 20, 2011

TEXT:

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Les planetes ont ete baptisees Kepler-20e et Kepler-20f.

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(The Associated Press)

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DIALOG(R)

US-SCI-Alien-Planets,

Top News Advisory as of 6 p.m. Tuesday, Dec. 20, 2011,

Canadian Press,

Tuesday, December 20, 2011

TEXT:

Tuesday, Dec. 20, 2011

6 p.m.

TOP NEWS ADVISORY

Here are the latest Top News stories from The Canadian Press. All times are Eastern unless otherwise stated. Coverage plans are included when available. Entries are subject to change as news develops. This advisory replaces The Canadian Press News Budget. Contact the National Desk at 416-507-2150.

TOP NEWS AT THIS HOUR

US-SCI-Alien-Planets

NEW YORK _ Scientists have found two Earth-sized planets orbiting a star outside the solar system, an encouraging sign for prospects of finding life elsewhere. The discovery shows that such planets exist and that they can be detected by the Kepler spacecraft, said Francois Fressin of the Harvard-Smithsonian Center for Astrophysics in Cambridge, Mass. They're the smallest planets found so far that orbit a star resembling our sun. PHOTO.
Big horned sheep gunned down in 'thrill kill'

Record - 27

DIALOG(R)

2 Earth-size planets spotted around distant star,
International News Advisory as of 3 p.m. Tuesday, Dec. 20, 2011,
2 Earth-size planets spotted around distant star,
Canadian Press
Tuesday, December 20, 2011

TEXT:

Tuesday, Dec. 20, 2011

3 p.m.

INTERNATIONAL NEWS ADVISORY

Here are the top International News stories. All times are Eastern unless otherwise stated. Coverage plans are included when available. Entries are subject to change as news develops. This advisory replaces The Canadian Press News Budget. Contact the National Desk at 416-507-2150.

TOP NEWS AT THIS HOUR

2 Earth-size planets spotted around distant star

US-SCI-Alien-Planets

NEW YORK _ Scientists have found two Earth-sized planets orbiting a star outside the solar system, an encouraging sign for prospects of finding life elsewhere. The discovery shows that such planets exist and that they can be detected by the Kepler spacecraft, said Francois Fressin of the Harvard-Smithsonian Center for Astrophysics in Cambridge, Mass. They're the smallest planets found so far that orbit a star resembling our sun. PHOTO.

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DIALOG(R)

2 Earth-size planets spotted around distant star, a boost for prospects of finding alien life,

MALCOLM RITTER,

Canadian Press,

Tuesday, December 20, 2011

TEXT:

NEW YORK _ Scientists have found two Earth-sized planets orbiting a star outside the solar system, an encouraging sign for prospects of finding life elsewhere.

The discovery shows that such planets exist and that they can be detected by the Kepler spacecraft, said Francois Fressin of the Harvard-Smithsonian Center for Astrophysics in Cambridge, Massachusetts. They're the smallest planets found so far that orbit a star resembling our sun.

Scientists are seeking Earth-sized planets as potential homes for extraterrestrial life, said Fressin, who reports the new findings in a paper published online Tuesday by the journal Nature. One planet's diameter is only 3 per cent larger than Earth's, while the other's diameter is about nine-tenths that of Earth. They appear to be rocky, like our planet.

But they are too hot to contain life as we know it, with calculated temperatures of about 1,400 degrees and 800 degrees Fahrenheit (760 Celsius and 425 Celsius), he said.

Any life found on another planet may not be intelligent; it could be bacteria or mould or some completely unknown form.

Since it was launched in 2009, NASA's planet-hunting Kepler telescope has

found evidence of dozens of possible Earth-sized planets. But Fressin's report is the first to provide confirmation, said Alan Boss of the Carnegie Institution for Science in Washington. He's a member of the Kepler science team but not an author of the paper.

The researchers ruled out a possible alternative explanation for the signals that initially indicated the planets were orbiting the star Kepler-20. The star is 950 light-years from Earth in the direction of the constellation Lyra.

The planets, called Kepler-20e and Kepler-20f, are part of a five-planet system around the star, and their location challenges current understanding of how planets form, scientists said. In our own solar system, the small rocky planets are closest to the sun, while gaseous giants are on the periphery. But the five-planet system has no such dividing line; big and small planets alternate as one moves away from the star.

That's "crazy," and unexplained by current understanding of how planets form around stars, said study co-author and Harvard scientist David Charbonneau.

Earlier this month, scientists said they'd found a planet around another distant star with a life-friendly surface temperature of about 72 degrees Fahrenheit (22 Celsius). But it was too big to suggest life on its surface. At 2.4 times the size of Earth, it could be more like the gas-and-liquid Neptune with only a rocky core and mostly ocean, scientists said.

Online:

Nature: <http://www.nature.com/nature>

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Record - 29

DIALOG(R)

Astronomers discover the first 'Earth twin',

Daily Telegraph (UK), 01 ed,

Wednesday, December 21, 2011

TEXT:

Astronomers have detected the first ever "Earth twin", a planet called Kepler-20f, 945 light years away which is the same size as Earth and is orbiting a Sun-like star.

It is the first time such a similar planet has been detected in another solar system. Kepler-20f could have a thick water-vapour atmosphere, but its surface is believed to be too hot to allow water, a key condition for the development of life.

Dr Francois Fressin, from the Harvard-Smithsonian Centre for Astrophysics, said: "It is the first time humanity has been able to discover an object similar to the Earth around a star."

Earlier this month the discovery of Kepler-22b, a planet twice the size of Earth but with the potential for surface water, led to speculation about oceans, continents and living creatures.

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Record - 30

DIALOG(R)

Scientists discover planet the same size as Earth,

Herald (Glasgow, Scotland), 1 ed, p7,

Wednesday, December 21, 2011

TEXT:

A rocky planet virtually identical in size to the Earth has been discovered orbiting a distant Sun-like star.

It is the first time such an Earth twin in another solar system has been detected.

Although the planet, Kepler-20f, could have a thick water-vapour atmosphere, its surface is believed to be too hot for life.

A second planet in the same system, Kepler-20e, is only slightly smaller than Earth and even hotter.

Both worlds circle their parent star closely with year-long orbital periods of just 19 and six days respectively.

Neither lie within the "habitable zone" where temperatures are just warm enough to allow liquid surface water, increasing the prospects for life.

But scientists are excited by the technical achievement of detecting Earth-sized "exoplanets" since it increases the chances of one day finding a potential life-bearing world.

The parent star, Kepler-20, is not exactly a close neighbour, being 945 light years away.

Dr Francois Fressin, one of the astronomers from the Harvard-Smithsonian Centre for Astrophysics, in Cambridge, US, said: "It is the first time humanity has been able to discover an object similar to the Earth around a star, so maybe we will be able to find others.

"This could be an important milestone. I think 10 years or maybe even 100 years from now people will look back and ask when was the first Earth-sized planet found. It is very exciting."

A number of extrasolar planets have already been identified with radiuses of 1.5 to twice that of the Earth.

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DIALOG(R)

An Earth-size planet, at last,

Carolyn Y. Johnson,

Boston Globe (MA), p1,

Wednesday, December 21, 2011

TEXT:

A team led by Harvard astronomers announced yesterday a major milestone in the long-running hunt for worlds capable of supporting life elsewhere in the cosmos: the detection of a planet the size of Earth

The rocky planet, and another they found that is a bit smaller than Earth, are the smallest ever discovered orbiting another star. They provide the powerful proof astronomers have been waiting for that it is possible - using a space-based telescope - to detect planets that fit the profile that has successfully spawned life in our own solar system

Astronomers are still far from the ultimate dream of finding an inhabited world; these so-called exoplanets sit scorchingly close to their sun and would be too hot for life, at least as we know it. But just weeks ago, scientists reported the discovery of a planet that is bigger than Earth, but otherwise just right - sitting squarely in the "Goldilocks zone" that is not too hot and not too cold for liquid water. Together, the discoveries signal that their search techniques are ready to pinpoint the right

planets - if they are out there to be found

"It is not just a milestone; it was the goal we were all headed for - and now, we turn toward repeating this success at cooler environments," said David Charbonneau, an astronomer at the Harvard-Smithsonian Center for Astrophysics and a coauthor of the paper describing the discovery, published online yesterday by the journal Nature

The two planets circle a star called Kepler-20, whose light takes 950 years to reach Earth. It has already been found to have three more massive planets in its solar system

That solar system, with gas giants interspersed with small rocky planets, shakes up conventional explanations of how solar systems form. Our system has rocky planets closer to the sun and giant gaseous and icy planets farther away, and current theories are based on this arrangement. In the Kepler-20 system, the planets alternate in size.

Kepler-20e, slightly more petite than Venus (which is smaller than Earth), takes just shy of a week to whip around its star, and would be too hot for water, at 1,400 degrees. Kepler-20f, on the other hand, which is almost precisely Earth-size in its diameter, circles the sun in a little less than three weeks, and would be a more temperate 800 degrees. (Earth's average temperature is about 59 degrees.)

Francois Fressin, the lead author of the study and a Harvard astronomer, said that it is possible that planet 20f could have migrated to its spot from farther out, meaning it could possibly have developed a water vapor atmosphere - a tantalizing possibility that the scientists can't prove, but also can't rule out

The search for exoplanets has moved forward rapidly over the past 15 years, as astronomers have detected smaller and smaller planets, and in spots that might be habitable for life

As a graduate student in 1999, Charbonneau first used the technique that has become standard for detecting and measuring planets circling other stars. Using a small telescope, he measured the regular dip in a star's light caused as a large, Jupiter-size planet circled it, crossing between the telescope and the sun. Think of people walking in front of the screen as they duck out of a movie to head to the bathroom - you could tell something about their size by how obtrusive their silhouette is

But it hadn't been easy to find that first Jupiter-size planet orbiting another star, and Charbonneau said planets the size of Earth would block only 1 percent as much light as a Jupiter-size one

Today, the scale of the project has changed. Charbonneau still has the type of small telescope he used to make that initial discovery in his Cambridge office, but the search for habitable planets now involves dozens of scientists at institutions in the United States, Canada, and Europe, and NASA's \$600 million Kepler space-based telescope, which is closely watching more than 150,000 stars

Michael Endl, a research scientist at the McDonald Observatory at the University of Texas at Austin, who was not involved in yesterday's finding, said it is a significant achievement since the researchers had to do extensive analysis to exclude the possibility that the minor blip in the light reaching the telescope was caused by something other than a planet

"The Kepler mission is specifically designed to give us the first estimate of Earth-size planets in the habitable zone," Endl said. "This paper is a milestone because it demonstrates that Kepler can detect those planets." Finding such planets orbiting their stars at a greater distance may take more time, he said. Because these two planets are so close to their sun, the scientists have had time to measure the change in the star's light over many crossings. For planets in the habitable zone, like Earth, which might spend a year circling the sun, it will take more time to accumulate enough data

Even with these two planets, the team had difficulties to overcome. Fressin said the conventional method to measure the mass of a planet could not be used because these planets were so light. The team toiled to rule out other possible explanations, utilizing a supercomputer, called Pleiades, at NASA's Ames Research Center in California. The computer, about the size of two basketball courts, ran calculations to show that it was very unlikely to be any other astrophysical phenomenon

While these planets are inhospitable to life, Charbonneau and his colleagues have their sights firmly on the larger goal.

"If all it was, was looking for smaller pieces of rock, I wouldn't do it," he said. "There has to be this promise, we have to eventually look for life. That has to be on the table."

Carolyn Y. Johnson can be reached at cjohnson@globe.com. Follow her on Twitter @carolynjohnson.

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Record - 32

DIALOG(R)

Earth-size planet duo orbit star,

Windsor Star (Canada), Final ed, pD8,
Wednesday, December 21, 2011

TEXT:

PARIS - Astronomers on Tuesday said that, for the first time, they had spotted two Earth-size worlds orbiting a star like our sun, another big advance in the search for so-called exo- planets.

One of the planets is just three per cent bigger than Earth, and the other is 13 per cent smaller, which would make it a bit tinier than Venus, they reported online in the British science journal Nature.

The planets are inferred to have a rocky composition similar to Earth's, but they orbit so close to their star, Kepler -20, that the temperature is likely to be far too high to nurture life.

The larger planet, Kepler-20f, completes a "year" in 19.5 days and may have a thick water-vapour atmosphere, while the smaller one, Kepler-20e, zips around the star in just 6.1 days.

Spotting the pair is a technical feat. They are the smallest exo-planets to be found since the first world beyond our solar system was officially detected in 1995. Their distance, too, is enormous: Kepler-20 is about a thousand light years from Earth.

So far 709 planets have been netted in 534 star systems, according to a tally compiled by the Extrasolar Planets Encyclopaedia (exoplanet.eu/catalog.php).

Almost all are gas giants or are located too close or too far from their star to allow water - the stuff of life - to exist in liquid form.

Only three have been confirmed as being rocky and orbiting in the "Goldilocks zone," where the temperature is balmy.

Two of the three are Gliese 581d and HD 85512b, orbiting stars that are cooler and smaller than our sun. The third is Kepler-22b, unveiled on Dec. 5, which is 2.4 times the size of the Earth, orbiting a star like our sun every 290 days.

The two new discoveries were found by a team led by Francois Fressin of the Harvard-Smithsonian Center for Astrophysics, using NASA's Kepler orbiting space telescope.

A \$600-million mission launched in March 2009, Kepler monitors more than 150,000 stars for tiny wobbles in light. This could signal that a planet is

passing in front of the star and is thus dimming the light reaching the telescope.

So far, Kepler has notched up 2,326 "planet candidates" - sightings that could turn out to be exo-planets if they are confirmed by further observations.

NASA astronomers assign the name of Kepler and a number to a star where the telescope has found exo-planets. The exo-planets are then identified by a lowercase letter in order of discovery - for instance Kepler-12b is the second exo-planet to have been found orbiting the star Kepler-12.

AFP, Getty Images / An artist's rendition showing two Earthsized planets orbiting a sunlike star.;

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Record - 33

DIALOG(R)

Astronomers discover two Earth-sized worlds; New advance in search for Exoplanets,

AGENCE FRANCE-PRESSE,
Montreal Gazette (Canada), Final ed, pA20,
Wednesday, December 21, 2011

TEXT:

PARIS - Astronomers on Tuesday said that for the first time they had spotted two Earth-sized worlds orbiting a Sun-like star, in another big advance in the search for so-called exoplanets.

One of the planets is just three per cent bigger than Earth and the other is 13 per cent smaller, which would make it a bit tinier than Venus, they reported online in the British science journal Nature.

The planets are inferred to have a rocky composition similar to Earth's but they orbit so close to their star, Kepler-20, that the temperature is likely to be far too high to nurture life.

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NASA assigns the name of Kepler and a number to a star where the telescope has found exoplanets. The exoplanets are then identified by a lowercase letter in order of discovery - for instance Kepler-12b is the second exoplanet to have been found orbiting the star Kepler-12.

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Record - 34

DIALOG(R)

Astronomers find two Earth-sized worlds,

Eric Berger,

Houston Chronicle,

Wednesday, December 21, 2011

TEXT:

Dec. 21--For the first time, astronomers have found a planet the size of

Earth around another star.

The scientists, using a sophisticated NASA observatory that scans incoming light from stars, announced the discovery of two planets around a star some 950 light-years from Earth.

The finds suggest that, far from being rare, our galaxy is filled with planets that may look a lot like our pale blue dot.

One of the two new planets, Kepler-20 f, has a diameter that's 3 percent larger than Earth's. The second planet, Kepler-20 e, has a diameter that's 15 percent smaller than Earth's.

"This is the first time we've crossed the Earth-size threshold," said Francois Fressin of the Harvard-Smithsonian Center for Astrophysics, who led the study.

The discovery, published Tuesday in the journal Nature, brings scientists tantalizingly close to finding the holy grail of planet hunters: an Earth-like world in a habitable zone.

Earlier this month, scientists using the Kepler instrument announced the discovery of 10 worlds in this habitable zone -- not too hot, not too cold -- where water can exist in a liquid form on the planet's surface.

But the largest of these discoveries was 2.4 times the size of Earth.

The new planets are most definitely not candidates for life as we know it. Although they orbit a star that's similar in size to the sun, they're very close in, nearer to their star than Mercury is to the sun.

Due to their close-in orbits they're estimated to have surface temperatures of 800 and 1,400 degrees Fahrenheit. Scientists believe they are rocky worlds like the Earth.

Launched in March 2009, the Kepler observatory tracks incoming light from some 155,000 stars -- out of billions in the galaxy -- looking for periodic dimming when a planet in each system might cross in front of the star, known as a transit.

Short 'years' helpful

Until Monday's announcement, the smallest planet found around another star was about 40 percent larger than Earth's.

Astronomers were able to find the close-in Kepler-20 planets because they have such short "years," six days and 20 days, in which they complete a

full orbit around their star. This gave scientists many transits to confirm that the blips in the light data they obtained for Kepler-20 were in fact two tiny planets.

Scientists believe there are many more Earth-size worlds out there because it takes more time to detect transits in front of stars by smaller planets farther out from their stars than the Kepler-20 worlds.

"It is beginning to look like Earths are not rare, and to me that's a really, really important result," said Bill Cochran, a co-investigator on the Kepler mission and a University of Texas at Austin astronomer.

"You obviously want to know how common potentially inhabitable Earths are in the galaxy. And we're finding the answer is we'll probably not have to go all that far to find one close to us."

The two Earth-size planets are part of an odd, five-planet solar system.

Unlike our solar system, in which the rocky planets orbit close to the sun and larger gas giants farther out, the planets of Kepler-20 are organized in an alternating size of big, little, big, little, big.

"The architecture of this planetary system is crazy," said David Charbonneau, professor of astronomy at Harvard University.

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Record - 35

DIALOG(R)

You wait 4.5bn yrs for another Earth then three come along all at once..

MIKE SWAIN,

Mirror (UK), Ulster ed, p28,

Wednesday, December 21, 2011

TEXT:

IN a galaxy far, far away a pair of Earth-like planets have been discovered orbiting a star similar to our own Sun.

One is almost the same size as Earth while the other is slightly smaller and one may even have a water vapour atmosphere.

Astronomers revealed last night that both have a similar make up to Earth and in the distant past they may have been able to support life but are now too hot.

The discovery follows the finding of a "Super-Earth", dubbed Kepler 22-b, earlier this month which was 1.42 times the Earth's diameter. Scientists say the new pair of planets are the most important found outside our solar system. They orbit a star called Kepler-20, which is 950 light years from Earth. Kepler-20f is almost the same size as Earth while Kepler-20e is 0.87 times our radius - just smaller than Venus.

Dr Emily Baldwin, of Astronomy Now magazine, said: "It is incredibly exciting. It brings us closer to finding a true Earth twin with running water."

The two worlds have years much shorter than our 4.5 billion year old Earth with Kepler-20f orbiting its star in 19.6 days and Kepler-20e zipping round it in only 6.1 days.

More than 700 planets have been found outside our solar system since 1996.

Most have been giant gasballs like Jupiter, but space telescope Kepler has found many smaller worlds since 2009.

Dr Francois Fressin of Harvard-Smithsonian Center for Astrophysics, Massachusetts, said: "The goal of Kepler is to find Earth-sized planets in the habitable zone. This is a major step." The planets were spotted due to dips in light as they passed their star, the journal Nature reported.

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Record - 36

DIALOG (R)

YOU WAIT 4.5BN YEARS FOR ANOTHER EARTH THEN 3 COME ALONG ALL AT ONCE,
MIKE SWAIN,

Mirror (UK), Eire ed, p24,
Wednesday, December 21, 2011

TEXT:

IN a galaxy far, far away a pair of Earth-like planets have been discovered orbiting a star similar to our own Sun.

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The planets were spotted due to dips in light as they passed their star, the journal Nature reported.

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DIALOG(R)

First Earth-size planets found around distant star a(euro)" in a bizarre solar system,

Pete Spotts Staff writer,

Christian Science Monitor (USA), ALL ed,

Tuesday, December 20, 2011

TEXT:

Scientists have found the first Earth-size planets orbiting a star like the sun, but the pair appear in a solar system so bizarre that it is for now upending current explanations for how solar systems form, the discoverers say.

The two planets, thought to be rocky, form a kind of cosmic triple-decker sandwich, with each interspersed among three Neptune-scale gas planets. All five are closer to their host star than Mercury is to the sun, meaning they are too hot for life.

But the find is proof that NASA's Kepler spacecraft can find Earth-size planets orbiting distant stars. Kepler 20e is slightly smaller than Venus, or about 0.87 times Earth's size. Kepler 20f is 1.03 times Earth's size.

Combined with the discovery, announced Dec. 5, of a "super Earth" in another star's habitable zone, these new planets move the Kepler team closer to its goal: detecting Earth-size planets in their stars' habitable zones a(euro)" orbital distances where temperatures on the planet are warm enough to allow water to remain stable on the surface.

The newest discovery is "the most important milestone" for the Kepler team, says Francois Fressin, a researcher at the Harvard-Smithsonian Center for Astrophysics in Cambridge, Mass., and the lead author of the team's formal report, which is being published by the journal Nature.

Kepler uncovered the two Earth-size planets 1,000 light-years away by tracking the changes the brightness of light coming from their host star, Kepler 20, as the planets pass in front of it. Kepler 20e orbits its sun once every 6.1 days at an average distance of 4.7 million miles. Kepler 20f orbits once in 19.6 days at a distance of 10.3 million miles.

Earth, by contrast, is 93 million miles from the sun.

The team doesn't yet have an independent confirmation of the planets' masses, but given their sizes and orbits, the planets likely are rocky a(euro)" probably composed of silicates and iron, as is Earth a(euro)" according to current models of how solar systems form.

Yet the arrangement of the five planets orbiting Kepler 20 is calling those models into question. It could be dubbed the Neptune/Rocky Horror Picture Show.

The configuration of the five planets a(euro)" Neptune-like planet, followed by small rocky planet, followed by Neptune-like planet, followed by small rocky planet, followed by Neptune-like planet a(euro)" is decidedly unlike anything yet seen.

"The architecture of that planetary system is crazy," says David Charbonneau, another researcher from the Harvard-Smithsonian Center for Astrophysics and a Kepler team member.

From centuries of studying our own solar system, astronomers had pieced together a convincing picture of planet formation. Rocky planets formed close to the sun, where temperatures were too warm to allow gases and ices to accumulate. Meanwhile, gas and ice giants formed beyond the so-called snow line, where temperatures even on the sunward side of objects could not unfreeze water and allowed gases to condense into liquids.

"We thought all solar systems would be like this," says Linda Elkins-Tanton, who heads the Carnegie Institution for Science's Department of Terrestrial Magnetism in Washington.

Extrasolar-planet hunters then found so-called hot Jupiters a(euro)" gas giants with Jupiter's mass and more a(euro)" orbiting close to their parent stars. But that still could be explained: The giants just migrated inward and forced the smaller rocky planets into the star as they came, Dr. Elkins-Tanton suggests.

"Now, with this new Kepler finding, comes a solar system that doesn't fit any mold we have," she says. "This system forces us to change out ideas about how planets are formed, and how they reach stable orbits, and where indeed in solar systems there could be Earth-sized rocky planets."

The Kepler team's announcement Tuesday coincides with an additional report released the same day by scientist claiming to have found two planets smaller than Earth orbiting a relic of a red-giant star some 4,000 light-years away. Although this second group is not part of the Kepler team, they used Kepler data to make their discovery.

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DIALOG(R)

Astronomers find two Earth-size planets,

UPI Science News,

Tuesday, December 20, 2011

TEXT:

NASA says its Kepler space telescope has discovered the first Earth-size planets orbiting a sun-like star outside our solar system.

While the planets, called Kepler-20e and Kepler-20f, are too close to their star to be in the so-called habitable zone where liquid water could exist on a planet's surface, they are the smallest exoplanets ever confirmed around a star like our sun, a release by the space agency said Tuesday.

Kepler-20e is slightly smaller than Venus while Kepler-20f is a bit larger than Earth, and both planets orbit in a five-planet system called Kepler-20, approximately 1,000 light-years away in the constellation Lyra.

"The primary goal of the Kepler mission is to find Earth-sized planets in the habitable zone," Francois Fressin of the Harvard-Smithsonian Center for Astrophysics in Cambridge, Mass., said. "This discovery demonstrates for the first time that Earth-size planets exist around other stars, and that we are able to detect them."

Kepler-20e orbits its parent star every 6.1 days and Kepler-20f every 19.6 days, short orbital periods that mean the planets are very hot, inhospitable worlds.

Still, their discovery is yet another milestone in the ultimate search for planets like Earth, scientists said.

"In the cosmic game of hide and seek, finding planets with just the right size and just the right temperature seems only a matter of time," said Natalie Batalha, Kepler deputy science team lead and professor of astronomy and physics at San Jose State University. "We are on the edge of our seats knowing that Kepler's most anticipated discoveries are still to come."

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Record - 39

DIALOG(R)

NASA descubre primeros planetas de tamaño de la Tierra mas alla de sistema

Solar,

Xinhua Spanish,

Tuesday, December 20, 2011

TEXT:

WASHINGTON, Dec 20, 2011 (Xinhua via COMTEX News Network) -- La mision Kepler de la Administracion Nacional de Aeronautica y del Espacio (NASA) descubrio los primeros planetas del tamaño de la Tierra que orbitan una estrella parecida al Sol fuera del sistema solar, anuncio hoy la agencia espacial estadounidense.

Los planetas, llamados Kepler-20e y Kepler-20f, estan demasiado cerca de su estrella como para ubicarse en la llamada zona habitable en donde podria existir agua en estado liquido en la superficie de un planeta, pero son los exoplanetas mas pequenos jamas confirmados alrededor de una estrella similar a nuestro Sol, segun la NASA.

El descubrimiento marca el siguiente hito importante en la busqueda de planetas como la Tierra. Se cree que los nuevos planetas son rocosos. Kepler-20e es ligeramente mas pequeno que Venus y mide 0,87 veces el radio de la Tierra. Kepler-20f es ligeramente mas grande que la Tierra y mide 1,03 veces su radio. Ambos planetas residen en un sistema de cinco planetas llamado Kepler-20, ubicado a aproximadamente a 1.000 anos luz de distancia en la constelacion Lira.

Kepler-20e orbita a su estrella cada 6,1 dias y Kepler-20f cada 19,6 dias. Estos periodos orbitales pequenos significan que se trata de mundos muy calientes e inhospitos.

"El objetivo principal de la mision Kepler es encontrar planetas del tamaño de la Tierra en la zona habitable", dijo Francois Fressin del Centro de Astrofisica Harvard-Smithsonian, autor principal de un nuevo estudio publicado en la revista Nature. "Este hallazgo demuestra por primera vez que existen planetas del tamaño de la Tierra alrededor de otras estrellas y que tenemos la capacidad de detectarlos".

El sistema Kepler-20 incluye tres planetas mas que son mas grandes que la Tierra, pero mas chicos que Neptuno. Kepler-20b, el planeta mas cercano, Kepler-20c, el tercer planeta, y Kepler-20d, el quinto planeta, orbitan a su estrella cada 3,7, 10,9 y 77,6 dias, respectivamente. Los cinco planetas tienen orbitas parecidas a la orbita de Mercurio en nuestro sistema solar. La estrella alrededor de la cual orbitan pertenece a la misma clase tipo-G que nuestro Sol, aunque es ligeramente mas pequena y fria.

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Record - 40

DIALOG(R)

NASA discovers first Earth-size planets beyond solar system,

Xinhua News Agency,

Tuesday, December 20, 2011

TEXT:

WASHINGTON, Dec 20, 2011 (Xinhua via COMTEX News Network) -- NASA's Kepler mission has discovered the first Earth-size planets orbiting a sun-like star outside our solar system, the U.S. space agency announce Tuesday.

The planets, called Kepler-20e and Kepler-20f, are too close to their star to be in the so-called habitable zone where liquid water could exist on a planet's surface, but they are the smallest exoplanets ever confirmed around a star like our sun, according to NASA.

The discovery marks the next important milestone in the ultimate search for planets like Earth. The new planets are thought to be rocky. Kepler-20e is slightly smaller than Venus, measuring 0.87 times the radius of Earth. Kepler-20f is slightly larger than Earth, measuring 1.03 times its radius. Both planets reside in a five-planet system called Kepler-20, approximately 1,000 light-years away in the constellation Lyra.

Kepler-20e orbits its parent star every 6.1 days and Kepler-20f every 19.6 days. These short orbital periods mean very hot, inhospitable worlds. Kepler-20f, at 800 degrees Fahrenheit, is similar to an average day on the planet Mercury. The surface temperature of Kepler-20e, at more than 1,400 degrees Fahrenheit, would melt glass.

"The primary goal of the Kepler mission is to find Earth-sized planets in the habitable zone," said Francois Fressin of the Harvard-Smithsonian Center for Astrophysics, lead author of a new study published in the journal Nature. "This discovery demonstrates for the first time that Earth-size planets exist around other stars, and that we are able to detect them."

The Kepler-20 system includes three other planets that are larger than Earth but smaller than Neptune. Kepler-20b, the closest planet, Kepler-20c, the third planet, and Kepler-20d, the fifth planet, orbit their star every 3.7, 10.9 and 77.6 days. All five planets have orbits lying roughly within Mercury's orbit in our solar system. The host star belongs to the same G-type class as our sun, although it is slightly smaller and cooler.

Record - 41

DIALOG(R)

Nasa encontra 2 planetas com o tamanho da Terra,

EFE Portugues,

Tuesday, December 20, 2011

TEXT:

(acrescenta detalhes).

Washington, 20 dez (EFE).- Os astrónomos da missão Kepler da Nasa (agência espacial americana) anunciaram nesta terça-feira a descoberta de dois planetas do tamanho da Terra que orbitam em torno de uma estrela distante, e classificaram a descoberta como "um marco na busca de mundos extraterrestres".

Os dois planetas, batizados de "Kepler-20e" e "Kepler-20f", são os primeiros de tamanho parecido ao da Terra orbitando uma estrela fora de nosso Sistema Solar. Um deles tem diâmetro 3% menor que o da Terra, enquanto o outro é 3% maior.

"Após quase três anos, o observatório orbital Kepler confirmou a existência de planetas que orbitam estrelas", disse em teleconferência Nick Gautier, do Laboratório de Propulsão da Nasa em Pasadena, estado americano da Califórnia.

Dado que os dois planetas orbitam muito perto da estrela, os pesquisadores acham que, devido às altas temperaturas, não são capazes de sustentar vida. No entanto, a descoberta aproxima os cientistas a sua meta de achar um planeta similar à Terra e que seja habitável.

Ambos os planetas orbitam a estrela Kepler-20, um astro classificado como tipo G, levemente mais frio que o Sol e situado a quase mil anos-luz da Terra. Os pesquisadores acreditam que esses planetas têm composição rochosa, de modo que suas massas devem ser entre 2,7 vezes menores e 3 vezes maiores que a massa da Terra.

O "Kepler-20f" completa sua órbita a cada 19,6 dias, a uma distância de 16,6 milhões de quilômetros. Estas órbitas tão reduzidas provocam temperaturas planetárias entre 760 e 430 graus Celsius, o que torna quase impossível a existência de água líquida nos planetas.

Ja o "Kepler-20e" orbita sua estrela a cada 6,1 dias, a uma distancia de 7,6 milhoes de quilometros, isto e, quase 20 vezes mais perto de seu astro que a Terra, que orbita o Sol a cerca de 150 milhoes de quilometros.

"Cruzamos um limite: pela primeira vez, detectamos planetas menores que a Terra em torno de outra estrela", disse o cientista Francois Fressin, do Centro Harvard Smithsonian para Astrofisica em Cambridge, estado americano de Massachusetts.

"Provamos que existem planetas como a Terra em torno de outras estrelas e, mais importante ainda, provamos que a humanidade pode detecta-los", acrescentou. "E o comeco de uma era".

Os pesquisadores ja identificaram mais de 700 planetas fora do Sistema Solar. Desde seu lancamento em marco de 2009, o telescopio Kepler localizou 2.326 possiveis planetas e confirmou a existencia de 28.

"Durante as ultimas duas decadas, ficou claro que, no final, os astronomos atingiriam esta meta, mas tambem e fantastico saber que foi possivel a deteccao", disse o astronomo Greg Laughlin, da Universidade da California, em mensagem eletronica. EFE

jab/sa

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Record - 42

DIALOG(R)

Orbitan estrella distante dos planetas del tamano de la Tierra,

Por MALCOLM RITTER

AP Online Regional - Latin America/Caribbean

Tuesday, December 20, 2011

TEXT:

NUEVA YORK_ Cientificos encontraron dos planetas del tamano de la Tierra orbitando una estrella fuera de nuestro sistema solar, una senal alentadora sobre la posibilidad de encontrar vida en otros sitios del universo.

El descubrimiento muestra que tales planetas existen y que pueden ser detectados por la nave espacial Kepler, dijo Francois Fressin, del Centro Harvard-Smithsonian para la Astrofisica, en Cambridge, Massachusetts. Son los planetas mas pequenos encontrados hasta ahora que orbitan una estrella semejante a nuestro sol.

Los científicos están buscando planetas del tamaño de la Tierra como residencias potenciales de vida extraterrestre, señaló Fressin, quien reportó los hallazgos en un documento publicado el martes en internet por la revista Nature. El diámetro de un planeta es solo 3% mayor al de la Tierra, mientras que el diámetro del otro es aproximadamente de nueve décimas del de la Tierra. Parecen ser rocosos, como nuestro planeta.

Pero son demasiado calientes para contener vida como la conocemos, con temperaturas calculadas en cerca de 760 y 425 grados Celsius (1.400 y 800 grados Fahrenheit), indicó.

Cualquier vida encontrada en otro planeta podría no ser inteligente; podría ser bacteria o moho, o una forma completamente desconocida.

Desde su lanzamiento en el 2009, el telescopio Kepler de la NASA ha encontrado evidencia de decenas de planetas posiblemente del tamaño de la Tierra. Pero el reporte de Fressin es el primero que proporciona confirmación, dijo Alan Boss, del Instituto Carnegie Institution para la Ciencia, en Washington. Él es miembro del equipo de ciencia Kepler, pero no es autor del documento.

Los investigadores descartaron una posible explicación alternativa para las señales que indicaron inicialmente que los planetas estaban orbitando la estrella Kepler-20. La estrella se encuentra a 950 años luz de la Tierra en dirección a la constelación de Lira.

Los planetas, llamados Kepler-20e y Kepler-20f, son parte de un sistema de cinco planetas con órbitas alrededor de una estrella, y su ubicación pone en duda la opinión actual sobre cómo se forman los planetas, señalaron científicos.

En nuestro sistema solar, los planetas rocosos pequeños están más cerca del sol, mientras que los gigantes gaseosos están en la periferia. Pero el sistema de cinco planetas no tiene tal línea divisoria: planetas grandes y chicos se alternan mientras uno se aleja de la estrella.

"Eso es una locura, e inexplicable por la noción actual sobre cómo se acomodan los planetas alrededor de estrellas", comentó David Charbonneau, coautor del estudio y científico de Harvard.

A inicios de este mes, científicos dijeron que encontraron un planeta alrededor de otra estrella distante con una temperatura de superficie benigna para la vida de aproximadamente 22 grados Celsius (72 grados Fahrenheit). Pero era demasiado grande para sugerir que había vida en su superficie. Con 2,4 veces el tamaño de la Tierra, podría asemejarse más a Neptuno, un planeta de gas y líquido con un núcleo rocoso y mayormente oceánico, señalaron

cientificos.

En internet:

Nature: <http://www.nature.com/nature>

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Record - 43

DIALOG(R)

NASA'S KEPLER TO ANNOUNCE NEWLY CONFIRMED PLANETS,

US Federal News,

Sunday, December 18, 2011

TEXT:

WASHINGTON, Dec.18 -- NASA issued the following press release/media advisory:

NASA will host a news teleconference at 1 p.m. EST, Tuesday, Dec.20, announcing new discoveries by the Kepler mission.

Kepler is the first NASA mission capable of finding Earth-size planets in or near the "habitable zone," the region in a planetary system where liquid water can exist on the surface of an orbiting planet. Although additional observations will be needed to reach that milestone, Kepler is detecting planets and possible candidates with a wide range of sizes and orbital distances to help scientists better understand our place in the galaxy.

The briefing participants are:

-- Nick Gautier, Kepler project scientist, NASA's Jet Propulsion Laboratory (JPL) in Pasadena, Calif.-- Francois Fressin, lead author, Harvard-Smithsonian Center for Astrophysics in Cambridge, Mass.-- David Charbonneau, professor of astronomy, Harvard University -- Linda Elkins-Tanton, director of the Carnegie Institution for Science's Department of Terrestrial Magnetism in Washington.

For dial-in information, media representatives should e-mail their name, affiliation and telephone number to Trent Perrotto at: trent.j.perrotto@nasa.gov.

For live audio of the teleconference, visit:

<http://www.nasa.gov/newsaudio> NASA's Ames Research Center in Moffett Field, Calif., manages Kepler's ground system development, mission operations and science data analysis. JPL managed the Kepler mission's development.

Ball Aerospace and Technologies Corp. in Boulder, Colo., developed the Kepler flight system and supports mission operations with the Laboratory for Atmospheric and Space Physics at the University of Colorado in Boulder.

The Space Telescope Science Institute in Baltimore archives, hosts and distributes Kepler science data. Kepler is NASA's 10th Discovery Mission and is funded by NASA's Science Mission Directorate at the agency's headquarters in Washington.

For information about the Kepler Mission, visit: <http://www.nasa.gov/kepler>
For any query with respect to this article or any other content requirement, please contact Editor at htsyndication@hindustantimes.com

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Record - 44

DIALOG(R)

Kerala Center honors six,

Anonymous,

India Abroad; New York edition, v42, n9, pA58,

Friday, December 2, 2011

TEXT:

A CORRESPONDENT

At its annual banquet, the Elmont, New York-based Kerala Center honored six people for their achievements or service to society.

Ramu Damodaran, deputy director, outreach division, department of public information, United Nations, was the chief guest. He quoted Adi Shankaracharya, who said the real test of liberation is what one does after that. 'We have multiple identities like religion, community, state, nation, and now global; however, none of these identities inhibit or lessen the other,' he said.

He listed innovation, enterprise, assimilation, caring and communication as traits Malayalis could be proud of. Sreedhar Menon, venture capitalist and the Kerala Center's founder grand patron, introduced Damodaran. Thambi

Thalappillil, president, Kerala Center, delivered the welcome speech.

The keynote speaker was Dr Mani Menon, the Rajendra and Padma Vattikutti Distinguished Chair in Oncology and director of the Vattikutti Urology Institute at Henry Ford Health System in Detroit. He was one of the six honoraries, for his contributions to medicine. Speaking on robotic surgery, one of his specializations, Menon said it is like playing a video game. Among the honors he has received the Dr B C Roy Award from the president of India in 2008.

Dr K M Abraham, honored in the applied sciences category, is a research professor at the Northeastern University Center for Renewable Energy Technology, Boston, and president of EKEM Sciences, a lithium battery consulting company. His work helped to make possible the first-ever practical rechargeable lithium battery with long cycle life, the development of gel polymer electrolytes which form the basis of lithium-ion polymer batteries, and invention of the ultra-high energy density lithium-air battery, being developed worldwide for electric vehicle and other applications.

Dr Santosh Mathew, honored for journalism, is a professor, researcher and science writer. He writes science columns for The Huffington Post and Worcester Telegram & Gazette. He also writes on science and Eastern philosophy in Indian newspapers and magazines.

He is a faculty member at Regis College, Weston, Massachusetts and continues his research in collaboration with the Harvard Smithsonian Center for Astrophysics.

Raju Mylapra, also honored for journalism, was chief editor of Aswamedham, one of the first Malayalam publications in the United States. He writes humor columns, and has also published books and poems.

Professor Murali D Nair, director, School of Social Work at Cleveland State University in Ohio, was honored in the social sciences category. He is also the co-director, the Center for Healing Across the Cultures, and director, India Experience Program, at the university. A Fulbright Scholar, for the past 14 years he has been offering a summer study abroad program for US university students in Kerala, known as the India Experience.

Gracy Varghese, honored for nursing, is nursing home administrator, East Haven Nursing and Rehabilitation Center, in Bronx, New York, a 200-bed facility with more than 250 employees and more than 25 physicians.

At the event, Sunny Kulathakal, international coordinator for the Global Organization of People of Indian Origin, Persian Gulf region, spoke. Kerala

Center founder benefactor and trustee Dr Thomas Abraham was the compere and also served as chairman of the awards committee, along with Professor M T Anthony, Dr Cecily Anto and Ramesh Menon.

SIDEBAR

Award recipients with Ramu Damodaran and Kerala Center officials. Honorees in the front row, from left: Dr Santosh Mathew, Gracy Varghese, Dr K M Abraham, Dr Mani Menon, Professor Murali Nair and Raju Mylapra

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