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2. **2009 in science and medicine**, ROGER SCHLUETER, Belleville News Democrat (IL), Sunday, January 3, 2010
3. **'Science, celestial bodies have always inspired humankind'**, Staff Correspondent, Hindu (India), Tuesday, December 29, 2009
4. **Why is Carpenter defending scientists?**, The Morning Call, Morning Call (Allentown, PA), FIRST ed, pA25, Sunday, December 27, 2009
5. **CORRECTIONS, OPINION BY RYAN FINLEY**, ARIZONA DAILY STAR, Arizona Daily Star (AZ), FINAL ed, pA2, Saturday, December 19, 2009
6. **We see a 'Super-Earth'**, TOM BEAL; TOM BEAL, ARIZONA DAILY STAR, Arizona Daily Star, (AZ), FINAL ed, pA1, Thursday, December 17, 2009

Record - 1

DIALOG(R)

New social science research from G. Sonnert and co-researchers described, Science Letter, p40, Tuesday, January 5, 2010

TEXT:

"In this paper we report on testing the 'rolen model' and 'opportunity-structure' hypotheses about the parents whom scientists mentioned as career influencers. According to the role-model hypothesis, the gender match between scientist and influencer is paramount (for example, women scientists would disproportionately often mention their mothers as career influencers)," scientists writing in the journal Social Studies of Science report (see also).

"According to the opportunity-structure hypothesis, the parent's educational level predicts his/her probability of being mentioned as a career influencer (that ism parents with higher educational levels would be more likely to be named). The examination of a sample of American scientists who had received prestigious postdoctoral fellowships resulted

in rejecting the role-model hypothesis and corroborating the opportunity-structure hypothesis. There were a few additional findings. First, women scientists were more likely than men scientists to mention parental influencers. Second, fathers were more likely than mothers to be mentioned as influencers," wrote G. Sonnert and colleagues.

The researchers concluded: "Third, an interaction was found between the scientist's gender and parental education when predicting a parent's nomination as influencer."

Sonnert and colleagues published their study in *Social Studies of Science* (Parents Who Influence Their Children to Become Scientists: Effects of Gender and Parental Education. *Social Studies of Science*, 2009;39(6):927-941).

Additional information can be obtained by contacting G. Sonnert, Harvard Smithsonian Center Astrophysics, MS 71, 60 Garden St., Cambridge, MA 02138, USA.

The publisher of the journal *Social Studies of Science* can be contacted at: Sage Publications Ltd., 1 Olivers Yard, 55 City Road, London EC1Y 1SP, England.

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Record - 2

DIALOG(R)

2009 in science and medicine,
ROGER SCHLUETER,
Belleville News Democrat (IL),
Sunday, January 3, 2010

TEXT:

Yogi Berra might have called it deja vu all over again -- only people wouldn't have laughed at his mangled prose this time.

When swine flu broke out in Mexico last April, its lethal opening salvo quickly evoked memories of the 1918 Spanish flu epidemic that led to 50 million to 100 million deaths worldwide.

At first, people had every reason to fear a possible repeat. After killing Mexicans by the score, the disease spread to dozens of other countries in just a couple of months, leading the World Health Organization to issue its highest warning -- a Phase 6 pandemic alert.

U.S. officials braced for the worse, predicting the virus might infect half of all Americans and might cause 30,000 to 90,000 deaths. Early signs indicated their dire warnings might be on target: The 2009 H1N1 flu was indeed a mutated cousin of the 1918 flu, and, just like the original version, it was hitting the young worse than the elderly, it was striking long before the regular flu season, and it seemed to be coming in waves.

On Oct. 23, President Barack Obama declared swine flu a national emergency. And when drug companies had churned out only 10 percent of a promised 250 million doses of vaccine by early November, concern continued to build.

Since then, however, fears of a massive deadly pandemic have been subsiding. While an estimated 50 million Americans have caught the disease, so far it has killed 10,000, which is far below the 35,000 that the seasonal flu kills in an average year. Indications are that there will be no repeat of the 1976 swine flu vaccine fiasco, which was quickly stopped after numerous reports of it causing Guillain-Barre syndrome.

Just last week, health officials offered more good news: The virus does not seem to be nearly as contagious as first thought. If your child brings it home, adults have only a one in eight chance of catching it, too, according to a study published in the *New England Journal of Medicine*. Still, it's too early to issue an all-clear signal, say authorities, who continue to urge everyone to be vaccinated.

For its impact alone, the swine flu arguably may have been the top medical-science story of 2009, but there were plenty of other momentous events with less dire consequences: a new human ancestor, the discovery of earthlike planets, water on the moon and another claim of finding dark matter, to name just a few. Here's a recap:

Long lost ancestor

The story of human evolution was turned on its ear in 2009 when the world was introduced to the bones of a 4.4-million-year-old hominid named *Ardipithecus ramidus* -- affectionately known as Ardi.

It had long been believed that man's earliest ancestors were hunched-over apelike creatures that roamed the open savannas of ancient Africa. But these remarkable remains told the story of a 4-foot-tall, 110-pound female who walked upright through verdant woodlands a million years before Donald Johanson's famous Lucy came along.

Ardi and the remains of about three dozen other adults and children were dug up in the Afar desert of Ethiopia along with thousands of other plant and animal remains. The finds were studied for 15 years before nearly a

dozen articles in a special issue of Science last October painted the picture of an early ancestor with large hands; feet and pelvis adapted for walking; a splayed-out big toe similar to modern apes; and a small brain but one positioned more like that of modern man.

She also had upper canine teeth similar in size to ours to help chew her diet of nuts, fruits, small mammals and eggs.

Because of its primitive pelvis and missing knee joints, some question the findings, but Tim White, co-director of the research group, says the evidence clearly puts Ardi at the earliest stages of human evolution.

Stem-cell green light

Even before President Obama could give his official blessing, the new administration had scientists diving into stem-cell research with renewed vigor.

Just two days after Obama took his oath, the Food and Drug Administration gave San Francisco-based Geron permission to conduct the first clinical trial of a medical therapy involving embryonic stem cells. Using embryos left over from in vitro fertilization treatments, scientists worked to coax stem cells into spinal cord cells that would be injected into paralyzed patients. It is an attempt to build on work at the University of California at Irvine that enabled paralyzed rats to walk again.

The FDA decision reversed eight years of restrictions under President George W. Bush that limited scientists to a few pre-existing cell lines. Then, on March 9, Obama signed an executive order freeing federal funds for all types of stem-cell work, boosting research around the country -- and not all involving the controversial embryonic variety.

In March, University of Wisconsin researchers said they had turned skin cells into stem cells with a new method that would not cause side effects such as cancer. And, in November, an international team said they were successful in stopping progression of a fatal brain disease known as X-linked adrenoleukodystrophy with a combination of stem cells and gene therapy.

Genetic treatments also continued to progress as doctors announced curing nine infants born with "bubble-boy" disease by injecting the patients with healthy copies of an immune-system gene they were born without. In Oregon, researchers successfully replaced mitochondrial genes in a macaque monkey egg, which could open the door to treating thousands of birth defects, researchers said.

Houston, we have problems

As 2010 dawns, the U.S. space program finds itself at a critical crossroads.

Long gone are the exciting days of watching NASA put a man on the moon in the 1960s. Now, an aging space shuttle fleet may be put out to pasture by the end of the year. Budget woes may slow plans for unmanned exploration of the solar system and elsewhere. And, a program to return to the moon by 2020, announced by President George W. Bush in 2004, now seems a pipe dream.

NASA "appears to be on an unsustainable trajectory," concluded former Lockheed CEO Norman Augustine and his commission when President Obama asked them to study the future of NASA's manned space program.

So what's next? If Augustine's commission has its way, you'll see private companies increasingly take over research and development. Already, NASA has given grants to SpaceX and Orbital Sciences to design new launchers and capsules. Such moves will allow NASA to focus on the biggest projects, such as the new Ares V rocket to carry man into deep space.

"NASA would be better served to spend its money on going beyond Earth orbit rather than running a trucking service to low Earth orbit," Augustine said at a press conference when his group's report was released.

Mars is the ultimate destination, it said, but NASA might want to aim at visiting an asteroid or exploring Mars' two moons first. The U.S. plans to end its part in the space station mission in 2016, but this is sure to upset the other countries involved. And, cuts in unmanned programs, which have had stellar success the past few years, would raise hackles.

Over-testing women?

Just when women thought they were doing everything right to catch breast cancer early, a government panel stirred up a hornets' nest in November with a new set of mammography guidelines.

In a decision that outraged experts and cancer survivors alike, the U.S. Preventive Service Task Force recommended against annual mammograms for women ages 40 to 49, reversing a long-standing recommendation. They said such tests lead to too many unnecessary biopsies, and the extra radiation may cause additional cancers.

The panel still recommended that women over 50 be screened, but, in another big change, they should have a mammogram every two years instead of annually. And, the task force recommended against teaching breast

self-exams to any woman.

The panel stressed that these new guidelines were only for women at normal risk for breast cancer -- not those, for example, who test positive for the BRCA-1 and BRCA-2 genes, which would put them at high risk. But that did little to placate those who think the old guidelines have played a major role in lowering breast cancer death rates. They also fear insurance companies will follow the new guidelines, cutting benefits.

"This is one screening test I recommend unequivocally and would recommend to any woman 40 and over, be she a patient, a stranger, or a family member," said Dr. Otis Brawley, chief medical officer of the American Cancer Society, which continues to strongly recommend annual mammograms for women 40 and older.

In a less controversial move, the American College of Obstetricians and Gynecologists two weeks later said it was OK for most women in their 20s to have a Pap smear every two years instead of annually to catch slow-growing cervical cancer.

Uppity neighbors

Until now, Venus has been about the nearest thing Earth has had to deserve the designation "sister planet."

Some sister. Although new evidence found last year suggests Venus had watery oceans millions of years ago, the planet now has a surface temperature of 850 degrees and an atmosphere filled with sulfuric acid mist. Hardly the place to look for extraterrestrial life as we know it. For the past few years, astronomers have reported finding a raft of planets outside the solar system, but these generally have been huge gas giants like Jupiter or Saturn, hardly burgeoning with E.T.s. Then in 2009, astronomers seemed to come crawling out of the woodwork to report the discovery of planets much more like our own globe.

The most exciting find came just two weeks ago from Mark Charbonneau at the Harvard-Smithsonian Center for Astrophysics. His team announced finding GJ1214b, a planet less than three times wider than the Earth orbiting a red dwarf star just 42 light years away, a hop, skip and jump in astronomical terms. Even better, it seems to have extraordinarily deep oceans, a big plus in the search for life.

At the same time, two international teams reported finding two more "Super Earths" orbiting relatively nearby sunlike stars, according to studies in the *Astrophysical Journal*. They cap a memorable year during which scientists at the High Accuracy Radial Velocity Planet Searcher in Chile

said that 40 percent of the sunlike stars they find seem to have planets similar in size to Earth.

Charbonneau is asking that the Hubble telescope, which was given a new lease on life last year, analyze GJ1214b's atmosphere for signs of oxygen.

Moon river?

The moon may not be made of green cheese, but it does seem to have one thing most people would never associate with it: water.

At least, that's what an ingenious experiment last October seemed to indicate. Forty years after it celebrated man's first steps on the moon's desolate surface, NASA purposely slammed a 3-ton rocket stage into a crater near the lunar south pole and had the resulting plume of debris analyzed by a satellite passing overhead. Preliminary data indicate that in addition to the dust and metal, the collision kicked up about 25 gallons of water ice as well.

The results seem to confirm findings made by three other satellites -- including NASA's own Deep Impact and Cassini -- that detected traces of water on the surface by analyzing reflected sunlight off the moon's surface. So how could such a barren world possibly show signs of liquid? Scientists speculate that hydrogen ions in the solar wind bond with oxygen in the lunar soil to produce trace amounts of water. Icy comets crashing into the moon may have added to the totals.

That was just the start of some out-of-this-world findings last year. A report about the existence of methane on Mars in January added more tantalizing evidence about the possibility of life on the Red Planet. And, three flybys of Mercury by NASA's Messenger revealed evidence of volcanoes and massive lava flows billions of years ago.

Dark matters

The year in science is ending on a dark note -- and physicists couldn't be more ecstatic. Using an abandoned mine, researchers two weeks ago reported what may be the strongest evidence yet of finding dark matter, a mysterious substance that is believed to constitute 90 percent of the mass of the universe.

The debate over dark matter has raged since 1933, when Swiss astronomer Fritz Zwicky contended that a distant group of galaxies would break up were it not for the gravitational pull of some massive but unseen material. Scientists dubbed it "dark matter" because it apparently neither reflects nor absorbs light and, therefore, cannot be seen by telescopes.

Working a half-mile under northern Minnesota, a team known as the Cryogenic

Dark Matter Search says it has spotted two particles that have all the characteristics of dark matter. The scientist were looking for weakly interacting massive particles (WIMPs), which are thought to make up dark matter.

"If they have a real signal, it's a seriously big deal," said Cambridge University's Gerry Gilmore of the discovery. "Dark matter is what created the structure of the universe and is essentially what holds it together. When ordinary matter falls into lumps of dark matter, it turns into galaxies, stars, planets and people. Without it, we wouldn't be here."

The scientists admit there's a 25 percent chance their readings may have been caused by something other than WIMPs, but if confirmed next year, it would rank as one of the greatest discoveries in decades.

Science lightning round

BIRD WARS: Be careful whom you call a birdbrain -- you could be paying him a compliment. Scientists at the University of Florida found that mockingbirds ignored people who merely passed by, but began to attack those who had intentionally stood near their nests for 15 seconds and touched the nests for another 15 seconds. The attacks continued even when these past intruders were just walking by, indicating the birds had learned who represented a potential danger.

DON'T PANIC: Being able to smell fear apparently is not just some B movie cliché. Students at the University of Dusseldorf , Germany, were able to sniff out the difference between sweat from students who had just exercised and perspiration from students facing a challenging exam. It may help explain how panic spreads among a crowd, researchers hypothesize.

PLAYING THE OLDIES: Think our ancient ancestors couldn't get down with some groovy sounds? Think again. Nicholas Conard , an archaeologist at the University of Tübingen , last summer unearthed a 35,000-year-old bone flute in southwestern Germany that not only produces nearly the same notes as today's flutes but may be capable of even greater harmonic variety. It was fashioned from the bone of a griffin vulture.

SPACE JUNK: Looks like we could soon use a traffic cop or two in outer space soon. In the first wreck of its kind, a U.S. communications satellite smashed head-on into an old Russian orbiter at 25,000 mph last February 500 miles over Siberia. And, in March, a 5-inch piece from a rocket engine whizzed uncomfortably close by the International Space Station. There are nearly 20,000 old satellites to run into up there.

MICRO MEDICINE: It's not like having Raquel Welch sail through your body a

la "Fantastic Voyage," but medical probes are becoming increasingly amazing. At the University of Austria , James Friend engineered a robot motor about the size of the head of a pin that may one day carry tiny instruments, drugs or a camera to any part of the body. And, Israeli scientists have developed a tiny bot they hope can stimulate hearing nerves in the deaf.

FAKING IT: Did you see the "Law & Order: SVU" episode in which Detective Benson was framed with faked DNA evidence? Turns out the story was ripped from all-too-real headlines: The Israeli company Nucleix this year announced that it had taken a small bit of DNA and turned it into blood and saliva samples that fooled even the experts. Fortunately for law enforcement officials, the company says that it now has developed a test that can spot the scam.

NEW WORLDS: Students in the distant future might be learning about an eighth continent and a sixth ocean. After discovering a new crack in northeastern Ethiopia, some geologists speculate that volcanic activity may one day split Africa in two, creating a new ocean in the process.

THE BEE'S KNEES: The bee world was buzzing last spring over a report from Spain showing that the alarming drop in bee population there apparently was caused by the fungi-related parasite *Nosema ceranae*. When two apiaries were sprayed with an antibiotic, the bee populations fully recovered. If a similar cause is found elsewhere, it would be one honey of a discovery.

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Record - 3

DIALOG(R)

'Science, celestial bodies have always inspired humankind',

Staff Correspondent,

Hindu (India),

Tuesday, December 29, 2009

TEXT:

Madikeri: Science and celestial bodies are not an exclusive preserve of scientists as they have always inspired humankind in one form or the other, thanks to their mysteries, Registrar of the Mangalore University K. Chinnappa Gowda said here on Monday.

'Science can make or mar a civilisation,' he said, addressing a gathering of scientists and students at the inauguration of the 'International intra-disciplinary conference on the frontiers of astronomy (IICFA)-2009',

at the Field Marshal K.M. Cariappa College, a constituent college of the university.

Contribution by illustrious persons such as Copernicus, Kepler and Galileo had changed the notion of the universe on astronomy, he said. Mr. Gowda said that science should not be hypothecated to any religion or ideology of convenience.

Humankind had always drawn inspiration from the universe. For instance, sun had been seen as a symbol of tremendous source energy while the moon was associated with romance and 'flights of fancy', Mr. Gowda said.

The university was proud to host the three-day conference which also coincided with the diamond jubilee of the college, he said. The event would provide a spectrum to spread scientific knowledge among students.

Earlier, the conference was inaugurated by Arun Cariappa, chairman of the Cauvery Group.

President of the Karnataka Kodava Sahitya Academy Rani Machaiah led the guests to an exhibition of rare Kodava artefacts organised on the occasion. The exhibition was inaugurated by Jagadeesh S. Moodera, scientist from the Massachusetts Institute of Technology (MIT), U.S.

Vinay Kashyap, from the Harvard-Smithsonian Centre for Astrophysics, U.S., who gave an account of the programme earlier, said the primary objective of the conference was to communicate knowledge on astronomy to all.

Observing that the event was significant in view of the fact that 2009 was being celebrated as the International Year of Astronomy, Dr. Kashyap said it also heralded the 400th anniversary of the first use of the telescope by Galileo.

He presented a replica of the Galileo telescope to Pushpa Kuttanna, principal of the college.

Jagadeesh S. Moodera said that spintronics was poised to replace electronics in another 15 years. It would help enlarge the horizon of scientific knowledge, benefiting humankind, he said.

Geeta Berera, also from the MIT, said 200 participants were taking part in the event.

P.D. Devamma, the former principal of the college and member of the Syndicate of the university, spoke. Jagannatha, convener of the IICFA-2009, was present.

'Science can make or mar a civilisation'

The three-day conference is being held at Field Marshal K.M. Cariappa College

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Record - 4

DIALOG(R)

Why is Carpenter defending scientists?,

The Morning Call,

Morning Call (Allentown, PA), FIRST ed, pA25,

Sunday, December 27, 2009

TEXT:

I find Paul Carpenter's defense of the indefensible breaches of ethics and scientific misconduct by the "global warmers" which occurred at Penn State and England to be both misguided and prejudicial. Carpenter attacks the source of the revelations, "thieves," he calls them, without worrying about the uncontested veracity of the e-mails which plainly demonstrate unethical conduct if not outright scientific fraud.

I can't remember Carpenter worrying about stolen e-mails when it suits his purposes. Carpenter assails the Washington Times and the "Moonies," attacking the source of the information rather than dealing with the real issues. Carpenter obviously believes that name-calling is easier than dealing with the complicated matter of global climate change.

I particularly object to the bigoted overtones of Carpenter's linking of Dr. Sallie Baliunas and Dr. Willie Wei-Hock Soon, who are actually physics professors at the Harvard-Smithsonian Center for astrophysics, to the "Moonies." I don't know whether the Moonies believe in anthropocentric global climate change or not. I'm not a Moonie. But I do know that 1,000 reputable scientists have issued a statement expressing their grave doubts about the validity of man-caused global climate change.

Charles D. Snelling

Fogelsville

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Record - 5

DIALOG(R)

CORRECTIONS

OPINION BY RYAN FINLEY, ARIZONA DAILY STAR,
Arizona Daily Star (AZ), FINAL ed, pA2,
Saturday, December 19, 2009

TEXT:

ORIGINAL ARTICLE RAN DEC. 18, 2009, A10, BUT WAS NOT ARCHIVED

* In "Big retailers trot out final holiday bargains" Friday on A10, The Associated Press misstated Wal-Mart's sales plan for Zhu Zhu pets. Wal-Mart is selling from 20 to 60 per store with a limit of one per person Monday through Wednesday.

ORIGINAL ARTICLE RAN DEC. 17, 2009, A1

* A headline Thursday on A1 ("We see a 'Super-Earth': UA grad student, using Hopkins array, plays critical role in finding planet much like ours") gave the wrong school affiliation for Zachary Berta. He is a graduate student with the Harvard-Smithsonian Center for Astrophysics in Cambridge, Mass.

The Star does its best to identify and correct all errors. If you find an error, please report it to us by calling the appropriate section editor listed on each section front.

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Record - 6

DIALOG(R)

We see a 'Super-Earth'

TOM BEAL; TOM BEAL, ARIZONA DAILY STAR
Arizona Daily Star (AZ), FINAL ed, pA1,
Thursday, December 17, 2009

TEXT:

CORRECTION RAN DEC. 19, 2009, A2

* A headline Thursday on A1 ("We see a 'Super-Earth': UA grad student, using Hopkins array, plays critical role in finding planet much like ours") gave the wrong school affiliation for Zachary Berta. He is a graduate student with the Harvard-Smithsonian Center for Astrophysics in Cambridge,

Mass.

UA grad student, using Hopkins array, plays critical role in finding planet much like ours

Astronomers say they have discovered a nearly Earthlike planet, loaded with water and covered with a thick atmosphere, using an array of small "off-the-shelf" telescopes atop Mount Hopkins.

The planet, six times more massive than Earth and orbiting a dim, nearby star, is probably too hot to support life, said astronomer David Charbonneau of the Harvard-Smithsonian Center for Astrophysics.

Charbonneau conceived the idea for the MEarth (pronounced "mirth") array on Mount Hopkins specifically to look for big, rocky planets, called "super-Earths," orbiting small suns known as M stars.

A graduate student at the center, Zachary Berta, made the discovery of a periodically dimming star in MEarth data collected last April. Subsequent spectrographic observation with a larger telescope at the European Southern Observatory in Chile confirmed that the dimming was caused by an orbiting planet.

Those observations also allowed astronomers to theorize that the planet has an atmosphere and water. The discovery was announced Wednesday in the journal Nature.

The planet, prosaically named GJ 1214b, is one of more than 400 exoplanets now known to exist in the universe but one of only a handful of "super-Earths," having a rocky mass up to 10 times that of Earth's. Scientists say they will soon find such a rocky planet in the habitable region, or "Goldilocks zone," of a star, where its orbit will make it "not too hot" and "not too cold" to theoretically support life.

"This rock is not in the habitable zone," said Charbonneau. "It is a wee bit too hot, but only by a smidge."

Charbonneau said the surface temperature of the planet is probably between 150 and 200 degrees Celsius (300 to 400 degrees F). The star it circles is one-fifth the size of our sun and fairly cool. The planet is very close by, about 1.25 million miles, and orbits its sun every 38 hours.

"This is certainly in the realm of exciting news," said Charles Beichman, executive director of the NASA ExoPlanet Science Institute. Most of the 400 exoplanets found so far are gas giants like Jupiter, Beichman said.

None of the planets found so far is classified as "Earthlike," but this one is close.

"The M star discovery is roughly the right size and density, but is probably a bit too hot, too close to its parent star," Beichman said.

Charbonneau said the discovery, made in the first six months of MEarth's operation, shows the program is on the right track.

Charbonneau is targeting 2,000 nearby, dim stars with his array of eight, 16-inch telescopes on a ridge below the UA-Smithsonian Multiple-Mirror Telescope on Mount Hopkins.

"Basically it's a 16-inch telescope like a lot of amateurs would have," Charbonneau said.

Telescopes that size can't look deeply into space, but Charbonneau hypothesized that they would detect light lost when fairly large planets pass by fairly small, nearby stars.

This first proof of the concept tells him he's on the right path, Charbonneau said.

After MEarth determined that the planet, orbiting a star about 40 light-years away, had 2.7 times the radius of Earth, spectrographic analysis found it had six times Earth's mass, leading scientists to believe it is made up of more water than rock.

It also blocks more light than its radius would indicate, leading them to infer it has an atmosphere about 75 miles thick.

Charbonneau hopes to get a closer look at the atmosphere and has applied for time on the Hubble space telescope.

The pace of exoplanet discovery is "just explosive," said Beichman of the Exoplanet Science Institute, with discoveries coming from big and small telescopes on Earth and in orbit.

Just this week, an international team of astronomers announced they had found five exoplanets causing a wobble in sunlike stars, including at least two super-Earths. The team had combined data from giant telescopes in Hawaii and Australia.

The planets they found would be too close to their hot stars to have water or atmosphere, said a release from the team, led by Paul Butler of the Carnegie Institution's Department of Terrestrial Magnetism and Steven Vogt of the University of California-Santa Cruz.

Faith Vilas, director of the UA-Smithsonian Multiple-Mirror Telescope on Mount Hopkins, called the MEarth discovery "very, very cool" and proof that "scientists can be creative on any size telescope."

The search for planets in the habitable zone is "something that we, as human beings, should be really, really excited about," said Vilas.

Beichman said he expects that someone will find a planet within the next couple of years that could support life as we know it.

"Then you've certainly answered a 2,500-year-old question," he said. "You have scratched an intelligent itch."

Contact reporter Tom Beal at 573-4158 or tbeal@azstarnet.com

On StarNet: View images of outer space on the Science page at

azstarnet.com/science

"This is certainly in the realm of exciting news."

Charles Beichman, executive director of the NASA ExoPlanet Science Institute

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Wolbach Library: CfA in the News ~ Week ending 10 January 2010

1. **Kepler telescope spots 'Styrofoam' planet**, Staff, New Scientist, v205, n2742, p7, Saturday, January 9, 2010
2. **NASA VA space exhibit**, AP Alert - Business, Wednesday, January 6, 2010
3. **Galaxy Exposes Its Dusty Inner Workings in New Spitzer Image**, National Aeronautics and Space Administration Documents, Tuesday, January 5, 2010
4. **NASA EXTENDS CHANDRA SCIENCE, OPERATIONS SUPPORT CONTRACT**, US Federal News, Tuesday, January 5, 2010
5. **MASSIVE BLACK HOLE IMPLICATED IN STELLAR DESTRUCTION, UNIVERSITY OF ALABAMA ASTRONOMER'S RESEARCH FINDS**, US Federal News, Tuesday, January 5, 2010
6. **Our views Global warming is not settled science Earth is far more complicated than mere mortals can comprehend**, Dmedit, Charleston Daily Mail (WV), pP4A, Monday, January 4, 2010
7. **EDITORIAL: Scientists close in on other Earths**, Knoxville News-Sentinel (TN), Monday, January 4, 2010
8. **EDITORIAL ROUNDUP**, Augusta Chronicle, The (GA), All ed, pA09, Saturday, December 19, 2009

Record - 1

DIALOG(R)

Kepler telescope spots 'Styrofoam' planet,
Staff,
New Scientist, v205, n2742, p7,
Saturday, January 9, 2010

TEXT:

CALL it the polystyrene planet. This bloated exoplanet is just one of a clutch NASA's Kepler telescope has trained its beady eye on.

Kepler has been scrutinising 100,000 stars since April 2009, searching for telltale dips in starlight created by planets passing in front of their host stars. During its first six weeks on the job, Kepler found five new

planets, according to results presented on Monday at the American Astronomical Society's meeting in Washington DC.

Kepler 7b is about 1.5 times as wide as Jupiter, though only a tenth as dense - similar to polystyrene - making it one of the most diffuse planets yet found. Heat is thought to have caused the planet to bloat, but how it did this is not yet understood.

"We think this has something to do with the fact that they are all very close to their host stars... but we haven't found the smoking gun," says team member Dimitar Sasselov of the Harvard-Smithsonian Center for Astrophysics in Cambridge, Massachusetts.

While the new planets are inhospitably hot, mission members say finding them bodes well for Kepler's ability to detect Earth's twins.

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Record - 2

DIALOG(R)
NASA VA space exhibit,
AP Alert - Business
Wednesday, January 6, 2010

TEXT:

-- WITH PHOTO -- TO EDUCATION, SCIENCE AND STATE EDITORS:

NASA's 'Exploring Space' Exhibit Coming to James City County Library

WILLIAMSBURG, Va., Jan 6 /PRNewswire-USNewswire/ -- In addition to checking out a book, you can also check out what life is like in space and

meet an astronaut during the "Exploring Space With NASA" event at the James City County Library, Jan. 23.

(Logo: <http://www.newscom.com/cgi-bin/prnh/20081007/38461LOGO>)

Co-sponsored by the Williamsburg Regional Library and NASA Langley

Research Center in Hampton, Va., the daylong "Exploring Space With NASA"

event

kicks off the traveling exhibit, "Visions of the Universe: Four Centuries of

Discovery," that will be displayed at the James City County Library, 7770 Croaker Road, from Jan. 13 through March 26, 2010.

At the event, you can meet former Astronaut Susan Still-Kilrain, a naval aviator who flew on two shuttle flights and traveled nearly eight million miles in space. She will present a video of her missions at 11 a.m. and 1:30

p.m. Throughout the day, a variety of hands-on activities will be held for children conducted by NASA Langley educators and by staff from the Virginia Air and Space Center. All programs, including the exhibit, are free.

"Visions of the Universe" focuses on astronomy through the ages - from Galileo's initial findings to the latest results of the Hubble Space Telescope. The Space Telescope Science Institute in Baltimore, Md.; the Smithsonian Astrophysical Observatory in Cambridge, Mass.; and the American Library Association in Chicago present the exhibit, through funding from the National Aeronautics and Space Administration.

Williamsburg Regional Library consists of the James City County Library, Mobile Library Services and the Williamsburg Library and serves more than 85,000 people in the City of Williamsburg, James City County and portions of

York County. Williamsburg Regional Library is one of 40 library systems nationwide selected to host the traveling exhibit, "Visions of the Universe:

Four Centuries of Discovery."

A complete list of programs associated with "Visions of the Universe" is posted at: <http://www.wrl.org/programs/visions.html>.

NASA news releases are available automatically by sending an e-mail message to Langley-news-requests@lists.nasa.gov 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 Langley-news-request@lists.nasa.gov with the word "unsubscribe" in the subject line.

SOURCE NASA

01/06/2010

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Record - 3

DIALOG(R)

Galaxy Exposes Its Dusty Inner Workings in New Spitzer Image,
National Aeronautics and Space Administration Documents,
Tuesday, January 5, 2010

TEXT:

MEDIA RELATIONS OFFICE JET PROPULSION LABORATORY CALIFORNIA INSTITUTE OF TECHNOLOGY NATIONAL AERONAUTICS AND SPACE ADMINISTRATION PASADENA, CALIFORNIA 91109. TELEPHONE 818-354-5011 <http://www.jpl.nasa.gov>

Whitney Clavin 818-354-4673 Jet Propulsion Laboratory, Pasadena, Calif.
whitney.clavin@jpl.nasa.gov

NEWS RELEASE: 2010-003 - - - - Jan. 5, 2010

Galaxy Exposes Its Dusty Inner Workings in New Spitzer Image

The full version of this story with accompanying images is at:

<http://www.jpl.nasa.gov/news/news.cfm?release=2010-003&cid=release2010-003>
NASA's Spitzer Space Telescope has captured an action-packed picture of the nearby Small Magellanic Cloud, a small galaxy that looks like a wispy cloud when seen from Earth.

From Spitzer's perch up in space, the galaxy's clouds of dust and stars come into clear view. The telescope's infrared vision reveals choppy piles of recycled stardust -- dust that is being soaked up by new star systems and blown out by old ones.

To some people, the new view might resemble a sea creature, or even a Rorschach inkblot test. But to astronomers, it offers a unique opportunity to study the whole life cycle of stars close-up. The image is available online at <http://www.nasa.gov/AAS> and

<http://www.jpl.nasa.gov/aas>.

"It's quite the treasure trove," said Karl Gordon, the principal investigator of the latest Spitzer observations at the Space Telescope Science Institute in Baltimore, Md. "Because this galaxy is so close and relatively large, we can study all the various stages and facets of how stars form in one environment."

The Small Magellanic Cloud, and its larger sister galaxy, the Large Magellanic Cloud, are named after the seafaring explorer Ferdinand Magellan, who documented them while circling the globe nearly 500 years ago. From Earth's southern hemisphere, they can appear as wispy clouds. The Small Magellanic Cloud is the farther of the pair, at 200,000 light-years away.

Recent research has shown that the galaxies may not, as previously suspected, orbit around the Milky Way. Instead, they are thought to be merely sailing by, destined to go their own way. Astronomers say the two galaxies, which are both less evolved than a galaxy like ours, were triggered to create bursts of new stars by gravitational interactions with the Milky Way and with each other. In fact, the Large Magellanic Cloud may eventually consume its smaller companion.

Gordon and his team are interested in the Small Magellanic Cloud not only because it is so close and compact, but also because it is very similar to young galaxies thought to populate the universe billions of years ago. The Small Magellanic Cloud has only one-fifth the amount of heavier elements, such as carbon, contained in the Milky Way, which means that its stars haven't been around long enough to pump large amounts of these elements back into their environment. Such elements were necessary for life to form in our solar system.

Studies of the Small Magellanic Cloud therefore offer a glimpse into the different types of environments in which stars form.

The new Spitzer observations were presented today at the 215th meeting of the American Astronomical Society in Washington. They reveal the galaxy's youngest stars embedded in thick dust, in addition to the older stars, which spit the dust out. Taken together with visible-light observations, these Spitzer data help provide a census of the whole stellar population.

"With Spitzer, we are pinpointing how to best calculate the numbers of new stars that are forming right now," said Gordon. "Observations in the infrared give us a view into the birthplace of stars, unveiling the dust-enshrouded locations where stars have just formed."

Infrared light is color-coded in the new picture, so that blue shows older stars, green shows organic dust and red highlights dust-enshrouded star formation. Light encoded in blue has a wavelength of 3.6 microns; green is 8.0 microns; and red is 24 microns. This image was taken before Spitzer ran out of its liquid coolant in May 2009 and began its "warm" mission.

Other collaborators include: M. Meixner, M. Sewilo and B. Shiao of the Space Telescope Science Institute; M. Meade, B. Babler, S. Bracker of the University of Wisconsin at Madison; C. Engelbracht, M. Block, K. Misselt of the University of Arizona, Tucson; R. Indebetouw of the University of Virginia, Charlottesville; and J. Hora and T. Robitaille of the Harvard Smithsonian Center for Astrophysics, Cambridge, Mass.

The image includes Spitzer observations taken previously by a team led by Alberto Bolatto of the University of Maryland, College Park.

NASA's Jet Propulsion Laboratory, Pasadena, Calif., manages the Spitzer Space Telescope mission for NASA's Science Mission Directorate, Washington. Science operations are conducted at the Spitzer Science Center at the California Institute of Technology in Pasadena. Caltech manages JPL for NASA.

For more information about Spitzer, visit <http://www.spitzer.caltech.edu/spitzer> and <http://www.nasa.gov/spitzer>.

-end-

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DIALOG(R)

NASA EXTENDS CHANDRA SCIENCE, OPERATIONS SUPPORT CONTRACT,

US Federal News,

Tuesday, January 5, 2010

TEXT:

WASHINGTON, Dec. 31 -- NASA issued the following press release:

NASA has extended a contract with the Smithsonian Astrophysical Observatory in Cambridge, Mass., to provide science and operational support for the Chandra X-ray Observatory, a powerful tool used to better understand the structure and evolution of the universe.

The contract extension with the Smithsonian Astrophysical Observatory provides continued science and operations support to Chandra. This approximately \$172 million modification brings the total value of the contract to approximately \$545 million for the base effort. The base effort period of performance will continue through Sept. 30, 2013, except for the work associated with the administration of scientific research grants, which will extend through Feb. 28, 2016. The contract type is cost reimbursement with no fee.

In addition to the base effort, the contract includes two options for three years each to extend the period of performance for an additional six years. Option 1 is priced at approximately \$177 million and Option 2 at approximately \$191 million, for a total possible contract value of about \$913 million.

The contract covers mission operations and data analysis, which includes observatory operations, science data processing and astronomer support. The operations tasks include monitoring the health and status of the observatory and developing and uplinking the observation sequences during Chandra's communication coverage periods. The science data processing tasks include the competitive selection, planning and coordination of science observations and processing and delivery of the resulting scientific data.

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.

For more information about NASA visit: <http://www.nasa.gov>

For more information about the Chandra X-ray Observatory visit:
<http://chandra.nasa.gov> For more information please contact: Sarabjit Jagirdar, Email:- htsyndication@hindustantimes.com.

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Record - 5

DIALOG(R)

MASSIVE BLACK HOLE IMPLICATED IN STELLAR DESTRUCTION, UNIVERSITY OF ALABAMA ASTRONOMER'S RESEARCH FINDS,

US Federal News,
Tuesday, January 5, 2010

TEXT:

TUSCALOOSA, Ala., Jan. 4 -- The University of Alabama issued the following news release:

New results from research led by a University of Alabama astronomer suggest that a dense stellar remnant has been ripped apart by a black hole a thousand times as massive as the sun.

If confirmed, this discovery would be a cosmic double play: it would be strong evidence for an intermediate mass black hole, which has been a hotly debated topic, and would mark the first time such a black hole has been caught tearing a star apart.

Dr. Jimmy Irwin, assistant professor in UA's department of physics and astronomy, led the team which obtained the results from NASA's Chandra X-ray Observatory and the Magellan telescopes.

"Astronomers have made cases for stars being torn apart by supermassive black holes in the centers of galaxies before, but this is the first good evidence for such an event in a globular cluster," said Irwin.

The cosmic double-play scenario is based on Chandra observations, which revealed an unusually luminous source of X-rays in a dense cluster of old stars, and optical observations that showed a peculiar mix of elements associated with the X-ray emission.

Taken together, a case can be made that the X-ray emission is produced by debris from a disrupted white dwarf star that is heated as it falls towards a massive black hole. The optical emission comes from debris further out that is illuminated by these X-rays.

The intensity of the X-ray emission places the source in the ultraluminous

X-ray source, or ULX, category, meaning that it is more luminous than any known stellar X-ray source, but less luminous than the bright X-ray sources (active galactic nuclei) associated with supermassive black holes in the nuclei of galaxies.

The nature of ULXs is a mystery, but one suggestion is that some ULXs are black holes with masses between about a hundred and several thousand times that of the sun, a range intermediate between stellar-mass black holes and supermassive black holes located in the nuclei of galaxies.

This ULX is in a globular cluster, a very old and crowded conglomeration of stars. Astronomers have suspected that globular clusters could contain intermediate-mass black holes, but conclusive evidence for this has been elusive.

Irwin and his colleagues obtained optical spectra of the object using the Magellan I and II telescopes in Las Campanas, Chile. These data reveal emission from gas rich in oxygen and nitrogen but no hydrogen, a rare set of signals from globular clusters. The physical conditions deduced from the spectra suggest that the gas is orbiting a black hole of at least 1,000 solar masses. The abundant amount of oxygen and absence of hydrogen indicate that the destroyed star was a white dwarf, the end phase of a solar-type star that has burned its hydrogen leaving a high concentration of oxygen. The nitrogen seen in the optical spectrum remains an enigma.

"We think these unusual signatures can be explained by a white dwarf that strayed too close to a black hole and was torn apart by the extreme tidal forces," said co-author Joel Bregman of the University of Michigan.

Theoretical work suggests that the tidal disruption-induced X-ray emission could stay bright for more than a century, but it should fade with time. So far, the team has observed there has been a 35 percent decline in X-ray emission from 2000 to 2008.

The ULX in this study is located in NGC 1399, an elliptical galaxy about 65 million light years from Earth.

Irwin presented these results at the 215th meeting of the American Astronomical Society in Washington, DC.

NASA's Marshall Space Flight Center in Huntsville 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, can be found at:

<http://chandra.harvard.edu>

and

<http://chandra.nasa.gov>

The department of physics and astronomy is part of UA' s 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 more information please contact: Sarabjit Jagirdar, Email:- htsyndication@hindustantimes.com.

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Record - 6

DIALOG(R)

Our views Global warming is not settled science Earth is far more complicated than mere mortals can comprehend,

Dmedit,

Charleston Daily Mail (WV), pP4A,

Monday, January 4, 2010

TEXT:

E-MAILS from leading global warming scientists cast some doubt over whether they had uncovered a dangerous increase in the world's temperatures, or whether they were trying to "hide the decline," as one e-mail put it.

But even without the e-mails involved in "Climategate," there is plenty of doubt about how much Man knows about the workings of his planet.

Responsible people will be cautious about accepting profound changes in the economy in an attempt to stop global warming.

The globe, it turns out, is a very complicated place, and the universe in which it spins is even more so.

For example, Richard Lovett of the National Geographic News service reported recently that Earth's north magnetic pole is shifting rapidly toward Siberia at the rate of almost 40 miles a year. It is now close to Canada's Ellesmere Island.

Scientists located the magnetic pole in 1831, and for 73 years, it didn't move very much. In 1904, however, it began shifting fairly consistently northeastward at the speed of 9 miles per year.

Now it moves swiftly.

Then there is the matter of solar activity.

It usually is cyclical. But after activity peaked in May 2000 with 170 sunspots, it dropped to zero in August 2007.

"The Sun has been at an extended minimum for the past two years," said Leon Golub, a senior astrophysicist at the Harvard-Smithsonian Institute for Astrophysics.

While he said the Sun is responsible for only 10 percent of climate variation, that is a pretty important variable if a few degrees in variance can cause the calamities that Al Gore and others have predicted. Science cannot explain why the Sun seems to be inactive for an extended period, although this has happened before.

Then there is the contention by Wolfgang Knorr of the Department of Earth Sciences at the University of Bristol in England that carbon dioxide levels in the atmosphere are about where they were 160 years ago.

Earth science is far more complicated than government officials wish to admit.

Some members of Congress insist that the "argument is over," and the federal government must burden Americans with high taxes on carbon dioxide emissions to save the planet.

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Record - 7

DIALOG(R)

EDITORIAL: Scientists close in on other Earths,
Knoxville News-Sentinel (TN),
Monday, January 4, 2010

TEXT:

Jan. 4--Astronomers are one step closer to discovering another Earth, a

planet that is roughly the same size and at enough distance from its star that it is in theory habitable. It is not far-fetched to say that this will very likely happen in the not-too-distant future.

The first extrasolar planets were discovered 15 years ago, and now more than 400 have been found and at an accelerating pace.

The early discoveries were gas giants on the order of Jupiter and Pluto, and they orbited far too close to their stars.

But as techniques have improved, astronomers are able to identify smaller, occasionally rocky, planets, orbiting far enough from their stars to be close to what is considered a habitable zone.

Especially sought are planets in a category known as "super-Earths," those that are within 10 times the mass of Earth.

Now a team from the Harvard-Smithsonian Center for Astrophysics has discovered a planet orbiting a star in the Ophiuchus constellation that is only 2.7 times the size of Earth and 6.6 times as massive.

And it is mainly water, alas, at 400 degrees F clouds of superheated steam over boiling oceans.

Team leader David Charbonneau told The New York Times, with a certain understatement, "This probably is not habitable, but it didn't miss the habitable zone by that much."

Ophiuchus is 40 light-years from Earth, a huge distance but one that Charbonneau put into an arresting perspective for the Times:

"Our own TV signals have already passed this star."

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Record - 8

DIALOG(R)

EDITORIAL ROUNDUP,

Augusta Chronicle, The (GA), All ed, pA09,
Saturday, December 19, 2009

TEXT:

-The Valdosta (Ga.) Daily Times

* Other Earths? Could be

Astronomers are one step closer to discovering another Earth, a planet that is roughly the same size and at enough distance from its star that it is in theory habitable. It is not far-fetched to say that this will very likely happen in the not-too-distant future.

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Ophiuchus is 40 light-years from Earth, a huge distance but one that Charbonneau put into an arresting perspective for the Times: "Our own TV signals have already passed this star."

- Scripps Howard News Service

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Wolbach Library: CfA in the News ~ Week ending 17 January 2010

1. **Paired stars may birth multiple litters of alien worlds**, Maggie McKee, New Scientist, v205, n2743, p10, Saturday, January 16, 2010
2. **United States : NASA Extends Chandra Support Contract**, TendersInfo, Wednesday, January 13, 2010
3. **Climate "teacup tempest"? When the released e-mails of some of the world's most respected climate alarmists showed that they were manipulating data,...** Jasper, William F., New American, v26, n1, p17(4), Monday, January 4, 2010

Record - 1

DIALOG(R)

Paired stars may birth multiple litters of alien worlds,
Maggie McKee,
New Scientist, v205, n2743, p10,
Saturday, January 16, 2010

TEXT:

WE THINK of stars as having just one shot at forging planets - a narrow window when the infant stars are surrounded by a disc of dust and gas. Now it seems paired stars may regularly spawn two or even three generations of planets.

The mechanism for this, proposed by Hagai Perets at the Harvard-Smithsonian Center for Astrophysics in Cambridge, Massachusetts, is simple, if somewhat macabre. A first clutch of planets would form as normal from a disc around one or both of the young stars. When one of the stars dies, it sheds material that then forms a disc around its surviving partner, providing the building blocks for a second generation of planets. Such discs have already been observed. A third generation may even rise from the ashes shed during the death of the second star. Double-star systems offer "a whole different regime for where to look for planets", says Perets (arxiv.org/1001.0581v1).

Finding such systems may not be too difficult. Planets that are observed orbiting closer or further away from a star than expected for a single star system may be second generation, mainly because double stars drift apart or draw closer together as they lose mass. Perets has identified several candidates.

As well as this, multiple litters may be spotted orbiting in two different planes, or rotating in different directions within the same plane. Second-generation planets might also be identified if they are unusually massive: some second-generation planets form when material from the dying star flows onto existing planets, potentially causing them to become hefty objects called brown dwarfs.

The process could be bad news for existing planets. The addition of gas and dust could impart enough friction to knock them out of orbit, and perhaps even right out of the system, says Perets.

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Record - 2

DIALOG(R)

United States : NASA Extends Chandra Support Contract

TendersInfo,

Wednesday, January 13, 2010

TEXT:

NASA awarded a contract extension potentially worth nearly \$540 million to the Smithsonian Astrophysical Observatory in Cambridge, Mass., to provide up to 10 more years of science and flight operations support for the Chandra X-ray Observatory, according to a Dec. 31 agency news release. Launched in 1999 aboard Space Shuttle Columbia, Chandra is part of NASA's fleet of Great Observatories, along with the Hubble Space Telescope, the Spitzer Space Telescope and the now deorbited Compton Gamma Ray Observatory. Managed by NASA's Marshall Spaceflight Center in Huntsville, Ala., Chandra and its instruments allow scientists from around the world to see unprecedented X-ray images of the electromagnetic spectrum. More than 100 times more powerful than any previous X-ray telescope, Chandra's life expectancy was initially limited to five years, though in September 2001 NASA said it would extend the observatory's mission through 2009, based on its outstanding performance to date. Since then, studies have indicated Chandra could last even longer, and the Smithsonian Astrophysical Observatory's recent contract extension suggests the spacecraft could continue operating through the end of the decade. The initial \$172 million contract modification extends science and flight operations support through Sept. 30, 2013, bringing the total contract value to approximately \$545 million, according to the news release. But if two additional options are exercised, that value will rise to \$913 million through 2019. Those additional extensions, each lasting three years, are valued at \$177 million and \$191 million, NASA said.

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Record - 3

DIALOG(R)

Climate "teacup tempest"? When the released e-mails of some of the world's most respected climate alarmists showed that they were manipulating data,....,

Jasper, William F.,
New American, v26, n1, p17(4),
Monday, January 4, 2010

TEXT:

Climate "teacup tempest"? When the released e-mails of some of the world's most respected climate alarmists showed that they were manipulating data, environmentalists tried to downplay the deceit.

[ILLUSTRATION OMITTED]

"As near as I can tell, Climate Gate is almost entirely a tempest in a teacup," wrote Kevin Drum in a November 30 column for the left-wing magazine Mother Jones. "There's nothing questionable there," he insisted. The tempest-in-a-teacup/no-big-deal trope has been regularly invoked by the proponents of global-warming alarmism to dismiss the significance of what may be one of the biggest science scandals in history.

The "Climategate" to which Drum refers is, of course, the still-developing scandal involving the release of thousands of e-mails and documents from a British climate research center. The leaked documents expose some of the biggest scientific names in the global-warming debate to serious charges of fraud, unethical attacks on colleagues, censorship of opposing viewpoints, and possible criminal destruction of, and withholding of, evidence.

The timing of Climategate has been a major boon to skeptics of catastrophic climate change and a monster headache to alarmists, breaking onto the world scene only three weeks before the United Nations Climate Change Conference (COP15) convened on December 7 in Copenhagen, Denmark.

Michael Mann, James Hansen, Phil Jones, Michael Oppenheimer, Stephen Schneider, and Kevin Trenberth--some of the biggest names in global-warming alarmism--are unfavorably exposed in the documents that were posted on the Internet on November 20 by unknown hackers who penetrated the computer system of the Climate Research Unit (CRU) at Great Britain's University of East Anglia. Phil Jones, the director of the CRU and a top guru in the

Intergovernmental Panel on Climate Change (IPCC), the UN's climate brain trust, comes off especially poorly in the e-mails. After initially balking at calls to resign or step down, the university announced on December 1 that Jones would be taking temporary leave while an independent inquiry is conducted into the matter.

Climatologist Patrick Michaels, who has long criticized the IPCC process, sees the e-mail scandal far differently than Kevin Drum, and chooses a much different metaphor to describe it. "This is not a smoking gun," says Dr. Michaels, "this is a mushroom cloud." On the face of it, it would seem difficult to dispute Professor Michaels' assessment. The Climategate e-mails provide powerful confirmation of charges by many scientists over the years that the UN's IPCC process is politically not scientifically--driven and that claims of scientific "consensus" to justify radical policies are a gross corruption of science. In the past, scientists who questioned the Jones-Mann-IPCC "consensus" have been denounced as "deniers" a vicious attempt to associate them with Nazi holocaust denial or "shills" for the fossil-fuel industries ... or both. Now, however, scientists who cannot be classified as skeptics indeed, some are prominent names in the alarmist camp are challenging the IPCC and the Climategate defendants to come clean and release the data on which they have been basing their dire predictions, but have been withholding from the public and their scientific peers.

"Tricks" and "Consensus"

In one damaging e-mail that has been widely publicized, Jones writes to colleagues that he has just used Mike's "Nature trick" of adding other temperature data to "hide the decline" in recent global temperatures. They had to resort to such trickery because the data conflicted with their claims that anthropogenic (human-caused) global warming, or AGW, is heating up the planet to unacceptable levels and must be curtailed before it leads to irreversible global catastrophe.

[ILLUSTRATION OMITTED]

The Mike referred to in this message is Michael Mann, professor of meteorology at Pennsylvania State University, whose influential "hockey stick" graph utilized statistical manipulation to produce a curve that would support claims of recent human activities causing the warmest period in the past millennia. The now thoroughly discredited "hockey stick," which was a big component of Al Gore's Nobel Prize-winning documentary, *An Inconvenient Truth*, attempted to wipe the Medieval Warm Period, one of the most solidly established periods of climate history, from the historical record.

During the Medieval Warm Period (about A.D. 800-1300), temperatures were higher than today; the Vikings colonized then-balmy Greenland and roamed the ice-free waters of the North Atlantic. If allowed to stand, this inconvenient truth would undercut the alarmists' exaggerated claims that burning fossil fuels is causing the warmest temperatures in 1,000 years. In trying to make the Medieval Warm Period disappear, the Jones/Mann team went too far, and other scientists responded with a robust "smack-down" of this attempt to falsify the historical record. However, before Mann was forced to retract some of his most egregious statistical falsifications, he and his allies had managed to vilify many reputable scientists and keep their sham going for several years. In 1998, astrophysicists Sallie Baliunas and Willie Soon of the Harvard-Smithsonian Center for Astrophysics challenged the Mann-Jones thesis, arguing in the journal *Climate Research* that the evidence supported the existence of the Medieval Warm Period. Drs. Soon and Baliunas were soon subjected to a smear campaign and six editors at *Climate Research* were forced to resign for allowing the Soon-Baliunas article to be published.

Now the Climategate e-mails are showing that the corruption of science in the name of "saving the planet" from the supposed scourge of climate change is far more extensive and egregious than the public or the scientific community realized.

In an e-mail of January 29, 2004 to Michael Mann, Phil Jones refers to the recent death of global-warming critic John L. Daly with this churlish comment: "In an odd way this is cheering news!" In the same e-mail, Jones then suggests to Mann that he has obtained legal advice that he does not have to comply with Freedom of Information (FOI) requests from other scientists to release data and codes underlying his research claims. Some of the e-mails seem to confirm concerns that Jones, Mann, et al., have destroyed data that could expose their fraudulent methods. That appears to be the case in a May 29, 2008 e-mail message, in which Jones writes to Mann about deleting data for the IPCC Fourth Assessment Report (AR4):

Mike, Can you delete any e-mails you may have had with Keith re AR4? Keith will do likewise.... Can you also email Gene and get him to do the same?... Will be getting Caspar to do likewise.

In another e-mail that has shocked and infuriated many in the scientific community, Jones reveals the lengths to which he is willing to go to sabotage fellow scientists in order to maintain the myth of AGW "consensus." In a July 8, 2004 e-mail, Jones assures Mann that he (Jones) and Kevin Trenberth will censor opposing scientific views from the forthcoming IPCC report. Jones writes:

I can't see either of these papers

being in the next IPCC report. Kevin and I will keep them out somehow-- even if we have to redefine what the peer-review literature is!

Similar e-mails paint a picture confirming the charges of critics that Jones, Mann, and other IPCC activists constitute a "climate mafia" or "climate cartel" that punishes dissenters and rewards those who toe the global-warming party line. The e-mails are shedding light on ugly episodes over the past decade or more in which the cartel trashed the reputations of, and slammed doors on, distinguished scientists who dared to dispute the politically ordained AGW orthodoxy. With this kind of control, claims of overwhelming consensus become a self-fulfilling prophecy; contrary opinions are effectively barred from publication in accepted "peer-reviewed" literature. Besides Drs. Soon and Baliunas, other eminent scientists who are trashed or referred to crudely in the CRU e-mails include Richard Lindzen; Hans Von Storch; Sonia Boehmer-Christianson; Patrick Michaels; Roger Pielke, Sr.; Robert Baling; Fred Singer; and Tim Ball.

Huge government grants, impressive computer models, and guaranteed headline stories from sympathetic activists in the media have transformed climate scientists into celebrities and power brokers. However, even with their super computer programs, political connections, and prestigious awards, they still haven't learned how to predict the weather, let alone control it.

An amusing admission against interest is this comment in an October 12, 2009 Climategate e-mail from Dr. Kevin Trenberth. He is stunned that not only have temperatures not warmed as predicted, but the temperatures have actually hit historic lows in his area, contradicting the supposedly authoritative pronouncements of the climate cartel. Trenberth comments:

Well I have my own article on where the beck is global warming? We are asking that here in Boulder [Colorado] where we have broken records the past two days for the coldest days on record.

Trenberth then goes on to admit: "The fact is that we can't account for the lack of warming at the moment and it is a travesty that we can't."

[ILLUSTRATION OMITTED]

Not only did Trenberth, Jones, Mann, et al., miss the current temperature downturn, but none of the IPCC's highly praised computer models foresaw the global mean temperature decline of the past decade. However, their

inability to explain away this enormous fact, which Trenberth admits is "travesty," has neither diminished the cartel's certitude nor dampened its zeal for implementing a planetary climate regime.

"Ignore That Man Behind the Curtain"

For years, the IPCC climate cartel has been using the "Wizard of Oz" defense every time some "Toto" pulls back the curtain to expose the IPCC's secretive machinations and its sanctimonious claims of "transparency," "openness," and "overwhelming consensus." Inquiring scientists and the general public alike are told not to pay attention to the mysterious process behind the curtain where the fantastic and frightening scenarios of impending doom are being created.

However, two Canadian "Totos" refused to stop tugging on the curtain, and, as a result, have successfully exposed some of the trickery of the IPCC "wizards." Retired businessman and statistician Stephen McIntyre and economist Ross McKittrick have doggedly pursued the truth and have subjected the IPCC's "climate science" to rigorous examination. Troubled by unexplained statistical anomalies in Mann's infamous "hockey stick" graph, they contacted Mann to request copies of his data sets. Mann balked and also refused to divulge publicly the algorithm he had used to concoct his "hockey stick" graph. McIntyre and McKittrick published several articles challenging Mann's work on a number of key points. Their path-breaking research sparked a congressional hearing validated by two independent academic panels, one of which was appointed by the National Academy of Sciences.

McIntyre and McKittrick have continued their independent investigations on their award-winning Internet website, ClimateAudit.com, which has won the respect of even many AGW proponents. However, it is clear that Mann, Jones, and the climate cartel regard the two dauntless sleuths as the enemy, and they are the subject of many Climategate e-mails, often referred to as "MM" or "the two MMs."

In an incriminating CRU e-mail of February 2, 2005, Jones writes to Mann:

The two MMs have been after the
CRU station data for years. If they
ever hear there is a Freedom of Information
Act now in the UK, I think
I'll delete the file rather than send to
anyone.

Oops! The Dog Ate It

The climate cartel, it appears, has already carried through on the data deletion threat. Scientists at the University of East Anglia CRU have admitted throwing out much of the raw data on which their ominous predictions are based.

In a statement on its website, the CRU said: "We do not hold the original raw data but only the value-added (quality controlled and homogenised) data." What happened to the original data? According to the CRU, it was discarded back in the 1980s. What this means is that the original CRU data cannot be checked or replicated, which means that the graphs, research, and predictions supposedly based on the missing data is worthless. The available "value-added" and "homogenised" data would also then be worthless, since there would be no way to verify or replicate it.

How many other data sets have likewise been "lost" or "accidentally deleted"? We may soon find out, as official investigations and FOIA lawsuits progress. In the meantime, we are simply supposed to trust the IPCC "experts" who say that we must "invest" trillions of dollars for mitigation and reparation of past carbon consumption, as well as for prevention of future warming.

IPCC vice-chairman Jean-Pascal van Ypersele tried to minimize the significance of the e-mail scandal as the Copenhagen conference opened by claiming that Climategate only pertains to one data set out of many that confirm the serious peril posed by anthropogenic global warming.

"It doesn't change anything in the IPCC's conclusions," said van Ypersele, "it's only one line of evidence out of dozens of lines of evidence." This is the party line echoed by most of the AGW alarmists in government, media, and environmental activist circles. Along with this corollary: The skeptics (or "deniers," "shills") are exploiting the e-mail controversy simply to sabotage Copenhagen and distract the scientists and politicians from the important work they must conclude there.

[ILLUSTRATION OMITTED]

"We mustn't be distracted by the behind-the-times, anti-science, flat-earth climate sceptics," British Prime Minister Gordon Brown told the Guardian. "We know the science. We know what we must do. We must now act and ... seal the deal."

Brown's Environmental Secretary, Ed Miliband, was even more scathing, describing skeptics as "dangerous and deceitful." "The approach of the climate saboteurs is to misuse data and mislead people," he charged. Miliband's accusations are especially audacious, inasmuch as it is his alarmist camp, not the skeptics (or "climate realists," as many prefer to call themselves), that has been caught red-handed misusing data. "The

skeptics are playing politics with science in a dangerous and deceitful manner," Miliband continued, then concluded with this warning: "There is no easy way out of tackling climate change despite what they would have us believe. The evidence is clear and the time we have to act is short. To abandon this process now would lead to misery and catastrophe for millions."

According to van Ypersele, "We are spending a lot of useless time discussing this rather than spending time preparing information for the negotiators."

Professor Judith Curry ham provided van Ypersele, Miliband, Brown, the IPCC, and other alarmists with an easy solution to this problem: Stop hiding your data and stop engaging in the hostile "tribalism" displayed in the infamous e-mail attacks on fellow scientists. Dr. Curry is no "climate skeptic." In fact, she is an AGW true believer, an IPCC expert reviewer, and chair of the School of Earth and Atmospheric Sciences at the Georgia Institute of Technology. Dr. Curry says:

Scientists claim that they would never get any research done if they had to continuously respond to skeptics. The counter to that argument is to make all of your data, metadata, and code openly available. Doing this will minimize the time spent responding to skeptics: try it! If anyone identifies an actual error in your data or methodology, acknowledge it and fix the problem. Doing this would keep molehills from growing into mountains that involve congressional hearings, lawyers, etc.

In other words, why not actually practice the transparency and openness that the UN and IPCC claim to favor? Don't hold your C[O.sub.2] while waiting for that to happen.

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Wolbach Library: CfA in the News ~ Week ending 24 January 2010

1. **Stranger than fiction**, Mark Sappenfield, Courier Mail (Australia), 1 - First with the news ed, p20, Monday, January 25, 2010

2. **If you go . . . Wishing you knew what star you wished upon? The cold, clear light of night is the time to find out**, Boston Globe (MA), p5, Sunday, January 24, 2010

Record - 1

DIALOG(R)

Stranger than fiction

Mark Sappenfield

Courier Mail (Australia), 1 - First with the news ed, p20, Monday, January 25, 2010

TEXT:

Floating mountains? Glowing plants? They're in Avatar and they're not beyond the realm of scientific possibility, writes Mark Sappenfield THE producer of Avatar is fond of saying that director James Cameron does not write science fiction, he writes science fact

From the reclining, cup-holdered seat of a multiplex cinema, that seems a generous statement. Neither mountains floating in mid-air or fauna that lights up like Las Vegas at night would seem to have the slightest foundation in reality. And yet they do

Beneath some of Cameron's most outlandish visions is often a kernel of scientific possibility

Take the floating Hallelujah Mountains. The topic of how an entire mountain range can bob over the landscape like corks is never explicitly addressed in the film, yet the explanation is woven throughout the story

It has to do with superconductors, which can float when in the presence of a magnetic field

Avatar's alien world of Pandora, it turns out, is simply a massive superconductor

At the beginning of the story, we are told that humans have come to Pandora to mine unobtainium - the ultimate superconductor

In Cameron's world, unobtainium can conduct electricity without resistance at room temperature; the best current superconductors work only when the temperature is below minus 93C

The discovery of unobtainium, which exists only on Pandora, revolutionised technology on Earth, the story goes, and the future human economy is dependent upon it

On Pandora, however, entire mountains loaded with unobtainium float in the world's massive magnetic field

In a glimpse of how thoroughly Cameron has analysed the science behind his creation, he and his team have written a 380-page Pandorapedia that explains the tectonics behind how such mountains could form. In effect, they crumble upward

This happens because Pandora is not a planet but a moon of a gas giant the size of Saturn - the fictional planet Polyphemus. Moons of gas giants are constantly tugged and deformed by the stresses of gravity

One of Jupiter's moons is pulled so violently by the gravitational forces of Jupiter and its other large moons, that it has ground tides - the ground rises and falls like a sea tide on Earth

On Cameron's Pandora, tidal stresses have fractured the landscape, and, in the case of the Hallelujah Mountains, sent it up into the sky

Cameron's fascination with the deep sea has already led to one of the most successful films of all time: Titanic. It appears to have shaped Avatar, too

The ocean's depths have a curious answer to sunlight, which has never been seen there. It's called bioluminescence - organisms ability to create their own light

On Pandora, where the nights can be long, Cameron has suggested that an entire bioluminescent ecosystem could emerge

This is where Cameron's decision to make Pandora a moon, and not a planet, comes in. Astronomers are still looking for planets like Earth, small and rocky within the so-called Goldilocks zone - not so close to its star that its life-giving water evaporates, yet not so far away that it freezes into ice

But small planets are hard to find. Instead, scientists have found gas

giants like Saturn in the habitable zone around stars. Those planets are not habitable but their moons could be

That makes moons a good place to start looking for alien life

"All of the gas giant planets in our solar system have rocky and icy moons," said Lisa Kaltenegger of the Harvard-Smithsonian Centre for Astrophysics

"That raises the possibility that alien Jupiters will also have moons. Some of those may be Earth-sized and able to hold onto an atmosphere." The problem is that gas giants emit tremendous amounts of radiation. The daily radiation on Jupiter, for instance, is 4000 times the lethal dose
Yet here again, Cameron uses science to solve science's own problems. The robust magnetic field created by Pandora's superconductivity deflects the radiation

At one point in the film, a spectacular aurora dances overhead

Striking filmmaking, yes. But also pure science. The companion book, *Avatar: A Confidential Report on the Biological and Social History of Pandora*, adds that the interaction of the magnetic fields of Pandora and its parent planet causes a giant increase in electrical activity on both bodies, with massive auroral storms and other electromagnetic phenomenon.

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Record - 2

DIALOG(R)

If you go . . . Wishing you knew what star you wished upon? The cold, clear light of night is the time to find out,
Boston Globe (MA), p5,
Sunday, January 24, 2010

TEXT:

BY PATRICIA HARRIS AND DAVID LYON | GLOBE CORRESPONDENTS

Who needs fantasy games or blue-skinned sci-fi melodramas when the great hunter, the god of war, and the deposed ruler of the universe are all afoot?

Nature's compensation for the short days of winter are the long nights, where Orion, Mars, and Saturn (see above) rule the dark skies. If you have

always wanted to see starlight and planet-glow firsthand, the crisp seasonal air often offers crystalline visions of the night sky. Observatories and astronomy buffs all over New England stand ready to show you around the celestial neighborhood

One of the great viewing opportunities this winter takes place next Friday and Saturday nights, when the Amherst Area Amateur Astronomers Association ("the 5As") holds a rare winter observing program at Wilder Observatory on the Amherst College campus. The occasion is the Mars opposition: when the sun and Mars are on exactly opposite sides of Earth, an event that happens roughly every 26 months. The planet will be visible from sunset to sunrise. It won't be this bright again for a few years

The Wilder telescope was fabricated in 1903 by legendary telescope makers Alvan Clark & Sons of Cambridge. Its 18-inch front lens makes it one of the more powerful refracting telescopes still in use, and in 1907 the massive instrument was shipped to the high desert in Chile to make some of the first detailed photographs of Mars during that opposition. (It was immediately returned to its McKim, Mead, and White observatory.) The formidable telescope still employs its original clockwork mechanism. Tom Whitney, president of the 5As, says the 18-inch Alvan Clark is the telescope equivalent of a Stradivarius violin. "Everyone wants to come to the recital played on a Stradivarius."

Other vintage Alvan Clark instruments are operating elsewhere in New England. A 7.5-inch Clark telescope was installed at the Maria Mitchell Association's Loines Observatory on Nantucket in 1913. In winter, the observatory opens to the public on the Friday and Saturday nights closest to the first quarter moon. The timing presents strong sideways shadows on the moon, providing crisp images of lunar features, including the Mitchell crater named for the pioneering Nantucket astronomer (1818-89). The guide scope mounted on the side of the Clark instrument is fitted with the lens from Mitchell's own 1859 Clark telescope

"Our open nights are often the first introduction to astronomy for many people," says Vladimir Strel'nitski, director of astronomy at the Maria Mitchell Association. Nantucket is a great spot for stargazing, he adds, because light pollution is minimal. Ninety-minute programs usually include viewing of the moon and planets and of distant galaxies and nebulae. Visitors also get to see the massive modern 24-inch research telescope in operation

The 8-inch Alvan Clark at the Maynard F. Jordan Observatory on the University of Maine, Orono, campus is available for public stargazing on clear Friday and Saturday nights when the mercury rises above 10 degrees. Friday night sessions follow the free indoor star show at the university's planetarium, and Bill Shackelford of the Penobscot Valley Star Gazers

astronomy club is usually there to show visitors the skies. "Most people are amazed to see Jupiter or Saturn through a telescope like this," he says. "You can usually see a moon or two. We also look at a few globular clusters and the impressive Ring Nebula in the constellation Lyra ."

The venerable Rhode Island astronomy club, Skyscrapers, opens its rural Seagrave Observatory in North Scituate every clear Saturday night for public viewing "unless we're snowed in," says president Bob Horton. Among the club's four top-notch telescopes, the 1878 Alvan Clark 8 1/4-inch instrument takes pride of place. Visitors get a full tour of the telescope, and "then we look at whatever is prominent," says Horton. That includes Saturn, "which always looks so much more vivid than in photographs." The club also employs a 12-inch Newtonian telescope built by a member in the 1920s and two modern, computer-controlled Meade telescopes

Horton is also associated with the Ladd Observatory at Brown University. Although somewhat plagued by Providence's light pollution, this archetypal 1891 observatory features a vintage 12-inch refractor telescope. Open every clear Tuesday for public viewing, the observatory often attracts 100 or more visitors in warm weather - fewer in the winter. In addition to watching Mars this winter, Horton expects spectacular views of the Orion Nebula.

Marc Stowbridge, chairman of public viewing at the New Hampshire Astronomical Society, or NHAS, waxes poetic about anticipated views of the Orion Nebula. He explains that it is visible to the naked eye as the faint middle star of Orion's sword. "But through a telescope," he says, "it looks like someone took a neon sign of multiple colors, squashed it up in a bag, and emptied it into the sky. There are bright glints of green and blue and red - little baby stars."

NHAS members staff the Skywatch on the first Friday of each month at the McAuliffe-Shepard Discovery Center in Concord, N.H. In addition to using the center's own computer-guided 14-inch Celestron, members bring their own telescopes that Stowbridge says vary "from delightful little refractors to 12- to 14-inch siege cannon reflectors that you have to go up on a stepladder to see the eyepiece." Stowbridge describes the Skywatch as both a social event and an "existential experience. You're looking up at the Milky Way and suddenly you realize it consists of zillions of stars. Then you start looking at them through a telescope. . . . What looks like one star, like the Beehive Cluster, jumps out as dozens or hundreds of stars. You feel the immensity of the universe."

The John J. McCarthy Observatory in New Milford, Conn., specializes in observing near-Earth asteroids (the kind that figure in disaster movies). Researchers have discovered four such objects since the observatory was completed in 2000. The independent facility, located at New Milford High School, has three state-of-the-art telescopes: a bright 16-inch Meade, a 4.2-inch wide-angle astrograph for making images of broad swatches of the

sky, and a dedicated solar telescope with filters for studying the surface of the sun. "Second Saturday Stars" programs include a slide talk before gazing at whatever is prominent on a given night. Monty Robson, observatory association president, adds that visitors are welcome at any time. "Just call to see if anyone is around."

Pounding swords into plowshares, the Westport (Conn.) Astronomical Society, or WAS, built its Rolnick Observatory on top of a Cold War-era missile radar site. "It's the highest spot in Westport," says WAS member Phil Flynn. "Unfortunately that means we get hit by lightning every so often, and it fries the electronics. But the concrete pier makes the telescopes rock-steady." The society holds public nights every clear Wednesday and Thursday. Winter viewing is largely limited to the computerized 12 1/2-inch Newtonian telescope inside the dome, though in warmer weather volunteers roll a 25-inch Dobsonian telescope from its storage shed to let visitors get a gander through the "light bucket," the largest telescope accessible to the public in Connecticut.

The Westport astronomers especially welcome youngsters

"The first guy or gal to walk on Mars," says Flynn, "is sitting in an elementary school classroom today."

Patricia Harris and David Lyon can be reached at harris.lyon@verizon.net.

All stargazing programs are predicated on having a clear night for observation. Call the information number for any last-minute announcements. Since telescopes must be the same temperature as the outdoor air, winter stargazing is a chilly affair. Bundle up! Except where noted, all programs are free to the public

Wilder Observatory
Amherst College
Snell Street, Amherst
413-628-3290

Loines Observatory
Maria Mitchell Association
59 Milk St., Nantucket
508-228-9273; www.mmo.org
Maynard F. Jordan Observatory
University of Maine Orono
207-581-1348

www.galaxymaine.com/OB/OB.htm
Seagrave Observatory
47 Peepoad Road
North Scituate, R.I

www.theskyscrapers.org

Ladd Observatory
Brown University
210 Doyle Ave., Providence
401-863-2323
www.brown.edu/Departments/Physics/Ladd/McAuliffe-Shepard
Discovery Center
2 Institute Drive, Concord, N.H

603-271-7827
www.starhop.com
John J. McCarthy Observatory
388 Danbury Road
New Milford, Conn

860-354-1595

www.mccarthyobservatory.org
Rolnick Observatory
Westport Astronomical Society
182 Bayberry Lane
Westport, Conn

203-227-0925; www.was-ct.org

Starwatch
close to home
Harvard-Smithsonian
Observatory
60 Garden St., Cambridge
617-495-7461
cfa-www.harvard.edu

Boston University
Coit Observatory
725 Commonwealth Ave
617-353-2630
www.bu.edu/astronomy/opennight.html

Gilliland Observatory
Museum of Science
Science Park, Boston
617-589-0267; www.mos.org
Merrimack College Observatory
North Andover

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Wolbach Library: CfA in the News ~ Week ending 31 January 2010

- 1. Panel calls for global 'asteroid defence agency'**, Staff, New Scientist, v205, n2745, p7, Saturday, January 30, 2010
- 2. ASTRONOMERS USE RADIO TELESCOPE TO FIND RARE SUPERNOVA EXPLOSION**, US Federal News, Friday, January 29, 2010
- 3. UNIVERSITY OF IOWA STUDENT MARIA DROUT AWARDED CHURCHILL SCHOLARSHIP, SECOND FOR UNIVERSITY OF IOWA**, US Federal News, Friday, January 29, 2010
- 4. Edmund R. Malinowski: Pseudoscience responsible for global warming scare**, Edmund R. Malinowski, Guest columnist, The Stuart News, All Zones ed, pA9, Thursday, January 28, 2010
- 5. Supernovae linked to gamma ray bursts**, Stuart Gary for ABC Science Online, ABC Premium News, Thursday, January 28, 2010
- 6. Newborn black holes can give an extra boost to exploding stars**, Hindustan Times, Thursday, January 28, 2010
- 7. Unraveling the mystery of black holes, space warps**, STAN FREEMAN, Republican, The (Springfield, MA), ALL ed, pE01, Wednesday, January 27, 2010
- 8. Newborn Black Holes May Add Power to Many Exploding Stars**, National Aeronautics and Space Administration Documents, Wednesday, January 27, 2010
- 9. LECTURES ARE OUT OF THIS WORLD**, Herald Sun (Australia), 1 - FIRST ed, p58, Tuesday, January 26, 2010
- 10. On the fringe: astronomers look to the Kuiper belt for clues to the solar system's history.**, Cowen, Ron, Science News, v177, n2, p16(5) Saturday, January 16, 2010
- 11. Super-Earth may host water, but probably not life: further studies could reveal close-by planet's composition.**, Grossman, Lisa, Science News, v177, n2, p5(2) Saturday, January 16, 2010
- 12. Spotting planets for lower prices**, TOM BEAL; TOM BEAL, ARIZONA DAILY STAR, Arizona Daily Star (AZ), FINAL ed, pA1, Saturday, January 2, 2010

Record - 1

DIALOG(R)

Panel calls for global 'asteroid defence agency'

Staff

New Scientist, v205, n2745, p7

Saturday, January 30, 2010

TEXT:

FANCY working for the asteroid defence agency? You might get the chance if a report on the threat from asteroid impacts sinks in.

A huge number of asteroids pass close to Earth's orbit. One such asteroid is Apophis, which has a small chance of hitting us in 2036. Last week a US National Research Council panel issued a report on how best to respond to this threat. It recommended setting up an international body that would spring into action and defend the planet if an asteroid is found on a likely collision course.

The agency could even organise a space mission to deflect the rock. "It is the only natural disaster we know about where we could actually prevent it," says panel-leader Irwin Shapiro of the Harvard-Smithsonian Center for Astrophysics in Cambridge, Massachusetts.

The report also found that existing surveys probably won't reach the goal set by US Congress in 2005 to find 90 per cent of near-Earth asteroids that are 140 metres across or larger by 2020. A new space telescope could meet the goal by 2022, says the panel, but it would cost over \$1 billion.

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Record - 2

DIALOG(R)

ASTRONOMERS USE RADIO TELESCOPE TO FIND RARE SUPERNOVA EXPLOSION

US Federal News

Friday, January 29, 2010

TEXT:

CHARLOTTESVILLE, Va., Jan. 28 -- The University of Virginia issued the following news release:

For the first time, astronomers have found a supernova explosion with properties similar to a gamma-ray burst, but without detecting any gamma rays from it. The scientists say the discovery, using the National Science Foundation's Very Large Array radio telescope, located near Socorro, N.M., promises to point the way toward locating many more examples of these

mysterious explosions.

The telltale clue came when the radio observations showed material expelled from the supernova explosion, dubbed SN2009bb, at speeds approaching that of light. This characterized the supernova as the type thought to produce one kind of gamma-ray burst.

"It is remarkable that very low-energy radiation radio waves can signal a very high-energy event," noted University of Virginia astronomer Roger Chevalier, a co-author of the study, which appears today in the journal *Nature*.

When the nuclear fusion reactions at the cores of very massive stars no longer can provide the energy needed to hold the core up against the weight of the rest of the star, the core collapses catastrophically into a superdense neutron star or black hole. The rest of the star's material is blasted into space in a supernova explosion.

Understanding these explosions is important to better understanding the evolution of the universe, Chevalier said, because they provide the energy that causes stars to form and the heavy elements that make up the planets and, in fact, everything.

For the past decade or so, astronomers have identified one particular type of "core-collapse supernova" as the cause of one kind of gamma-ray burst. Only about one out of 100 supernovae produce gamma-ray bursts.

In the more common type of supernova, the explosion blasts the star's material outward in a roughly spherical pattern at speeds that, while fast, are only about 3 percent of the speed of light. In the supernovae that produce gamma-ray bursts, a small amount of the ejected material is accelerated in jets to nearly the speed of light. The jets burrow through the star and escape out of the surface.

The superfast speeds in these rare blasts, Chevalier and his colleagues say, are caused by an "engine" in the center of the supernova explosion that resembles a scaled-down version of a quasar. Material falling toward the core enters a swirling disk surrounding the new neutron star or black hole. This accretion disk produces jets of material boosted at tremendous speeds from the poles of the disk.

Until now, no such "engine-driven" supernova had been found any way other than by detecting gamma rays emitted by it.

This discovery by radio emission observation, rather than through gamma rays, is a breakthrough, Chevalier said. And more such discoveries soon will be possible, he added, when the Very Large Array is refurbished in the

next few months.

"The community of radio observers likely will be able to make these observations more frequently, in deeper detail, as the Expanded Very Large Array comes on line," he said.

Why didn't anyone see gamma rays from this explosion?

"We know that the gamma-ray emission is beamed in such blasts, and this one may have been pointed away from Earth and thus not seen," said lead author Alicia Soderberg, of the Harvard-Smithsonian Center for Astrophysics. In that case, finding such blasts through radio observations will allow scientists to discover a much larger percentage of them in the future.

"Another possibility," Soderberg added, "is that the gamma rays were 'smothered' as they tried to escape the star. This is perhaps the more exciting possibility, since it implies that we can find and identify engine-driven supernovae that lack detectable gamma rays and thus go unseen by gamma-ray satellites."

One important question the scientists hope to answer is just what rare property causes the difference between the "ordinary" and the "engine-driven" core-collapse supernovae. This is important, Chevalier said, because it is a crucial clue to the life and death of massive stars, which play an essential role in the evolution of the universe.

Chevalier and Soderberg worked with Alak Ray and Sayan Chakrabarti of the Tata Institute of Fundamental Research in India; Poonam Chandra of the Royal Military College of Canada; and a large group of collaborators at the Harvard-Smithsonian Center for Astrophysics. For more information please contact: Sarabjit Jagirdar, Email:- htsyndication@hindustantimes.com.
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Record - 3

DIALOG(R)

**UNIVERSITY OF IOWA STUDENT MARIA DROUT AWARDED CHURCHILL SCHOLARSHIP,
SECOND FOR UNIVERSITY OF IOWA,**

US Federal News,
Friday, January 29, 2010

TEXT:

IOWA CITY, Iowa, Jan. 28 -- The University of Iowa's College of Liberal Arts and Sciences Department issued the following news release:

Maria Drout, a University of Iowa senior in the Department of Physics and

Astronomy in the College of Liberal Arts and Sciences, has won a 2010 Churchill Scholarship. She is the second-ever Churchill scholar from the UI. Only 14 Churchill scholarships are awarded nationally each year to outstanding math, science and engineering students. This award, worth up to \$50,000, will send Drout to study for one year at the University of Cambridge in England.

Drout, from Eau Claire, Wis., has been working on research with Cornelia Lang, assistant professor of physics and astronomy, since her freshman year. They have been using telescopes, including the Very Large Array and the Hubble Space Telescope, to study the core of the Milky Way Galaxy. She also collaborates with Phil Massey of the Lowell Observatory in Flagstaff, Ariz., on massive star evolution research and Alicia Soderberg of the Harvard-Smithsonian Center for Astrophysics on Supernovae and Gamma-Ray Bursts. In 2009, Drout received a Goldwater Scholarship, a national award given to sophomores and juniors with potential for careers in math, science or engineering research.

Drout plans to complete the Master of Advanced Study in Applied Mathematics/Theoretical Physics (Part III of the Mathematical Tripos) at the University of Cambridge. Through this program, she will complement her experiences in observational astronomy by taking courses in advanced astrophysical theory. Upon returning to the United States, Drout plans to earn her doctorate in astrophysics, conduct research in astronomical sciences and develop outreach programs to encourage students to pursue careers in the sciences.

Each year, participating institutions can nominate up to two students to compete for a Churchill Scholarship. The application process for the scholarship - and Maths Part III, in particular - is rigorous, according to Andrea Beloy, UI Honors Program scholarship director, who advises UI Honors students through national and international scholarship competitions. Drout faced an additional challenge in choosing Maths Part III, since this is perhaps the most sought-after mathematics graduate program in the world.

"Maria is such an unusually talented and enthusiastic student, and she will be missed in our department when she graduates," Lang said. "However, the community of astronomers is fairly small, and I look forward to watching her excel in her graduate studies and being her colleague and collaborator in the future."

Established in 1959, the Winston Churchill Foundation was founded by American friends of Churchill who wanted to fulfill his wish of always having young American graduate students at Churchill College at the University of Cambridge. The foundation's scholarship program offers American citizens of exceptional ability and outstanding achievement the

opportunity to pursue graduate studies in engineering, mathematics or the sciences at Cambridge. One of the newer colleges at the University of Cambridge, Churchill College was built in tribute to Winston Churchill, who in the years after World War II recognized the growing importance of science and technology for prosperity and security. Churchill College focuses on the sciences, engineering and mathematics.

For more information about the Churchill Scholarship, visit <http://winstonchurchillfoundation.org>. For more information please contact: Sarabjit Jagirdar, Email:- htsyndication@hindustantimes.com.
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Record - 4

DIALOG(R)

Edmund R. Malinowski: Pseudoscience responsible for global warming scare,
Edmund R. Malinowski, Guest columnist,
The Stuart News, All Zones ed, pA9,
Thursday, January 28, 2010

TEXT:

DON'T WORRY: Alarmists' claims based on pseudoscience, distortions

There is no consensus among scientists and no credible evidence that man-made carbon dioxide (CO) is responsible for global warming. More than 32,000 American scientists have signed a petition urging the U.S. government not to sign any global warming agreement.

Climate change alarmists would like us to believe that CO is responsible not only for global warming, but also for increasing hurricanes, tornadoes, droughts, floods, tidal waves, sea rise, earthquakes, blizzards, etc.

The alarmists have bombarded us, ad nauseam, with every conceivable media containing messages rife with gross exaggerations and distortions. These so-called man-made catastrophes have been refuted in the 2008 Science and Environmental Policy Project of the Nongovernmental International Panel on Climate Control.

Increased CO, as well as increased temperature, are beneficial to plant and animal life. Polar bear population has increased and not decreased as the alarmists would have us believe.

Studies have shown that global warming reduces the temperature gradient between the poles and the equator and therefore reduces the development of hurricanes. Hurricane activity throughout the world during the past two

years has been lower than in 30 years.

Sea levels have not been rising as rapidly as predicted by the alarmists.

Climate change fanaticism was promulgated by the U.N. IPCC Executive Summary Report. This report concludes that human activity is the major cause of global warming. The report focuses on "climate models" that attempt to explain the warming trend.

Models are not scientific facts. Models represent theoretical explanations based on intuition and, in many cases, biased expectations. Climate models do not prove that CO causes global warming. The IPCC models are based on "adjusted" and "homogenized" data sets. In other words, fudge factors are used to make the data fit the model.

Scientists at the Harvard-Smithsonian Center for Astrophysics report a near-perfect alignment between solar output and temperature in the 20th century. Global temperatures are tuned to solar and ocean circulation cycles, not CO cycles. Scientists at Colorado State University have shown that deep-water circulations control ocean surface temperatures. Variations in ocean salinity, not CO, is responsible for ocean temperature changes.

Unfortunately many of our worldwide leaders have been duped into believing that they can control the global temperature by limiting man-made CO, and are now hell-bent in a direction that will lead to worldwide economic disaster. The cap-and-trade bill passed by Congress is the first step along this foolhardy path.

What we need to fear is not man-made climate change but man-made pseudoscience amalgamated with political action groups.

Malinowski, a PhD from Stuart, is emeritus professor of chemistry at the Stevens Institute of Technology. He has been a scientific reviewer for more than 45 years.

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Record - 5

DIALOG(R)

Supernovae linked to gamma ray bursts,

Stuart Gary for ABC Science Online,

ABC Premium News,

Thursday, January 28, 2010

TEXT:

Thursday, January 28, 2010 - Scientists have discovered a new way of detecting gamma ray bursts while using radio telescopes to observe supernovae.

The researchers say this may provide new clues in understanding how some supernovae explode and how they may be related to gamma ray bursts.

Gamma ray burst events are among the most powerful and violent explosions in the universe, emitting mostly gamma and x-rays.

Supernovae are much smaller by comparison, typically emitting light at visible wavelengths.

One group of supernovae known as type Ib/c have previously been associated with gamma ray bursts, but their optical and radio emissions have never shown evidence of travelling close to the speed of light - a true sign of gamma ray bursts.

Now a report in the journal Nature suggests long duration gamma ray bursts are a rare sub-class of type Ib/c supernovae.

Powerful engines

Using radio telescopes, the researchers found that material ejected from supernova 2007gr - located in the galaxy NGC1058 - is moving at more than 60% the speed of light.

"These relativistic jets imply the presence of powerful central engines driving the outflows," says radio astronomer Dr Megan Argo of Curtin University of Technology in Perth.

"These central engines are thought to involve the accretion of matter either into a black hole or onto a neutron star."

Argo says the strong magnetic forces inside the neutron star tightly focus the ejected material into high energy jets, which can be measured by the radio telescopes.

"It's the same process believed to be at the heart of gamma ray bursts," she says.

According to Argo, the findings suggest that some type Ib/c supernovae may produce mildly relativistic jets.

More evidence

In another paper published in Nature, a team led by Dr Alicia Soderberg from the Harvard-Smithsonian Centre for Astrophysics detected radio emissions from supernova 2009bb near the centre of the galaxy NGC 3278.

"Discovering such a supernova by observing its radio emission, rather than through gamma rays, is a breakthrough," says Soderberg. "We believe we'll find more in the future through radio observations than with gamma ray satellites."

Their data showed material leaving the supernova at a velocity of 85% the speed of light, as well as energy comparable to the radio afterglows coming from nearby gamma-ray bursts.

The researchers say SN 2009bb was the only relativistic supernova found in a radio survey of 143 nearby supernovae in the part of the sky her team looked at.

They believe that only 1% of type Ib/c supernovae harbour central engines, a figure they say is consistent with the inferred rate of nearby gamma-ray bursts.

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Record - 6

DIALOG(R)

Newborn black holes can give an extra boost to exploding stars,

Hindustan Times,

Thursday, January 28, 2010

TEXT:

Washington, January. 28 -- Astronomers studying two exploding stars, or supernovae, have found evidence the blasts received an extra boost from newborn black holes.

The supernovae were found to emit jets of particles traveling at more than half the speed of light.

Previously, the only catastrophic events known to produce such high-speed jets were gamma-ray bursts, the universe's most luminous explosions.

"The explosion dynamics in typical supernovae limit the speed of the expanding matter to about three percent the speed of light," explained Chryssa Kouveliotou, an astrophysicist at NASA's Marshall Space Flight Center in Huntsville, Ala., co-author of one of the new studies.

"Yet, in these new objects, we're tracking gas moving some 20 times faster

than this," Kouveliotou added.

The astronomers discovered the ultrafast debris by studying two supernovae at radio wavelengths using numerous facilities, including the National Science Foundation's Very Large Array in Socorro, N.M., and the Robert C. Byrd Green Bank Telescope in West Virginia.

One team used the real-time operating mode of the European Very Long Baseline Interferometry Network, an international collaboration of radio telescopes, to rapidly analyze data.

"In every respect, these objects look like gamma-ray bursts, except that they produced no gamma rays," said Alicia Soderberg at the Harvard-Smithsonian Center for Astrophysics.

Soderberg led a team that studied SN 2009bb, a supernova discovered in March 2009.

It exploded in the spiral galaxy NGC 3278, located about 130 million light-years away.

The other object is SN 2007gr, which was first detected in August 2007 in the spiral galaxy NGC 1058, some 35 million light-years away.

The researchers searched for gamma-ray signals associated with the supernovae using archived records in the Gamma-Ray Burst Coordination Network located at NASA's Goddard Space Flight Center in Greenbelt, Maryland.

The project distributes and archives observations of gamma-ray bursts by NASA's Swift spacecraft, the Fermi Gamma-ray Space Telescope and many others.

However, no bursts coincided with the supernovae.

Unlike typical core-collapse supernovae, the stars that produce gamma-ray bursts possess what astronomers call a "central engine" - likely a nascent black hole - that drives particle jets clocked at more than 99 percent the speed of light.

By contrast, the fastest outflows detected from SN 2009bb reached 85 percent the speed of light and SN 2007gr reached more than 60 percent of light speed.

"These observations are the first to show some supernovae are powered by a central engine," Soderberg said.

"These new radio techniques now give us a way to find explosions that resemble gamma-ray bursts without relying on detections from gamma-ray satellites," she added. Published by HT Syndication with permission from Asian News International. For more information on news feed please contact Sarabjit Jagirdar at htsyndication@hindustantimes.com

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Record - 7

DIALOG(R)

Unraveling the mystery of black holes, space warps,

STAN FREEMAN,

Republican, The (Springfield, MA), ALL ed, pE01,

Wednesday, January 27, 2010

TEXT:

sfreeman@repub.com

In science fiction, black holes seem to be everywhere. It's only in reality that they are hard to find.

Perhaps nothing in astronomy is as mysterious and compelling as these regions of space where matter is believed to have collapsed on itself, forming a single point of infinite density, and creating gravity so powerful around it that light cannot escape it and space and time are distorted in incredible ways.

A new exhibit opening on Jan. 30 at the Springfield Science Museum, "Black Holes: Space Warps & Time Twists," attempts to cast some light on a phenomenon that is strongly believed to exist but has never really been seen. It will run until May 2.

"It's true that 25 years ago there was more theory than evidence for them," said Mary E. Dussault, the science educator at the Harvard-Smithsonian Center for Astrophysics who is directing the traveling exhibit.

"But with the advent of X-ray telescopes and new observatories and more ways to observe, the evidence is quite strong that they exist," she said.

The leading candidate for a black hole, called Sagittarius A*, is at the very center of our own galaxy, the Milky Way, she said. While the black hole itself can't be seen (since light gets pulled back into it), the behavior of objects around it can be.

"We've actually observed stars whizzing around the center of our galaxy, but they are going so fast that you can use Newton's laws (which explain how mass and gravity and the motion of objects circling a mass are related) to determine the mass of the thing at the center. Its mass is 4 million of our suns," she said.

The exhibit, which premiered at the Boston Museum of Science in June, contains 17 elements, including a virtual voyage to the edge of a black hole in which the viewer guides the exploration.

The concept that a mass could be so great that not even light could escape its pull was proposed as early as 1783 by English natural philosopher John Michell. But it was not until Albert Einstein showed that gravity does affect the motion of light that the idea of a black hole began to take hold.

In science fiction, black holes are now a staple, like superintelligent robots and time travel. Indeed, black holes are often depicted as time machines, Dussault said. Spaceships enter them, are tossed about, and somehow manage to exit in a different time than the passengers expected.

"In fact, it's very weird how time flows is around black holes. They distort time and theoretically, time comes to a stop at the singularity (the infinitely dense mass at its center). But the truth is that if you came anywhere near a black hole, you'd be in a lot of trouble," she said.

IF YOU GO

Event: "Black Holes: Space Warps & Time Twists"

When: Jan. 30 through May 2

Where: Springfield Science Museum at the Quadrangle, off Edwards Street in Springfield

Cost: The exhibit has a special fee of \$3 per person in addition to the general admission fee for all visitors ages 3 and up at the Springfield Museums.

For more info: Online at www.springfieldmuseums.org

(COLOR) Mary Dussault, a Harvard astrophysicist and project director for the Black Hole Exhibit at the Springfield Science Museum, stands by one of the interactive exhibits.

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Record - 8

DIALOG(R)

Newborn Black Holes May Add Power to Many Exploding Stars,

National Aeronautics and Space Administration Documents

Wednesday, January 27, 2010

TEXT:

Jan. 27, 2010

J.D. Harrington Headquarters, Washington 202-358-5241

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Janet Anderson Marshall Space Flight Center, Huntsville, Ala. 256-544-0034

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RELEASE: 10-025

NEWBORN BLACK HOLES MAY ADD POWER TO MANY EXPLODING STARS

WASHINGTON -- Astronomers studying two exploding stars, or supernovae, have found evidence the blasts received an extra boost from newborn black holes. The supernovae were found to emit jets of particles traveling at more than half the speed of light.

Previously, the only catastrophic events known to produce such high-speed jets were gamma-ray bursts, the universe's most luminous explosions. Supernovae and the most common type of gamma-ray bursts occur when massive stars run out of nuclear fuel and collapse. A neutron star or black hole forms at the star's core, triggering a massive explosion that destroys the rest of the star.

"The explosion dynamics in typical supernovae limit the speed of the expanding matter to about three percent the speed of light," explained Chryssa Kouveliotou, an astrophysicist at NASA's Marshall Space Flight Center in Huntsville, Ala., co-author of one of the new studies. "Yet, in these new objects, we're tracking gas moving some 20 times faster than this."

The new results, published in this week's edition of the journal Nature, used observations from several space and ground-based observatories, including NASA's SWIFT satellite.

The astronomers discovered the ultrafast debris by studying two supernovae

at radio wavelengths using numerous facilities, including the National Science Foundation's Very Large Array in Socorro, N.M., and the Robert C. Byrd Green Bank Telescope in West Virginia. One team used the real-time operating mode of the European Very Long Baseline Interferometry Network, an international collaboration of radio telescopes, to rapidly analyze data.

"In every respect, these objects look like gamma-ray bursts -- except that they produced no gamma rays," said Alicia Soderberg at the Harvard-Smithsonian Center for Astrophysics in Cambridge, Mass.

Soderberg led a team that studied SN 2009bb, a supernova discovered in March 2009. It exploded in the spiral galaxy NGC 3278, located about 130 million light-years away.

The other object is SN 2007gr, which was first detected in August 2007 in the spiral galaxy NGC 1058, some 35 million light-years away. The study team, which included Kouveliotou and Alexander van der Horst, a NASA Postdoctoral Program Fellow in Huntsville, was led by Zolt Paragi at the Netherlands-based Joint Institute for Very Long Baseline Interferometry in Europe.

The researchers searched for gamma-ray signals associated with the supernovae using archived records in the Gamma-Ray Burst Coordination Network located at NASA's Goddard Space Flight Center in Greenbelt, Md. The project distributes and archives observations of gamma-ray bursts by NASA's Swift spacecraft, the Fermi Gamma-ray Space Telescope and many others. However, no bursts coincided with the supernovae.

Unlike typical core-collapse supernovae, the stars that produce gamma-ray bursts possess what astronomers call a "central engine" -- likely a nascent black hole -- that drives particle jets clocked at more than 99 percent the speed of light.

By contrast, the fastest outflows detected from SN 2009bb reached 85 percent the speed of light and SN 2007gr reached more than 60 percent of light speed.

"These observations are the first to show some supernovae are powered by a central engine," Soderberg said. "These new radio techniques now give us a way to find explosions that resemble gamma-ray bursts without relying on detections from gamma-ray satellites."

Perhaps as few as one out of every 10,000 supernovae produce gamma rays that we detect as a gamma-ray burst. In some cases, the star's jets may not be angled in a way to produce a detectable burst. In others, the energy of

the jets may not be enough to allow them to overcome the overlying bulk of the star.

"We've now found evidence for the unsung crowd of supernovae -- those with relatively dim and mildly relativistic jets that only can be detected nearby," Kouveliotou said. "These likely represent most of the population."

For more information, images and animation about this discovery, visit:

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

- -end-

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Record - 9

DIALOG(R)

LECTURES ARE OUT OF THIS WORLD,
Herald Sun (Australia), 1 - FIRST ed, p58,
Tuesday, January 26, 2010

TEXT:

The Melbourne Physics Lectures for VCE students begin February 18. The first free lecture is Let's Start with a Big Bang -- Astrophysics. It links to Unit 1: Study 3.1, 3.2. The picture (left) from the Harvard-Smithsonian Centre for Astrophysics shows the latest view of the Milky Way

The lecture is on at 6pm in the Laby Theatre, School of Physics, University of Melbourne. Visit physics.unimelb.edu.au/community/physics-outreach

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Record - 10

DIALOG(R)

On the fringe: astronomers look to the Kuiper belt for clues to the solar system's history.

Cowen, Ron,
Science News, v177, n2, p16(5)
Saturday, January 16, 2010

TEXT:

[ILLUSTRATION OMITTED]

Beyond Neptune lies a reservoir of rejects--icy debris left to roam the solar system's dim outer limits having never coalesced into planets. But these frozen relics preserve a trove of clues about the earliest history and architecture of the solar system, astronomers are discovering.

Named for astronomer Gerard Kuiper, who in 1951 predicted the existence of this 3-billion-kilometer-wide swath of icy chunks, the Kuiper belt didn't begin to reveal itself to observers until 1992. Since then, researchers have found more than a thousand bodies filling a doughnut-shaped belt, which extends 30 to about 50 astronomical units from the sun. One astronomical unit is the average distance between the Earth and sun.

Pluto may be the most famous resident of this frozen netherworld, but other objects in this sparsely populated region stand out for their bewildering variety of shapes, colors, densities and orbits. Some travel sedately on circular paths that hew closely to the plane in which the planets orbit the sun. Many have wildly elliptical orbits and move on paths at high inclination to that plane.

The puffed-up, elongated orbits and present-day sparseness of the belt all but scream that the region had a close and violent encounter with at least one of the outer planets, says theorist Hal Levison of the Southwest Research Institute in Boulder, Colo. Recent findings are providing new evidence of this long-ago melee, and the details could help scientists reconstruct early conditions in the solar system.

Planetary scientists examining the Kuiper belt today are "like a CSI team going into a room where there was a grisly murder," Levison says. And sometimes the blood spattered on the wall--the thousands of small bodies in the Kuiper belt--can tell you more about the early solar system than the actual planetary bodies can, he adds.

Astronomers don't yet have a complete picture of the Kuiper belt, and new riddles--some discussed for the first time in October in Fajardo, Puerto Rico, at the annual meeting of the American Astronomical Society's Division for Planetary Sciences--are emerging. A comprehensive new survey of the belt, set to begin by early spring, will likely explain some of these mysteries and uncover new ones.

Migration and mayhem

To understand how the Kuiper belt has retained so much information about

planet formation, scientists must first understand the planet-building process. All the planets and smaller bodies in the solar system formed from particles of gas and dust that stuck together within a protoplanetary disk surrounding the young sun, Levison notes.

But particles can't stick unless they collide gently. Careening rocks and ice chunks in elongated, high-inclination orbits--like many of those in the Kuiper belt today--would hit with high velocity, which would break them apart instead of building them up. Only objects in more circular orbits have low enough relative velocities to coalesce.

That means that the belt's biggest bodies, such as Pluto and Eris (the largest known in the region), would never have formed unless they originally followed more circular, low-inclination orbits. In addition, the belt must have been much more crowded and thousands of times heavier than it is today. Like a ghostly highway with only a few cars, the belt nowadays has such a low density of objects that any collision--whether a high-speed crack-up or a low-speed merger--is improbable.

"You needed a massive Kuiper belt, and you needed relative velocities to be low" for large bodies to have formed during the first few millions years of the solar system, Levison notes. But then, "you need to perturb the objects and [tip] their orbits to get the highly inclined, elongated orbits we see today."

Such changes are a smoking gun that an intruder must have plowed into the Kuiper belt, he says. Whatever disturbed the belt also removed 99.99 percent of its mass.

The obvious suspect is Neptune, the closest large body to the belt, says observer Mike Brown of Caltech. "That's really the only thing that will scatter these objects all around."

Now researchers are trying to figure out how and when Neptune barged into the belt and how quickly it did so, details that could help explain how and when the planets assumed their final positions in the solar system.

In one scenario, suggested earlier in the decade by Levison and his colleagues, Neptune and its three larger compatriots--Jupiter, Saturn and Uranus--were once packed together into a region only about half the diameter of Neptune's current orbit (SN: 2/14/09, p. 26).

Gravitational interactions with the then-hefty belt gradually spread these planets out until the orbits of Jupiter and Saturn reached a special synchrony. That synchrony strengthened the mutual gravity of Jupiter and Saturn, which in turn hurled Neptune, and possibly Uranus, headlong into

the Kuiper belt. Like a bowling ball, Neptune scattered most of the icy bodies toward the sun or out of the solar system entirely, and scrambled the orbits of those denizens that remained. With the belt emptied of much of its material, the gravitational tussle lessened and Neptune came to rest there.

[ILLUSTRATION OMITTED]

Researchers now think that comparing the number of Kuiper belt objects in two particular orbits relative to that of Neptune could reveal when and how quickly Neptune's big migration occurred--a natural speedometer.

Scientists had realized that as Neptune moved toward the belt early in the solar system's history, some belt members fell under the planet's gravitational spell and settled into special orbits: Each time that Neptune orbits the sun twice, these objects go around once. Some of the objects in these orbits, classified as in a 2:1 resonance with Neptune, appear to trail the planet, while others lead it.

The number of Kuiper belt objects trailing Neptune in this resonance would increase relative to the number leading it the faster that Neptune migrated, Ruth Murray-Clay of the Harvard-Smithsonian Center for Astrophysics in Cambridge, Mass., and Eugene Chiang of the University of California, Berkeley reported in 2005. Counting these objects might ultimately reveal whether Neptune took roughly 1 million or 10 million years to migrate about 7 astronomical units from its birth site.

The timescale would help researchers "understand the properties of the protoplanetary disk around the sun at the time that Neptune formed," Murray-Clay says. If the migration lasted only a million years, it could mean that the planetesimals in the disk were particularly abundant and had circular orbits. Which, in turn, could mean that planets coalesced relatively quickly.

Studies also show that giant extrasolar planets orbiting within roasting distance of their parent stars couldn't have formed so close and therefore must have migrated inward. New clues about how Neptune migrated could provide hints about the movement of planets in systems far beyond Earth's, Murray-Clay notes.

More answers, more mysteries That goal isn't just wishful thinking. A sky survey called Pan-STARRS, which will feature the world's largest digital cameras--1.4 billion pixels--attached to each of four small telescopes on Mount Haleakala in Maui, Hawaii, is poised to do the head count required to gauge Neptune's migration speed, Murray-Clay says.

The survey, set to begin early this year, covers a vast portion of the sky

each night. The initial 3.5-year study has the capability to find Kuiper belt objects as small as about 250 kilometers across, or about one-tenth the diameter of Pluto, says Matt Holman of Harvard-Smithsonian. From the northern sky, PanSTARRS "will do a complete census of the Kuiper belt" and will have a field of view wide enough to record objects at very high inclinations to the plane in which the planets orbit the sun, he says. Earlier studies were limited to finding objects in or near that plane.

By providing a fuller picture of the belt and possibly finding as many as 10 times the number of Kuiper belt denizens now known, the survey is also expected to quantify the rarity of particular classes of Kuiper belt objects and the extent to which such objects' orbits were altered by an early interaction with one or more of the outer planets.

And the survey will search for fainter, more remote bodies beyond the belt, such as Sedna, the most distant known object in the solar system (see "Solitary puzzle beyond the belt," Page 20).

Surveys about to get underway in Chile will be the first comprehensive studies of the Kuiper belt from the southern hemisphere. And around 2016, the mammoth Large Synoptic Survey Telescope is scheduled to begin operation, providing an even more detailed study of the belt.

Other ongoing surveys are finding Kuiper belt objects. In sifting through 4.5 years of data collected by the Hubble Space Telescope's Fine Guidance Sensors, researchers have found the first belt object smaller than a kilometer, observed as it passed in front of and occulted the light of a distant star. The newly discovered body has a diameter of 500 meters, Hilke Schlichting of the University of Toronto and Caltech and her colleagues report in the Dec. 17 Nature.

Another study, the Taiwanese-American Occultation Survey, has been using the same technique to look for small belt objects since 2005 and has found none.

The single finding in Schlichting's study is a surprise because she and her collaborators calculate that small Kuiper belt objects should be about 35 times more numerous than the observations indicate. The deficit, Schlichting's team concludes, suggests that over the lifetime of the solar system, small bodies in the belt have collided and ground down to dust. This process would produce a fainter version of the debris disks observed around a myriad of other stars believed to have planets and similar belts.

[ILLUSTRATION OMITTED]
Millions of Quaoars

With new and continuing surveys, more clues to the early and still-evolving solar system are expected to emerge. And future findings may add to the list of odd belt characters already uncovered.

[ILLUSTRATION OMITTED]

There's Haumea, with its highly elongated shape, an average diameter of 1,500 kilometers and a family of ice cubes--satellites made of pure water-ice, the only such moons known in the belt. And Eris is bizarre for its highly inclined orbit. "We blame Neptune for all the inclined orbits in the belt," Brown notes, but a 45-degree incline is too high to be generated by that planet's gravity. "No one has been able to explain Eris' incline; it's kind of the dirty secret no one wants to talk about," Brown says.

And then there's Quaoar.

Discovered by Brown and his colleagues in 2002, Quaoar took center stage at a session of the planetary science meeting in Puerto Rico. Wesley Fraser of Caltech reported that he and Brown had used the Hubble Space Telescope to observe both Quaoar and its tiny moon, Weywoot. By measuring the motion of the orbiting moon, the researchers found that Quaoar is about 350 kilometers smaller than previously estimated, bringing its diameter to less than half that of Pluto. With a smaller diameter, Quaoar must be correspondingly denser; otherwise it wouldn't wield a large enough gravitational tug to keep Weywoot in around orbit.

Quaoar must have a density akin to that of rock, despite its residency in the icy belt, Fraser reported. That not only makes Quaoar a supreme odd-ball--perhaps the densest body in the Kuiper belt--but also puts it on par with rocky bodies that fill the asteroid belt, located between the orbits of Mars and Jupiter.

In an article now in press in *Chemie der Erde*, Erik Asphaug of the University of California, Santa Cruz offers an intriguing explanation for the new finding. His solution not only fits with existing evidence that the Kuiper belt was once a more crowded place, but also could explain other formation scenarios.

He envisions that Quaoar was originally covered by a mantle of ice that made it 300 to 500 kilometers bigger than it is today, and that it collided with another Kuiper belt body about twice its size--an object roughly the diameter of Pluto, possibly Pluto itself.

In this scenario, Quaoar is a bullet, striking a bigger body in the belt at a speed a few times higher than the escape velocity of that object. At that speed, Quaoar wouldn't have stuck to the object but would have ricocheted

off it. The bigger body would have emerged from the collision pretty much unscathed, but the encounter would have gravitationally and mechanically stripped Quaoar of most of its icy mantle, leaving only its denser, rockier core intact.

[ILLUSTRATION OMITTED]

If Asphaug is right, the belt must have been rife with millions of Quaoars several billion years ago. That's the era when Quaoar-sized objects were coalescing to make larger bodies like Pluto. A large number of Quaoars are required so that after most of these bodies were either ejected from the belt or accreted onto bigger bodies, there would still be enough left over to make a hit-and-run collision likely. A few other Quaoars might still lurk somewhere in the belt, awaiting discovery by future surveys, Asphaug suggests.

Anytime a small body has a much higher density than bigger bodies in the same region of space, this collision scenario may apply, Asphaug says. Indeed, hit-and-runs are by no means limited to the outer solar system.

Asphaug's interest in such collisions was first piqued by puzzles closer to the sun. In the inner solar system, the dense, iron-rich planet Mercury stands out like a sore thumb. He speculates that a fluffier, bigger Mercury with a lot of mantle collided with Venus, the next-largest planet in the neighborhood, ridding Mercury of its lower-density, outer layers while leaving Venus relatively undisturbed. And in the asteroid belt, an exotic population of about 100 dense, iron-rich asteroids maybe the remains of hit-and-run collisions with larger rocks.

In the standard picture of evolution in the solar system, Asphaug says, bodies of similar size were thought to collide and merge, and then a few chunks might be whacked off during a subsequent impact. In contrast, the hit-and-run model "gives a whole new pathway for planetary evolution," Asphaug says. Understanding how such impacts occurred may indicate how crowded the early solar system was.

All this activity--formations, migrations, collisions--took place some 4 billion years ago, soon after the solar system's birth. Today, Brown says, "we are left with this junk on the floor, the Kuiper belt objects, to try to reconstruct what might have happened."

Explore more

* More information about the Kuiper belt, from NASA: <http://bit.ly/4nT5XY>

* Planetary scientist Mike Brown's blog: www.mikebrownplanets.com

* Information on Eris: <http://bit.ly/6vnQFq>

* And on Pluto and other dwarf planets: <http://bit.ly/7G2mL2>

Solitary puzzle beyond the belt

Discovered by Mike Brown of Caltech and colleagues in 2004, an object called Sedna is the most distant body known in the solar system. Residing beyond the Kuiper belt, Sedna approaches as close to Earth as 76 times the Earth-sun distance (or 76 astronomical units) and travels as far away as 1,000 times that distance during its highly elongated, 10,500-year orbit (illustrated below).

Sedna's very existence is a puzzle, Brown says. The body lies too far from the Kuiper belt to have been affected by any migration of Neptune but too close to the sun to have been pulled outward by a passing star. If Sedna were one of a group of objects in similarly remote orbits, it would indicate that the sun was born within a cluster of stars, long since dispersed, that tugged on these now-remote bodies and pulled them into their current orbits.

[ILLUSTRATION OMITTED]

But a survey of the edge of the solar system has failed to turn up any other single object like Sedna. Meg Schwamb of Caltech, who collaborated with Brown, reported these findings in October at a planetary science meeting in Fajardo, Puerto Rico. The survey searched a sizable patch of sky--about 220 times the apparent area of the full moon--and was sensitive enough to detect large objects as far as 1,200 astronomical units from the sun. Sedna's seemingly solitary status makes it "one of the strangest objects in the solar system," Brown says.--Ron Cowen

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Record - 11

Super-Earth may host water, but probably not life: further studies could reveal close-by planet's composition.

Grossman, Lisa,

Science News, v177, n2, p5(2)

Saturday, January 16, 2010

TEXT:

A relatively small planet orbiting a star not far from Earth may be made mostly of water, new observations show.

"This planet is the most Earthlike planet yet discovered," comments planet hunter Geoffrey Marcy of the University of California, Berkeley.

Called GJ 1214b, the planet is the second super-Earth--a planet with a mass roughly between five and 10 times Earth's mass--detected passing in front of its parent star. GJ 1214b is 6.5 times more massive than Earth and 2.7 times wider, scientists report in the Dec. 17 *Nature*. It is the first super-Earth found that is close enough for astronomers to study its atmosphere.

"We're on the eve of a new phase of exoplanet studies," says astronomer Sara Seager of MIT. "This planet is a harbinger of what's to come. It's not just that we can study this one object in more detail. It's the torch, telling us about this new thing that's going to happen."

The discovery comes on the heels of other exoplanet sightings, two of which also may be super-Earths. All three possible super-Earths have masses between those of Earth and Uranus--a range not represented in the solar system.

[ILLUSTRATION OMITTED]

"This is completely unexpected," says Greg Laughlin of the University of California, Santa Cruz, a coauthor of two reports appearing online December 14 about the potential super-Earths. "It tells us that planets really form very easily."

Scientists led by David Charbonneau of the Harvard-Smithsonian Center for Astrophysics in Cambridge, Mass., studied GJ 1214b as it passed in front of its star from Earth's point of view. The team determined GJ 1214b's radius by measuring how much light the planet blocked during this transit. The planet's mass was calculated using follow-up observations from the European Southern Observatory's High Accuracy Radial Velocity Planet Searcher instrument, which measures how much the planet's gravity tugs at the parent star. Charbonneau and colleagues then used GJ 1214b's size and mass to calculate density, a clue to the orb's composition.

Only by knowing a planet's mass and size is it possible to figure out what it's made of, Charbonneau says--and making both of those measurements is possible only for a transiting planet. "Those are the most precious planets by far," he says.

The only other known transiting super-Earth, COROT-7b, has a rocky composition (SN: 10/10/09, p. 8). With a density nearly twice that of water, GJ 1214b could be as much as 75 percent water by mass, though there are a number of other possible compositions (see Back Story, Page 6).

GJ 1214b orbits its star, a red dwarf 42 light-years from Earth, once every 38 hours at a distance of 2 million kilometers--about one-thirtieth the distance between Mercury and the sun. Despite its close orbit, the planet reaches temperatures of only about 280[degrees]Celsius because its star is relatively cool.

"If the sun is a 1,000-watt light bulb, this star is a three-watt light bulb," says Charbonneau. Most of the 400-plus extrasolar planets found to date have surfaces that boil at thousands of degrees Celsius. Although GJ 1214b is as hot as an oven, possible scenarios posit that the planet could have an atmosphere of water vapor or of hydrogen and helium that provides enough pressure to keep water liquid at the surface, even at such high temperatures.

The planet's discovery marks an early success of the MEarth survey. That survey uses eight ground-based, amateur-grade telescopes to automatically follow 2,000 small, dim stars in a search for transiting planets (SN: 12/20/08, p. 16). GJ 1214b showed up in the first six months of observations.

"The fact that we found it in the first six months means either we were very lucky, or these planets are very common," Charbonneau says.

Laughlin and his colleagues' recent exoplanet discoveries also suggest that super-Earths may be common, he says. Using the Keck telescopes in Hawaii and the Anglo-Australian Telescope in Australia, two teams, both including Laughlin, found at least four and possibly six new planets orbiting sunlike stars. One planet, orbiting the star 61 Virginis, is at least five times Earth's mass. Its detection, slated to appear in the *Astrophysical Journal*, is described at arXiv.org/abs/0912.2599. The other candidate super-Earth, which orbits the star HD 1461, is at least 7.4 times Earth's mass, researchers report in a second paper, posted at arXiv.org/abs/0912.2566.

[ILLUSTRATION OMITTED]

None of the new planets are likely to be habitable, though. The planets near sunlike stars are too hot, and the possible atmosphere of GJ 1214b would be thick enough to block all incoming light, an important ingredient for life on Earth. But when Charbonneau, Seager and Laughlin talk about finding habitable--and perhaps inhabited--planets, the researchers all say the same thing: It's only a matter of time.

"These planets are like mileposts on the road rather than a destination itself," Laughlin says. "It's very exciting to know that we're getting close."

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Record - 12

DIALOG(R)

Spotting planets for lower prices,

TOM BEAL; TOM BEAL, ARIZONA DAILY STAR,

Arizona Daily Star (AZ), FINAL ed, pA1

Saturday, January 2, 2010

TEXT:

SMALL SCOPES REACH BEYOND SOLAR SYSTEM

The first asteroid glimpsed by astronomers before it crashed into Earth was spotted with a couple of refurbished telescopes hooked up to some digital cameras by the the Catalina Sky Survey.

The closest thing to an Earthlike exoplanet was found recently with a telescope at Whipple Observatory that an avid amateur might have in his backyard.

From that same ridge in the Santa Ritas, an astronomer has discovered 13 exoplanets orbiting distant stars with the kind of telephoto lenses you would use to snap pictures of a high school football game. Giant land-based telescopes and space missions gobble up most of the money available each year for astronomical exploration. But innovative astronomers are proving that you don't need a multibillion-dollar orbiting telescope to find planets or even save the world.

Lately, they have been making headlines and making the point that the worth of a discovery is not directly related to the size of investment.

HATNet

Gaspar Bakos started his planet search with a \$350 Nikon telephoto lens from a used-camera store in Manhattan.

His current arrays - including four HAT telescopes at Whipple Observatory on Mount Hopkins in Arizona - are a bit pricier. Once you add the fancy digital technology and mounting hardware, each telescope costs about \$50,000.

The design, developed by Bakos and three amateur astronomers in Hungary, still employs a relatively modest telephoto lens, hooked up to a CCD camera and set on a movable, robotically controlled mount.

They scan the night sky in a wide field, searching for the periodic dimming of stars, signs that a planet is passing.

Bakos, an astronomer with the Harvard-Smithsonian Center for Astrophysics, has now found 13 planets - mostly big balls of gas. Some demonstrate novel properties. One, bigger than Jupiter but with half that planet's mass, has been called "the puffy planet." It would float in water, if you had a very large bathtub.

Bakos' program, now at sites in Arizona and Hawaii, is called HATnet, the Hungarian-made Automatic Telescope network. Bakos was honored as one of Popular Science's "Brilliant 10" in 2007 for his accomplishments.

MEarth

Astronomers such as Bakos and Harvard-Smithsonian colleague David Charbonneau, who developed the moderately priced MEarth array on Mount Hopkins, are good "advocates for small telescopes," said astronomer Emilio Falco, science director for several programs at Whipple Observatory.

Falco, who helped build and provides technical support for the HAT and MEarth arrays, said "there is still a trend toward the larger telescopes, with all the funding diverted to these huge projects. However, as Gaspar and other groups have shown, you can do a lot with these small telescopes."

Charbonneau pioneered the technique of searching for planets around distant stars by measuring the light lost when the planet orbited or transited in front of the star.

Then he got the idea to use an array of off-the-shelf telescopes to search the sky for such reductions in the light emitted by nearby stars. He chose 2,000 of the smallest ones, known as M stars, and began to look for rocky planets similar to Earth but about twice its size.

He's searching for "earths" around M stars, hence the name MEarth. It is pronounced "mirth," said Charbonneau, "because it makes us happy."

Eight of MEarth's telescopes sit in a boxcar-sized enclosure known as "the shed" on Mount Hopkins. They click automatically to life when the shed roof rolls back at twilight, feeding data to Cambridge, Mass., where Charbonneau and his colleagues look for signs of a transit.

Finding a rocky planet in a habitable zone near its star would be a coup. Most of the 400 exoplanets discovered so far are big gassy giants like Jupiter.

Charbonneau said he chose his targets to match the limits of his viewing

technique. Did such things exist? He didn't know, but he expected they did and predicted it mathematically.

Sure enough, he recently announced a startling discovery in the scientific journal *Nature* - the most Earthlike planet discovered so far.

It's a little close to its sun and a bit too hot for life as we know it, but it's made of rock and water and has an atmosphere.

Not a bad find for an \$8,000 telescope with a 16-inch mirror.

Catalina Sky Survey

Astronomers with the Catalina Sky Survey adopted an age-old marketing strategy to reduce the price of their science - volume, volume, volume.

The group, based at the University of Arizona, refurbished two of the Steward Observatory's outmoded telescopes on Mount Lemmon and Mount Bigelow in the Santa Catalina Mountains and began clicking away at the night sky six years ago with digital cameras, feeding a computer program that looks for moving objects.

With those relatively modest 60-inch and 28-inch telescopes, they quickly became the world's leader in discovering NEOs, near-earth objects that could crash into our planet.

They counted 565 in 2008 and will better that record in 2009, using an annual budget from NASA of \$1 million.

"We are the Wal-Mart of astronomy. Actually, we're the Dollar Store," said Sky Survey Director Ed Beshore.

"If you figure a cost per asteroid, our price keeps going down," Beshore said.

In 2008, the year Catalina Sky Survey gained fame by predicting the path of a meteor that crashed in Sudan, the price per asteroid was \$1,758.

And - as they say in the infomercials - that's not all.

The Catalina Sky Survey is now wholesaling its unexamined data to other astronomers. A pilot program with CalTech recently yielded 877 sightings of peculiar objects - active galactic nuclei, stellar flares, supernovae and optical transients.

Now the folks at Caltech have snared a grant to combine those data with results from Catalina's Southern Hemisphere observatory at Sliding Spring

in Australia. Then they plan to put real-time images from the three telescopes online, along with a library of the same portions of the sky taken in past viewing. The data will be made available for searching to armchair astronomers everywhere.

It is a low-budget version of the type of "synoptic" sky survey envisioned by more grandiose astronomical endeavors, such as the \$390 million Large Synoptic Survey Telescope.

The limits of cheap

None of these astronomers argues for an end to the big telescope projects. In fact, most of their discoveries must be verified by bigger and better telescopes.

Charbonneau, for instance, has partners in his "super Earth" search who used a giant telescope in Chile to verify his discovery. To learn more about it, he has applied for time on the Hubble space telescope, which is expected to burn through about \$6 billion in its 10 years of operation.

Falco, meanwhile, has been busy verifying HAT discoveries on two larger scopes on Mount Hopkins.

"The immediate next step is to use our 1.2 meter, do follow-up to refine the light curves - the variation of brightness that gives you the transit measurement," Falco said.

Then he uses a nearby 1.5-meter telescope that is equipped to do spectroscopy to "get a basic description of the system."
Then it's on to the twin 10-meter Keck Telescopes atop Mauna Kea in Hawaii.

"That's when you hit the jackpot. You get exquisite detail," he said.

At a price. Those Keck twins cost \$200 million to bring into the world.

Contact reporter Tom Beal at 573-4158 or tbeal@azstarnet.com

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Wolbach Library: CfA in the News ~ Week ending 7 February 2010

1. **MSU helped design solar telescopes**, AP Alert - Montana, Saturday, February 6, 2010
2. **MONTANA STATE UNIVERSITY HELPED DESIGN SOLAR TELESCOPES TO BE LAUNCHED FEB. 9**, US Federal News, Friday, February 5, 2010
3. **Merging galaxies create a binary quasar**, UPI Science News, Thursday, February 4, 2010
4. **Astronomers find evidence of merging galaxies creating binary quasar**, Hindustan Times, Thursday, February 4, 2010
5. **New planet-hunter captures quarry: Kepler mission spots five extrasolar orbs in first six weeks**. Cowen, Ron, Science News, v177, n3, p12(1), Saturday, January 30, 2010
6. **ANOTHER EARTH? THE ISSUE: ASTRONOMERS CLOSE TO DISCOVERY. OUR VIEW: HABITABLE PLANET IS NOT A FAR-FETCHED IDEA.**, Evansville Courier & Press, pA10, Tuesday, December 22, 2009

Record - 1

DIALOG(R)

MSU helped design solar telescopes,
AP Alert – Montana,
Saturday, February 6, 2010

TEXT:

BOZEMAN, Mont._Solar physicists at Montana State University helped design four telescopes that are scheduled to be launched into space Tuesday from the Kennedy Space Center in Florida.

MSU research professor Piet Martens and associate research professor David McKenzie plan on being in Florida for the launch, scheduled for between 8:30 a.m. and 9:30 a.m. Mountain.

McKenzie and Martens helped design the ultraviolet telescopes with partners at the Lockheed Martin Solar and Astrophysics Laboratory and the Harvard-Smithsonian Center for Astrophysics. They've been working on the project for about six years.

"It is the culmination of a long wait," McKenzie said.

The telescopes, attached to a satellite, will spend about three years collecting ultraviolet images from the sun's atmosphere to help scientists

understand the physics behind the activity on the sun's corona, which drives space weather.

The four telescopes _ together called the Atmospheric Imaging Assembly _ are one of three instrument packages that will be launched on the Solar Dynamics Observatory satellite, McKenzie said. Another will take pictures of the sun's surface and the third will measure the UV radiation that comes from the sun to the Earth and variation sin the radiation.

The information will be transmitted to computers in the Midwest and sent to MSU, Stanford University and Lockheed Martin for analysis, McKenzie said.

The ultimate goal is to develop advanced forecasting tools.

Ultraviolet rays affect the chemistry of the Earth's atmosphere, McKenzie said.

"We need to understand how it's producing these activities that affect us," he said.

Graduate student Jason Scott of Butte helped design and test the software that will operate the cameras on the telescopes. He plans to be in California from Feb. 15 to mid-March to work with Lockheed Martin scientists to see how the instruments are working an analyze initial data.

"It's been a great experience," he said.

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Record - 2

DIALOG(R)

MONTANA STATE UNIVERSITY HELPED DESIGN SOLAR TELESCOPES TO BE LAUNCHED FEB. 9,

US Federal News,
Friday, February 5, 2010

TEXT:

BOZEMAN, Mont., Feb. 4 -- Montana State University issued the following press release:

Solar physicists at Montana State University helped design and calibrate four telescopes that are scheduled to be launched Tuesday, Feb. 9, from the Kennedy Space Center in Florida.

If all goes as planned, the telescopes will be launched between 8:30 and 9:30 a.m. Montana time on NASA's Solar Dynamics Observatory, said David McKenzie, an associate research professor at MSU.

McKenzie and Piet Martens, an MSU research professor, will be in Florida for the launch, but the public is invited to watch a live feed on the big screen in MSU's Studio 1080, McKenzie said. The studio is located in the main lobby of the Engineering Physical Sciences (EPS) Building. Refreshments will be served, and solar posters will be given away during the viewing. The event will be conducted by the Montana Space Grant Consortium and MSU's Extended University.

If the flight is delayed, the viewing event will be rescheduled, McKenzie said. Updates will be available on the Montana Space Grant Consortium's Web page at <http://spacegrant.montana.edu> and on the MSU Solar Physics Group's Web page at <http://solar.physics.montana.edu>

McKenzie and Martens helped design the telescopes with partners at the Lockheed Martin Solar and Astrophysics Laboratory and the Harvard-Smithsonian Center for Astrophysics, McKenzie said. Graduate student Jason Scott helped design and test the software that will operate the cameras on the telescopes. They've been working on the project for about six years.

"It (the upcoming launch) is the culmination of a long wait," McKenzie said.

The UV telescopes - together called an Atmospheric Imaging Assembly, or AIA - will spend at least three years collecting ultraviolet images from the sun's atmosphere, McKenzie said. Each of the four telescopes will collect ultraviolet rays at two different wavelengths. Together, they will yield 1,000 gigabytes of information every day.

"That's more than anyone can look at in a lifetime," McKenzie said.

The information will be transmitted to computers in the Midwest and sent to MSU, Stanford University and Lockheed Martin for analysis, McKenzie said. He added that Martens has a grant, jointly with the Harvard-Smithsonian Astrophysical Observatory, to develop computer software for automatically recognizing features in the solar images returned by AIA.

The main goal of the UV telescopes is to help scientists understand the physics behind the activity on the sun's corona, which drives space weather, McKenzie said. The ultimate goal is to use this information to develop advanced forecasting tools in NASA's Living With a Star program.

The Atmospheric Imaging Assembly is one of three instrument packages that will be launched on the Solar Dynamics Observatory, McKenzie added. A second package - a helioseismic and magnetic imager - will take pictures of the sun's surface. That's where sunspots occur and scientists take measurements so they can study the interior of the sun. The third instrument package - EVE, or Extreme UV Variability Experiment - will take precise measurements of the UV radiation that comes from the sun to the Earth and variations in the radiation.

Ultraviolet rays cause sunburns, but they also affect the chemistry of the Earth's atmosphere, McKenzie said. UV rays relate to global warming, ozone layers and greenhouse effect. He added that the sun is a very active star.

"We need to understand how it's producing these activities that affect us," McKenzie said.

The Solar Dynamics Observatory is the first satellite to be launched in NASA's Living with a Star program, McKenzie said. The program focuses on the sun-Earth connection, space weather and the environment we live in because the Earth travels through the sun's atmosphere.

For more information about the mission, see <http://sdo.gsfc.nasa.gov/> For more information please contact: Sarabjit Jagirdar, Email:- htsyndication@hindustantimes.com.

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Record - 3

DIALOG(R)

Merging galaxies create a binary quasar,

UPI Science News,

Thursday, February 4, 2010

TEXT:

U.S. astronomers say they have discovered the first clear evidence of a binary quasar within a pair of actively merging galaxies.

Quasars are the extremely bright centers of galaxies surrounding super-massive black holes, and binary quasars are pairs of quasars bound together by gravity. Binary quasars, like other quasars, are thought to be the product of galaxy mergers. But until now, binary quasars have not been seen in galaxies that are unambiguously in the act of merging.

The discovery came from the Carnegie Institution's Magellan telescope in Chile and the images show two distinct galaxies with "tails" produced by tidal forces from their mutual gravitational attraction.

"This is really the first case in which you see two separate galaxies, both with quasars, that are clearly interacting," said Carnegie astronomer John Mulchaey.

The study that included astronomers from the Harvard-Smithsonian Center for Astrophysics, the Universities of Illinois and North Dakota, and the University of California-Santa Barbara, appears in the *Astrophysical Journal*.

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Record - 4

DIALOG(R)

Astronomers find evidence of merging galaxies creating binary quasar,
Hindustan Times,
Thursday, February 4, 2010

TEXT:

Washington, Feb. 4 -- Astronomers have found the first clear evidence of a binary quasar within a pair of actively merging galaxies.

Quasars are the extremely bright centers of galaxies surrounding super-massive black holes, and binary quasars are pairs of quasars bound together by gravity.

Binary quasars, like other quasars, are thought to be the product of galaxy mergers.

Until now, however, binary quasars have not been seen in galaxies that are unambiguously in the act of merging.

But images of a new binary quasar from the Carnegie Institution's Magellan telescope in Chile show two distinct galaxies with "tails" produced by tidal forces from their mutual gravitational attraction.

"This is really the first case in which you see two separate galaxies, both with quasars, that are clearly interacting," said Carnegie astronomer John Mulchaey, who made observations crucial to understanding the galaxy merger.

Most, if not all, large galaxies, such as our galaxy the Milky Way, host super-massive black holes at their centers.

Because galaxies regularly interact and merge, astronomers have assumed that binary super-massive black holes have been common in the Universe, especially during its early history.

Black holes can only be detected as quasars when they are actively accreting matter, a process that releases vast amounts of energy.

A leading theory is that galaxy mergers trigger accretion, creating quasars in both galaxies.

Because most such mergers would have happened in the distant past, binary quasars and their associated galaxies are very far away and therefore difficult for most telescopes to resolve.

The binary quasar, labeled SDSS J1254+0846, was initially detected by the Sloan Digital Sky Survey, a large scale astronomical survey of galaxies and over 120,000 quasars.

Further observations by Paul Green of the Harvard-Smithsonian Center for Astrophysics and colleagues using NASA's Chandra's X-ray Observatory and telescopes at Kitt Peak National Observatory in Arizona and Palomar Observatory in California indicated that the object was likely a binary quasar in the midst of a galaxy merger.

Carnegie's Mulchaey then used the 6.5 meter Baade-Magellan telescope at the Las Campanas observatory in Chile to obtain deeper images and more detailed spectroscopy of the merging galaxies.

"Just because you see two galaxies that are close to each other in the sky doesn't mean they are merging," said Mulchaey.

"But from the Magellan images, we can actually see tidal tails, one from each galaxy, which suggests that the galaxies are in fact interacting and are in the process of merging," he added. Published by HT Syndication with permission from Asian News International. For more information on news feed please contact Sarabjit Jagirdar at htsyndication@hindustantimes.com

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Record - 5

DIALOG(R)

New planet-hunter captures quarry: Kepler mission spots five extrasolar orbs in first six weeks.

Cowen, Ron,
Science News, v177, n3, p12(1)
Saturday, January 30, 2010

TEXT:

NASA's planet-hunting Kepler mission is off to a precocious start. The first six weeks of observations recorded by the space faring telescope, combined with follow-up studies from the ground, have revealed five previously unknown extra-solar planets--one body roughly the size of Neptune and four low-density versions of Jupiter. All reside within roasting distance of their parent stars.

The findings appear to reinforce hints from ground-based telescopes that stars have relatively few close-in planets with a mass between that of Saturn and Neptune, says Dimitar Sasselov of the Harvard-Smithsonian Center for Astrophysics in Cambridge, Mass.

Lead mission scientist William Borucki of NASA Ames Research Center in Moffett Field, Calif., and colleagues reported the findings on January 4, and a paper describing the results appeared online January 7 in Science.

Astronomers say that the early results bode well for achieving Kepler's main goal: finding Earthlike planets in or near the habitable zones of sun like stars.

Kepler, launched in March 2009 and expected to last 3 1/2 years, detects planets by recording tiny decreases in starlight when one transits, or passes across the face of its parent star. Kepler "has already established that Earth-size transiting planets can be found," says theorist Sara Seager of MIT, a member of the discovery team. "We are salivating over the upcoming data and Kepler discoveries."

The least-massive planet found by Kepler during its early observations, dubbed Kepler-4b has a radius and density comparable to that of both Neptune and GJ 436b, a Neptune-like transiting planet observed by the European COROT satellite in 2007.

Even though Kepler-4b is blasted with 800,000 times more radiation from its star than is Neptune or GJ 436b, all three orbs are similar in size. That suggests that Kepler-4b has a denser composition, with either a higher ratio of rock to water or a lower ratio of hydrogen to helium gas, Borucki and colleagues noted.

None of the five planets Kepler discovered would be habitable. All have temperatures at least as high as in molten lava, and two, Kepler-5b and Kepler-8b, reside so close to their parent stars that their average temperature is high enough to melt iron.

The four hot, Jupiter-like planets have densities lower than predicted for giant, gaseous planets. One, Kepler-7b, has one of the lowest densities--0.17 grams per cubic centimeter--of any known extrasolar planet. That's the same density as Styrofoam, Borucki noted during his talk. (By comparison, Jupiter's average density is 1.33 grams per cubic centimeter, slightly higher than that of water, but Jupiter lies much farther from the sun than Kepler-7b does from its star.)

Borucki also noted that Kepler has identified another 100 planetary candidates. His team is now analyzing those to determine which ones, if any, might be actual extrasolar planets.

For more astronomy meeting coverage, visit www.sciencenews.org/AASwinter010

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Record - 6

DIALOG(R)

ANOTHER EARTH? THE ISSUE: ASTRONOMERS CLOSE TO DISCOVERY. OUR VIEW: HABITABLE PLANET IS NOT A FAR-FETCHED IDEA.

Evansville Courier & Press, pA10,
Tuesday, December 22, 2009

TEXT:

Astronomers are one step closer to discovering another Earth, a planet that is roughly the same size and at enough distance from its star that it is in theory habitable. It is not far-fetched to say that such a discovery will very likely happen in the not-too- distant future.

A team from the Harvard-Smithsonian Center for Astrophysics has discovered a planet orbiting a star in the Ophiuchus constellation that is only 2.7 times the size of Earth and 6.6 times as massive. And it is mainly water, alas, at 400 degrees F clouds of superheated steam tower over boiling oceans. Team leader David Charbonneau told The New York Times with a certain understatement, "This probably is not habitable, but it didn't miss the habitable zone by that much." Ophiuchus is 40 light-years from Earth, a huge distance but one that Charbonneau put into an arresting perspective: "Our own TV signals have already passed this star."

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Wolbach Library: CfA in the News ~ Week ending 14 February 2010

1. **New astronomy data have been reported by K. Rines and co-authors**, Science Letter, p168, Tuesday, February 16, 2010
2. **OK, just exactly how is the Earth changing?**, Edmund R. Malinowski, Guest columnist, The Stuart News, All Zones ed, pA7, Wednesday, February 10, 2010
3. **United States: MSU helped design solar telescopes**, sanjayV03, TendersInfo Tuesday, February 9, 2010
4. **Milky Way enigma: Why galaxy's central black hole is silent**, Peter N. Spotts, Staff writer, Christian Science Monitor (USA), ALL ed, Thursday, January 7, 2010
5. **Avatar: the real-life science behind the fantasy**, Mark Sappenfield, Staff writer, Christian Science Monitor (USA), ALL ed, Monday, December 28, 2009

Record - 1

DIALOG

New astronomy data have been reported by K. Rines and co-authors, Science Letter, p168, Tuesday, February 16, 2010

TEXT:

"We use the Fifth Data Release of the Sloan Digital Sky Survey (SDSS) to study X-ray-selected galaxy groups and compare their properties to clusters. We search for infall patterns around the groups and use these to measure group mass profiles to large radii," investigators in the United States report (see also).

"In previous work, we analyzed infall patterns for an X-ray-selected sample of 72 clusters from the ROSAT All-Sky Survey. Here, we extend this approach to a sample of systems with smaller X-ray fluxes selected from the 400 deg(2) serendipitous survey of clusters and groups in ROSAT pointed observations. We identify 16 groups with SDSS DR5 spectroscopy, search for infall patterns, and compute mass profiles out to 2-6 h(-1) Mpc from the group centers with the caustic technique. No other mass estimation methods are currently available at such large radii for these low-mass groups, because the virial estimate requires dynamical equilibrium and the gravitational lensing signal is too weak. Despite the small masses of these

groups, most display recognizable infall patterns. We use caustic and virial mass estimates to measure the scaling relations between different observables, extending these relations to smaller fluxes and luminosities than many previous surveys. Close inspection reveals that three of the groups are subclusters in the outskirts of larger clusters. A fourth group is apparently undergoing a group-group merger. These four merging groups represent the most extreme outliers in the scaling relations. Excluding these groups, we find $L-X \propto \sigma^{3.1 \pm 1.6}$, consistent with previous determinations for both clusters and groups. Understanding cluster and group scaling relations is crucial for measuring cosmological parameters from clusters," wrote K. Rines and colleagues.

The researchers concluded: "The complex environments of our group sample reinforce the idea that great care must be taken in determining the properties of low-mass clusters and groups."

Rines and colleagues published their study in *Astronomical Journal* (INFALL REGIONS AND SCALING RELATIONS OF X-RAY SELECTED GROUPS. *Astronomical Journal*, 2010;139(2):580-593).

For additional information, contact K. Rines, Harvard Smithsonian Center Astrophys, 60 Garden St, MS 20, 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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DIALOG UPDATE DATE: 20100212; 20:18:40 EST
JOURNAL SUBJECT: Science & Engineering

Record - 2

DIALOG(R)

OK, just exactly how is the Earth changing?

Edmund R. Malinowski, Guest columnist,
The Stuart News, All Zones ed, pA7,
Wednesday, February 10, 2010

TEXT:

WHY ROUND 2?

After we published a "One Issue, Two Views" debate Jan. 29 from Jeffrey Chanton and Edmund Malinowski in which the columnists took differing views of global warming, one reader wanted to learn more about the subject.

He suggested we ask each writer to critique the other's position. Here's the result.

VERY SLOWLY: But one thing's clear, despite increased carbon dioxide, changes minimal

Professor Jeffrey Chanton claims that global warming is real and is caused by man-made carbon dioxide.

According to the National Oceanic and Atmospheric Administration, the global temperature has not risen since 2000. Four major global-tracking organizations (NASA's Goddard Institute for Space Studies, Hadley UK, University of Alabama-Huntsville, and Remote Sensing Systems of Santa Rosa, Calif.) report that the global temperature dropped 0.7 of a degree since 2007. NASA satellite data indicates that 2008 was the coldest year since 2000. This cooling occurred while carbon dioxide increased throughout the world.

I agree with professor Chanton that we should not jump to the conclusion that the globe is cooling, but it is not warming as predicted by the alarmists.

A recent study of 246 glaciers between 1946 and 1995 shows that the amount of ice lost equals the amount of ice gained, giving a net change of zero. The National Geographic magazine reported that the snows of Kilimanjaro decreased because of a lack of precipitation, not global warming.

Unfortunately, Professor Chanton fails to mention that global temperature correlates extremely well with solar energy cycles as reported by the Harvard-Smithsonian Center for Astrophysics.

The famous "hockey stick" temperature graph of the U.N. Intergovernmental Panel on Climate Change, so prominently displayed by Al Gore, is severely flawed. This graph, obtained from tree-ring data, differs substantially from Greenland bore-hole measurements that show a medieval period with low carbon dioxide levels much hotter than the current period with high carbon dioxide levels.

Most disconcerting is the recent revelation that the raw (unadjusted) data obtained from tree-ring measurements have been discarded. Because the scientific method requires substantiation by independent examination of the raw data, all credibility in this model is forfeited. The IPCC conclusion does not meet the most fundamental principle of the scientific method: verification.

The IPCC report ignores the role of water vapor, which accounts for 95 percent of the greenhouse effect. Man-made carbon dioxide contributes 0.117

percent to the greenhouse effect. Removing 50 percent of all man-made carbon dioxide (50 percent less from cars, 50 percent less from home heating, 50 percent less from manufacturing, etc.) will reduce man-made carbon dioxide to 0.0585 percent, a negligible effect on global warming.

Carbon dioxide is not toxic. It is used to manufacture soda pop. Plant life requires carbon dioxide just as humans oxygen. Plants convert it into oxygen.

If we classify carbon dioxide as a pollutant to be regulated by the Environmental Protection Agency, should we not also classify water as a pollutant since its overall contribution to the greenhouse effect is almost 1,000 times greater than man-made carbon dioxide?

Tens of thousands of U.S. scientists have sent letters to our congressmen urging them to reject global warming policies because there is no evidence that man-made carbon dioxide is responsible for global warming.

Cap-and-trade is a tax on carbon-based fuels. It is disguised as a tax on industry but will trickle down to be a hidden tax on you and me.

Fuel is the bloodstream of our economy. Limiting its flow will lead to economic disaster. Emerging countries, such as China and India, will not reduce their consumption of fuel. All unilateral efforts will be economically as well as scientifically fruitless and wasteful.

Malinowski, a PhD from Stuart, is emeritus professor of chemistry at the Stevens Institute of Technology. He has been a scientific reviewer for more than 45 years.

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Record - 3

DIALOG(R)

United States: MSU helped design solar telescopes

sanjayV03

TendersInfo

Tuesday, February 9, 2010

TEXT:

Solar physicists at Montana State University helped design four telescopes that are scheduled to be launched into space Tuesday from the Kennedy Space Center in Florida. MSU research professor Piet Martens and associate

research professor David McKenzie plan on being in Florida for the launch, scheduled for between 8:30 a.m. and 9:30 a.m. Mountain. McKenzie and Martens helped design the ultraviolet telescopes with partners at the Lockheed Martin Solar and Astrophysics Laboratory and the Harvard-Smithsonian Center for Astrophysics. They've been working on the project for about six years. "It is the culmination of a long wait," McKenzie said. The telescopes, attached to a satellite, will spend about three years collecting ultraviolet images from the sun's atmosphere to help scientists understand the physics behind the activity on the sun's corona, which drives space weather. The four telescopes together called the Atmospheric Imaging Assembly are one of three instrument packages that will be launched on the Solar Dynamics Observatory satellite, McKenzie said. Another will take pictures of the sun's surface and the third will measure the UV radiation that comes from the sun to the Earth and variation in the radiation. The information will be transmitted to computers in the Midwest and sent to MSU, Stanford University and Lockheed Martin for analysis, McKenzie said. The ultimate goal is to develop advanced forecasting tools. Ultraviolet rays affect the chemistry of the Earth's atmosphere, McKenzie said. "We need to understand how it's producing these activities that affect us," he said. Graduate student Jason Scott of Butte helped design and test the software that will operate the cameras on the telescopes. He plans to be in California from Feb. 15 to mid-March to work with Lockheed Martin scientists to see how the instruments are working and analyze initial data.

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Record - 4

DIALOG(R)

Milky Way enigma: Why galaxy's central black hole is silent,

Peter N. Spotts, Staff writer,
Christian Science Monitor (USA), ALL ed,
Thursday, January 7, 2010

TEXT:

One of the Milky Way's longstanding puzzles centers on the super-massive black hole at its core, in the constellation Sagittarius: Why is that monstrous black hole, known as Sag A*, so much less energetic than its counterparts in other galaxies?

The behemoth, with some 2.6 million times the sun's mass, is a cosmic dud at the moment. Something is starving it, depriving it of material that

otherwise would plummet into it.

Roman Shcherbakov, a researcher at the Harvard-Smithsonian Center for Astrophysics, says he's figured out what that "something" is likely to be: heat.

As material from surrounding stars approaches the black hole and gets compressed by the monster's gravity, it heats up. Some of that heat gets conducted away from the black hole, setting up a source of pressure that sweeps material away from the voracious object.

In other words, heating around the black hole's event horizon - essentially the boundary within which material falls into oblivion - is in effect starving the black hole.

The challenges of studying black holes:

In presenting his results during the American Astronomical Society's winter meeting in Washington this week, Dr. Shcherbakov says that building the process of heat conduction into models of how black holes work began only a couple of years ago.

The processes are so complex that, until recently, "it's been hard to include them in the models," he adds.

Black holes are objects so massive that their gravity is strong enough to prevent light from escaping. Yet scientists have developed ways of detecting them through their effects on the material around them.

In galaxies with active black holes at their cores, strong magnetic fields in the black hole's neighborhood accelerate electrons to speeds up to 99.9 percent of the speed of light and collect them into jets that erupt from the poles of a central black hole. These are visible in a range of wavelengths, from radio waves to x-rays.

In addition, the material falling into a black hole heats to the point where it emits x-rays.

Testing the theory:

Shcherbakov and colleague Frederick Baganoff, with the Massachusetts Institute of Technology, used data from NASA's Chandra X-Ray Observatory as a reality check on their computer simulations testing the heat-conduction idea.

Typically, Shcherbakov explains, roughly 1 percent of the material that surrounding stars exhale as stellar wind reaches the event horizon of a black hole like Sag A*. If Sag A* was receiving that banquet, it should be

100 times brighter in x-rays than it is.

Using a long exposure from Chandra, the duo was able to observe the black hole's activity out to a radius of about 4 light-years. They found that only 0.01 percent of the material one would expect to see ever reaches the black hole's event horizon.

The observations, Shcherbakov says, "are in good agreement" with the model results that take heat conduction into account.

Sag A* hasn't always been this mellow. Last year, for instance, a team of Japanese astrophysicists reported evidence that x-rays from superheated material falling into Sag A* briefly flared some 300 years ago. The x-ray signature at the time would have been a million times brighter than it is today.

Heat conduction is not the only explanation scientists have offered up to explain Sag A*'s current somnolence. Another idea, for instance, involves stellar explosions called supernovae. So many stars near the center of the galaxy are popping off this way that the outrush of material from the explosions in effect is pushing material away from the black hole.

Researchers now face the task of figuring out the relative roles such mechanisms play in keeping Sag A* on its version of a Weight Watchers program.

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Record - 5

DIALOG(R)

Avatar: the real-life science behind the fantasy,

Mark Sappenfield, Staff writer,

Christian Science Monitor (USA), ALL ed,

Monday, December 28, 2009

TEXT:

The producer of "Avatar" is fond of saying that writer and director James Cameron does not write science fiction, he writes science fact.

From the reclining, cup-holdered seat of a local multiplex, that seems a generous statement. Neither mountains floating in midair or fauna that

lights up like the Las Vegas Strip at night would seem to have the slightest foundation in reality.

And yet they do.

To be sure, Mr. Cameron likes to bring his fair share of Hollywood to the cosmos, painting his scenes with the brush of fantasy. But beneath some of his most outlandish visions is often a kernel of scientific possibility.

The floating Hallelujah Mountains:

The topic of how an entire mountain range can bob over the landscape like corks is never explicitly addressed in the film, yet the explanation is woven throughout the story.

It all has to do with superconductors.

When superconductors are in the presence of a magnetic field, they can float. "Avatar's" alien world of Pandora, it turns out, is simply a massive superconductor.

At the very beginning of the story, we are told that humans have come to Pandora to mine unobtainium. Unobtainium is the ultimate superconductor. (The very name, "unobtainium," is a nod to sci-fi aficionados, who coined the word to describe a material with mythical properties.)

In Cameron's world, unobtainium can conduct electricity without resistance at room temperature; the best current superconductors work only when the temperature is below minus 200 degrees F.

The discovery of unobtainium, which exists only on Pandora, revolutionized technology on Earth, the story goes, and the future human economy is dependent upon it.

On Pandora, however, entire mountains loaded with unobtainium float in the world's massive magnetic field.

In a glimpse of how thoroughly Cameron has thought through the science behind his creation, he and his team have written a 380 page "Pandorapedia" that explains (among other things) the tectonics behind how such mountains could form.

In effect, they crumble upward.

This happens because Pandora is not a planet but a moon of a gas giant the size of Saturn - the fictional planet Polyphemus. Moons of gas

giants are constantly tugged and deformed by the stresses of gravity.

One of Jupiter's moons, Io, is pulled so violently by the gravitational forces of both Jupiter and Jupiter's other large moons, that it has ground tides - the ground literally rises and falls like a sea tide on Earth. On a second moon of Jupiter, Europa, these tidal forces have heated the interior of the moon to the point that part of its crust has melted, creating a sea of liquid water beneath a surface of ice, scientists say.

On Cameron's Pandora, those tidal stresses have fractured the landscape, and, in the case of the Hallelujah Mountains, sent it up into the sky. A companion book to the movie explains the larger process: "This ... energy drives continental drift at a much faster rate than on Earth, causing tectonic plates to fracture more extensively because of the increased stress."

Glowing plants:

Cameron's fascination with the deep sea has already led to one of the most successful films of all time: "Titanic." It appears to have shaped "Avatar," too. The oceans' depths have a curious answer to sunlight, which has never been seen there. It's called bioluminescence - organisms' ability to create their own light.

Fireflies are perhaps the most obvious example, but the bioluminescent fish of the deep sea tell a different story - that nature, when deprived of light, sometimes creates its own.

On Pandora, where the nights can be many Earth days long, Cameron has suggested that an entire bioluminescent ecosystem could emerge.

This is where Cameron's decision to make Pandora a moon - and not a planet - comes in. Moons, including Earth's, are typically "locked" to their planets, with one side eternally facing the planet and one side eternally facing out into space. What this means is that one day on a moon equals the time it takes to orbit its parent planet - a long time.

To watch the phases of our Moon is actually to watch the lunar day in real time. A full moon is midday for the side of the Moon facing the Earth. A new moon is midnight for the side of the Moon facing the Earth. In other words, a lunar day takes more than 27 Earth days. And that means a very long night.

Home Sweet Moon:

But could a moon hold life?

Potentially, yes. Actually, making Pandora a moon appears to be an acknowledgment of recent science. Astronomers are still looking for planets like Earth - small and rocky - within the so-called "Goldilocks zone": Not so close to its star that its life-giving water evaporates, yet not so far away that it freezes into ice.

But small planets are hard to find. Instead, scientists have found gas giants like Saturn in the habitable zone around stars. Those planets are not inhabitable - but their moons could be.

That makes moons a good place to start looking for alien life. "All of the gas giant planets in our solar system have rocky and icy moons," Lisa Kaltenegger of the Harvard-Smithsonian Center for Astrophysics in Cambridge, Mass., told AP. "That raises the possibility that alien Jupiters will also have moons. Some of those may be Earth-sized and able to hold onto an atmosphere."

The problem is that gas giants emit tremendous amounts of radiation. The daily radiation on Jupiter's Io, for instance, is 4,000 times the lethal dose.

Yet here again, Cameron uses science to solve science's own problems. The robust magnetic field created by Pandora's superconductivity deflects the radiation.

At one point in the film, a spectacular aurora dances overhead. Striking filmmaking, yes. But also pure science. The companion book, "Avatar: A Confidential Report on the Biological and Social History of Pandora," adds that the interaction of the magnetic fields of Pandora and its parent planet "causes a giant increase in electrical activity on both bodies, with massive auroral storms and other electromagnetic phenomenon."

Such a magnetic field could also be responsible for the telltale arcing formations of rock apparent at the climax of the film.

Other tidbits:

Everything on Pandora - including the 10-foot, blue-skinned Na'vi - is big because the gravity is 80 percent of what it is on Earth.

Cameron has put Pandora and Polyphemus in the real Alpha Centauri star system, the closest star system to Earth. The system is actually three stars all revolving around one another. The biggest is 20 percent larger than the Sun, the second is 15 percent smaller than the Sun,

and the third is a red dwarf 80 percent smaller than the Sun.

Polyphemus is named for the one-eyed Cyclops in Homer's "Odyssey." In the film, a gigantic storm similar to Jupiter's Great Red Spot is visible.

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Wolbach Library: CfA in the News ~ Week ending 21 February 2010

1. **Study results from S.R. Cranmer and colleagues update understanding of astronomy**, Science Letter, p270, Tuesday, February 23, 2010
 2. **Research on astronomy described by A. Pal and colleagues**, Science Letter, p242, Tuesday, February 23, 2010
 3. **Reports on astronomy findings from M.R. Garcia and co-researchers provide new insights**, Science Letter, p224, Tuesday, February 23, 2010
 4. **Reports from J.L. Christiansen and co-researchers add new data to research in astronomy**, Science Letter, p223, Tuesday, February 23, 2010
 5. **New astronomy research has been reported by T. Temim et al**, Science Letter, p208 Tuesday, February 23, 2010
 6. **UNIVERSITY OF NORTH DAKOTA RESEARCHER ONE OF FIRST TO DISCOVER CLEAR EVIDENCE OF BINARY QUASAR**, US Federal News, Saturday, February 20, 2010
 7. **CA Lockheed Physicist photo 02 19**, AP Alert - Business, Friday, February 19, 2010
 8. **MOST PRECISE TEST YET OF EINSTEIN'S GRAVITATIONAL REDSHIFT**, US Federal News, Thursday, February 18, 2010
 9. **NASA'S CHANDRA REVEALS ORIGIN OF KEY COSMIC EXPLOSIONS**, US Federal News, Thursday, February 18, 2010
 10. **NASA's Chandra Reveals Origin of Key Cosmic Explosions**
AP Alert - Business, Wednesday, February 17, 2010
 11. **For the record**, Boston Globe (MA), p14, Wednesday, February 17, 2010
 12. **Goal for NASA: To Mars, or Not Quite?**, New York Times (NY), Late Edition - Final ed, p26, Tuesday, February 16, 2010
 13. **Babette Whipple, 91; was psychotherapist, wife of noted astronomer**, Gloria Negri, Boston Globe (MA), p10, Monday, February 15, 2010
 14. **Latest Montana news, sports, business and entertainment:**, AP Alert - Montana, Sunday, February 7, 2010
- WORD COUNT: 912

Record - 1

DIALOG(R)

Study results from S.R. Cranmer and colleagues update understanding of Astronomy,

Science Letter, p270,

Tuesday, February 23, 2010

TEXT:

"The origins of the hot solar corona and the supersonically expanding solar wind are still the subject of debate. A key obstacle in the way of producing realistic simulations of the Sun-heliosphere system is the lack of a physically motivated way of specifying the coronal heating rate," investigators in the United States report (see also).

"Recent one-dimensional models have been found to reproduce many observed features of the solar wind by assuming the energy comes from Alfvén waves that are partially reflected, then dissipated by magnetohydrodynamic turbulence. However, the nonlocal physics of wave reflection has made it difficult to apply these processes to more sophisticated (three-dimensional) models. This paper presents a set of robust approximations to the solutions of the linear Alfvén wave reflection equations. A key ingredient of the turbulent heating rate is the ratio of inward-to-outward wave power, and the approximations developed here allow this to be written explicitly in terms of local plasma properties at any given location. The coronal heating also depends on the frequency spectrum of Alfvén waves in the open-field corona, which has not yet been measured directly. A model-based assumption is used here for the spectrum, but the results of future measurements can be incorporated easily. The resulting expression for the coronal heating rate is self-contained, computationally efficient, and applicable directly to global models of the corona and heliosphere," wrote S.R. Cranmer and colleagues.

The researchers concluded: "This paper tests and validates the approximations by comparing the results to exact solutions of the wave transport equations in several cases relevant to the fast and slow solar wind."

Cranmer and colleagues published their study in *Astrophysical Journal* (AN EFFICIENT APPROXIMATION OF THE CORONAL HEATING RATE FOR USE IN GLOBAL SUN-HELIOSPHERE SIMULATIONS. *Astrophysical Journal*, 2010;710(1):676-688).

For additional information, contact S.R. Cranmer, Harvard Smithsonian Center Astrophys, 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.

Record - 2

DIALOG(R)

**Research on astronomy described by A. Pal and colleagues,
Science Letter, p242,**

Tuesday, February 23, 2010,

TEXT:

According to a study from the United States, "We present refined parameters for the extrasolar planetary system HAT-P-2 (also known as HD 147506), based on new radial velocity and photometric data. HAT-P-2b is a transiting extrasolar planet that exhibits an eccentric orbit."

"We present a detailed analysis of the planetary and stellar parameters, yielding consistent results for the mass and radius of the star, better constraints on the orbital eccentricity and refined planetary parameters. The improved parameters for the host star are $M_{\text{star}} = 1.36 \pm 0.04 M_{\odot}$ and $R_{\text{star}} = 1.64 \pm 0.08 R_{\odot}$, while the planet has a mass of $M_{\text{p}} = 9.09 \pm 0.24 M_{\text{Jup}}$ and radius of $R_{\text{p}} = 1.16 \pm 0.08 R_{\text{Jup}}$. The refined transit epoch and period for the planet are $E = 2454387.49375 \pm 0.00074$ (BJD) and $P = 5.6334729 \pm 0.0000061$ (d), and the orbital eccentricity and argument of periastron are $e = 0.5171 \pm 0.0033$ and $\omega = 185^{\circ} 22' \pm 0^{\circ} 95'$. These orbital elements allow us to predict the timings of secondary eclipses with a reasonable accuracy of similar to 15 min. We also discuss the effects of this significant eccentricity including the characterization of the asymmetry in the transit light curve. Simple formulae are presented for the above, and these, in turn, can be used to constrain the orbital eccentricity using purely photometric data," wrote A. Pal and colleagues (see also).

The researchers concluded: "These will be particularly useful for very high precision, space-borne observations of transiting planets."

Pal and colleagues published the results of their research in Monthly Notices of the Royal Astronomical Society (Refined stellar, orbital and planetary parameters of the eccentric HAT-P-2 planetary system. Monthly Notices of the Royal Astronomical Society, 2010;401(4):2665-2674).

For additional information, contact A. Pal, Harvard Smithsonian Center Astrophys, 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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Record - 3

DIALOG(R)

Reports on astronomy findings from M.R. Garcia and co-researchers provide new insights,

Science Letter, p224,
Tuesday, February 23, 2010

TEXT:

According to a study from the United States, "We confirm our earlier tentative detection of M31* in X-rays and measure its light curve and spectrum. Observations in 2004-2005 find M31* rather quiescent in the X-ray and radio."

"However, X-ray observations in 2006-2007 show M31* to be highly variable at times. A separate variable X-ray source is found near P1, the brighter of the two optical nuclei. The apparent angular Bondi radius of M31* is the largest of any black hole and large enough to be well resolved with Chandra. The diffuse emission within this Bondi radius is found to have an X-ray temperature similar to 0.3 keV and density 0.1 cm^{-3} , indistinguishable from the hot gas in the surrounding regions of the bulge given the statistics allowed by the current observations. The X-ray source at the location of M31* is consistent with a point source and a power-law spectrum with energy slope 0.9 ± 0.2 ," wrote M.R. Garcia and colleagues (see also).

The researchers concluded: "Our identification of this X-ray source with M31* is based solely on positional coincidence."

Garcia and colleagues published the results of their research in Astrophysical Journal (X-RAY AND RADIO VARIABILITY OF M31*, THE ANDROMEDA GALAXY NUCLEAR SUPERMASSIVE BLACK HOLE. Astrophysical Journal, 2010;710(1):755-763).

For additional information, contact M.R. Garcia, Harvard Smithsonian Center Astrophys, 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.

Record - 4

DIALOG(R)

Reports from J.L. Christiansen and co-researchers add new data to research in astronomy,

Science Letter, p223,

Tuesday, February 23, 2010

TEXT:

According to recent research from the United States, "The highly irradiated transiting exoplanet, HAT-P-7b, currently provides one of the best opportunities for studying planetary emission in the optical and infrared wavelengths. We observe six near-consecutive secondary eclipses of HAT-P-7b at optical wavelengths with the EPOXI spacecraft."

"We place an upper limit on the relative eclipse depth of 0.055% (95% confidence). We also analyze Spitzer observations of the same target in the infrared, obtaining secondary eclipse depths of 0.098 +/- 0.017%, 0.159% +/- 0.022%, 0.245% +/- 0.031%, and 0.225% +/- 0.052% in the 3.6, 4.5, 5.8, and 8.0 μ m IRAC bands, respectively. We combine these measurements with the recently published Kepler secondary eclipse measurement and generate atmospheric models for the dayside of the planet that are consistent with both the optical and infrared measurements. The data are best fit by models with a temperature inversion, as expected from the high incident flux. The models predict a low optical albedo of less than or similar to 0.13, with subsolar abundances of Na, K, TiO, and VO. We also find that the best-fitting models predict that 10% of the absorbed stellar flux is redistributed to the nightside of the planet, which is qualitatively consistent with the inefficient day-night redistribution apparent in the Kepler phase curve. Models without thermal inversions fit the data only at the 1.25s level, and also require an overabundance of methane, which is not expected in the very hot atmosphere of HAT-P-7b," wrote J.L. Christiansen and colleagues (see also).

The researchers concluded: "We also analyze the eight transits of HAT-P-7b present in the EPOXI data set and improve the constraints on the system parameters, finding a period of $P = 2.2047308 \pm 0.0000025$ days, a stellar radius of $R_{\text{star}} = 1.824 \pm 0.089 R_{\odot}$, a planetary radius of $R_{\text{p}} = 1.342 \pm 0.068 R_{\text{Jup}}$, and an inclination of $i = 85.7(-2.2)(+3.5)$ deg."

Christiansen and colleagues published their study in *Astrophysical Journal* (STUDYING THE ATMOSPHERE OF THE EXOPLANET HAT-P-7b VIA SECONDARY ECLIPSE MEASUREMENTS WITH EPOXI, SPITZER, AND KEPLER. *Astrophysical Journal*,

2010;710(1):97-104).

For additional information, contact J.L. Christiansen, Harvard Smithsonian Center Astrophys, 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 - 5

DIALOG(R)

New astronomy research has been reported by T. Temim et al,

Science Letter, p208,

Tuesday, February 23, 2010

TEXT:

According to recent research published in the Astrophysical Journal, "G54.1+0.3 is a young pulsar wind nebula (PWN), closely resembling the Crab, for which no thermal shell emission has been detected in X-rays. Recent Spitzer observations revealed an infrared (IR) shell containing a dozen point sources arranged in a ring-like structure, previously proposed to be young stellar objects."

"An extended knot of emission located in the NW part of the shell appears to be aligned with the pulsar's X-ray jet, suggesting a possible interaction with the shell material. Surprisingly, the IR spectrum of the knot resembles the spectrum of freshly formed dust in Cas A, and is dominated by an unidentified dust emission feature at 21 μ m. The spectra of the shell also contain various emission lines and show that some are significantly broadened, suggesting that they originate in rapidly expanding supernova (SN) ejecta. We present the first evidence that the PWN is driving shocks into expanding SN ejecta and we propose an alternative explanation for the origin of the IR emission in which the shell is composed entirely of SN ejecta. In this scenario, the freshly formed SN dust is being heated by early-type stars belonging to a cluster in which the SN exploded," wrote T. Temim and colleagues (see also).

The researchers concluded: "Simple dust models show that this interpretation can give rise to the observed shell emission and the IR point sources."

Temim and colleagues published their study in Astrophysical Journal (DEEP CHANDRA OBSERVATIONS OF THE CRAB-LIKE PULSAR WIND NEBULA G54.1+0.3 AND SPITZER SPECTROSCOPY OF THE ASSOCIATED INFRARED SHELL. Astrophysical

Journal, 2010;710(1):309-324).

For additional information, contact T. Temim, Harvard Smithsonian Center Astrophys, 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 - 6

DIALOG(R)

UNIVERSITY OF NORTH DAKOTA RESEARCHER ONE OF FIRST TO DISCOVER CLEAR EVIDENCE OF BINARY QUASAR,

US Federal News,

Saturday, February 20, 2010

TEXT:

GRAND FORKS, N.D., Feb. 19 -- University of North Dakota issued the following news release:

A University of North Dakota faculty member was at the Kitt Peak National Observatory telescope in Tucson, Ariz., in March 2009 when the first discovery images brought clear evidence of a binary quasar within a pair of actively merging galaxies. Follow-up images were obtained with a larger telescope in Chile to verify the discovery.

An interview with Dr. Wayne Barkhouse, the UND Department of Physics & Astrophysics faculty member who was at Kitt Peak National Observatory at the time of the discovery, will air on the CBC radio program "Quirks and Quarks" Saturday, Feb. 20, starting at 12:06 p.m. (airing locally on Channel 990 AM from Winnipeg). The interview can also be found starting Saturday on the CBC website

<http://www.cbc.ca/quirks/archives/09-10/qq-2010-02-20.html> as a podcast and mp3 file. This show is broadcast internationally on shortwave and satellite radio. [The following is a link to Barkhouse's web page, which describes the research from his aspect: <http://www.physics.und.edu/news2/index.htm>.]

Quasars are the extremely bright centers of galaxies surrounding super-massive black holes, and binary quasars are pairs of quasars bound together by gravity. Binary quasars, like other quasars, are thought to be the product of galaxy mergers. Until now, however, binary quasars have not been seen in galaxies that are unambiguously in the act of merging. But images of a new binary quasar from the Carnegie Institution's Magellan telescope in Chile show two distinct galaxies with "tails" produced by

tidal forces from their mutual gravitational attraction.

Most, if not all, large galaxies, such as our galaxy the Milky Way, host super-massive black holes at their centers. Because galaxies regularly interact and merge, astronomers have assumed that binary super-massive black holes have been common in the Universe, especially during its early history. Black holes can only be detected as quasars when they are actively accreting matter, a process that releases vast amounts of energy. A leading theory is that galaxy mergers trigger accretion, creating quasars in both galaxies. Because most of such mergers would have happened in the distant past, binary quasars and their associated galaxies are very far away and therefore difficult for most telescopes to resolve.

Barkhouse is one of the authors of the paper published in the Astrophysical Journal. Others include Paul J. Green of the Harvard-Smithsonian Center for Astrophysics, Adam D. Myers of the University of Illinois at Urbana-Champaign, John S. Mulchaey of the Observatories of the Carnegie Institution for Science, Vardha N. Bennert of the Department of Physics, University of California, Santa Barbara, Thomas J. Cox of the Observatories of the Carnegie Institution for Science, and Thomas L. Aldcroft of the Harvard-Smithsonian Center for Astrophysics. For more information please contact: Sarabjit Jagirdar, Email:- htsyndication@hindustantimes.com.

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Record - 7

DIALOG(R)

CA Lockheed Physicist photo 02 19

AP Alert - Business

Friday, February 19, 2010

TEXT:

Lockheed Martin Physicist Inducted Into Silicon Valley Engineering Hall of Fame

PALO ALTO, Calif., Feb. 19 /PRNewswire/ -- Dr. Alan M. Title, physicist at the Lockheed Martin Space Systems Advanced Technology Center (ATC) in Palo Alto, was inducted last evening into the Silicon Valley Engineering Hall of Fame. The Silicon Valley Engineering Hall of Fame Award recognizes engineers/technologists/scientists in the region who have demonstrated outstanding professional achievement and have made significant contributions to Silicon Valley and the Greater Bay Area communities. The award is conferred by the Silicon Valley Engineering Council.

(Photo: <http://www.newscom.com/cgi-bin/prnh/20100219/SF57847>)

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. 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 responsible for the Atmospheric Imaging Assembly on SDO, which was launched on Feb. 11, 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 is also the Principal Investigator on a new NASA solar mission under development called the Interface Region Imaging Spectrograph (IRIS), which will launch in 2012. Both the instrument and spacecraft will be built at the ATC.

Dr. Title's research has centered on solar magnetic and velocity fields, on optical interferometers, in particular ultra narrow optical filters, on high-resolution observations using active and adaptive optical systems, and

on data analysis systems for image analysis. Additionally, he has led the development of ground- and space-based instruments for solar physics research.

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, Ma. 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 ATC has a 47-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 on NASA's Transition Region and Coronal Explorer, the Solar X-ray Imager on the GOES-N and O environmental satellites, the Focal Plane Package on Hinode and an Extreme Ultraviolet Imager on each of the two spacecraft in NASA's Solar Terrestrial Relations Observatory. The laboratory also conducts basic research into understanding and predicting space weather and the behavior of the Sun including its impacts on Earth and climate.

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. "Lockheed Martin is dedicated to building excitement for science, engineering, and math education through the excellent National Engineers Week 'Discover E' (for engineering) program as well as many other outreach efforts," said John Kowalchik, vice president and chief engineer at LMSSC. "For over two decades many of our finest engineers have been affiliated

with the Silicon Valley Engineering Council in support of their educational goals.

Each year, Lockheed Martin engineers visit about 100 classrooms to teach and mentor students, as well as to share their enthusiasm for math, science and engineering, and the exciting careers that become a reality from working hard in school." Headquartered in Bethesda, Md., Lockheed Martin is a global security company that employs about 140,000 people worldwide and is principally engaged in the research, design, development, manufacture, integration and sustainment of advanced technology systems, products and services. The Corporation reported 2009 sales of \$45.2 billion.

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Record - 8

DIALOG(R)

MOST PRECISE TEST YET OF EINSTEIN'S GRAVITATIONAL REDSHIFT,

US Federal News,

Thursday, February 18, 2010

TEXT:

BERKELEY, Calif., Feb. 17 -- The University of California at Berkeley issued the following press release:

While airplane and rocket experiments have proved that gravity makes clocks tick more slowly - a central prediction of Albert Einstein's general theory of relativity - a new experiment in an atom interferometer measures this slowdown 10,000 times more accurately than before, and finds it to be exactly what Einstein predicted.

The result shows once again how well Einstein's theory describes the real world, said Holger Muller, an assistant professor of physics at the University of California, Berkeley.

"This experiment demonstrates that gravity changes the flow of time, a concept fundamental to the theory of general relativity," Muller said. The phenomenon is often called the gravitational redshift because the oscillations of light waves slow down or become redder when tugged by gravity.

A report describing the experiment appears in the Feb. 18 issue of the journal Nature.

Treating particles as waves

Muller tested Einstein's theory by taking advantage of a tenet of quantum mechanics: that matter is both a particle and a wave. The cesium atoms used in the experiment can be represented by matter waves that oscillate 3×10

25 times per second, that is, nearly a million billion billion times per second.

When the cesium atom matter wave enters the experiment, it encounters a carefully tuned flash of laser light. The laws of quantum mechanics step in, and each cesium atom enters two alternate realities, Muller said. In one, the laser has pushed the atom up one-tenth of a millimeter - $4/1000$ of an inch - giving it a tiny boost out of Earth's gravitational field. In the other, the atom remains unmoved inside Earth's gravitational well, where time flies by less quickly.

While the frequency of cesium matter waves is too high to measure, Muller and his colleagues used the interference between the cesium matter waves in the alternate realities to measure the resulting difference between their oscillations, and thus the redshift.

The equations of general relativity predicted precisely the measured slowing of time, to an accuracy of about one part in 100 million (7×10

-9) - 10,000 times more accurate than the measurements made 30 years ago using two hydrogen maser clocks, one on Earth and the other launched via rocket to a height of 10,000 kilometers.

"Two of the most important theories in all of physics are Quantum Mechanics and the General Theory of Relativity," noted Muller's collaborator, Steven Chu, a former UC Berkeley professor of physics and former director of Lawrence Berkeley National Laboratory (LBNL). Chu was one of the originators of the atom interferometer, which is based on his Nobel Prize-winning development of cold laser traps. "The paper that we are publishing in Nature uses two fundamental aspects of the quantum description of matter to perform one of the most precise tests of The General Theory of Relativity."

Precision timekeeping

Far from merely theoretical, the results have implications for Earth's global positioning satellite system, for precision timekeeping and for gravitational wave detectors, Muller said.

"If we used our best clocks, with 17-digit precision, in global positioning satellites, we could determine position to the millimeter," he said. "But lifting a clock by 1 meter creates a change in the 16th digit. So, as we use better and better clocks, we need to know the influence of gravity better."

Muller also noted that the experiment demonstrates very clearly "Einstein's profound insight, that gravity is a manifestation of curved space and time, which is among the greatest discoveries of humankind."

This insight means that what we think of as the influence of gravity - planets orbiting stars, for example, or an apple falling to Earth - is really matter following the quickest path through spacetime. In a flat geometry, the quickest route is a straight line. But in Einstein's theory, the flow of time becomes a function of location, so the quickest path could now be an elliptical orbit or a plumb line to the ground.

Experiments have tested the theory to higher and higher precision, but direct measurements of the gravitational redshift have had to struggle with the minimal size of the effect in Earth's gravitational field. These measurements culminated in the 1976 experiment by NASA and the Harvard Smithsonian Astrophysical Observatory using hydrogen maser clocks. That precision was 7×10^{-16}

Atom interferometers

Just as an optical interferometer uses interfering light waves to measure time or distance to within a fraction of a wavelength, an atom interferometer uses interfering matter waves. Because matter waves oscillate at a much higher frequency than light waves, they can be used to measure correspondingly smaller times and distances.

Since 1991, when Chu was at Stanford University, he and former members of his lab have used Chu's technique of cooling and trapping atoms with lasers to build the most precise atom interferometers. In 1999, one of those students, Achim Peters, now at Humboldt University in Berlin, performed such an experiment on cesium atoms in free fall to precisely measure the acceleration of gravity.

Muller, who was Peters' graduate student at Humboldt University, subsequently worked in Steve Chu's group at Stanford as a postdoctoral fellow, although Chu left Stanford during that time to become the director of LBNL and later U.S. Secretary of Energy. After joining the UC Berkeley faculty in July 2008, Muller attended a conference on frequency and time measurement where he realized that Peters' experimental data could also yield the most precise measure yet of the gravitational redshift. Muller approached Chu about the experiment and received an enthusiastic response.

Peters' experiment involved capturing a million cesium atoms in a cold laser trap chilled to a few millionths of a degree above absolute zero and zapping them with a vertical laser beam tuned to give them a kick upwards, with 50 percent probability. A split second later, a second laser pulse sends the high-flying matter waves downward and the stationary ones upward to merge. A third laser pulse recombines the two. Measuring the amplitude of the recombined matter waves reveals the phase difference between the two.

Muller and Chu noted that the contribution of the rest mass to the frequency of matter wave oscillations is normally ignored in quantum mechanical calculations, because the resulting frequencies are too fast to measure. But in this experiment, that high "Compton" frequency allowed an extremely precise measurement of the different clock rates.

"In conceiving of this research, we realized that relativity theory demands that the energy E also includes the energy due to the rest mass of the atom, given by Einstein's famous equation $E = mc^2$," Chu wrote in an e-mail. "The energy due to the rest mass of the atoms is enormous, resulting in an atomic clock that ticks at 3×10^{25}

25 Hertz."

Freefall

During the approximately 0.3 seconds of freefall, the matter waves on the higher route feel that a little more time elapsed: just 2×10^{-20}

seconds compared to the lower route. But because of the sheer magnitude of the Compton frequency, Muller said, they oscillated about a million times more often. Since the atom interferometer could measure the difference to within a thousandth of an oscillation, the experiment produced a 9-digit accuracy. This corresponds to measuring the time difference to 10

-28 seconds.

To put these numbers in perspective, Muller said, "if the time of freefall was extended to the age of the universe, 14 billion years, the time difference between the upper and lower routes would be a mere 1/100th second, and the accuracy of the measurement would be 60 picoseconds, the time it takes for light to travel about 1/2 inch."

Muller is building ever more precise atom interferometers, and hopes this year to measure the gravitational redshift more precisely with a millimeter separation. One future milestone will be a separation of a meter or more.

"If we could separate the atoms by a meter, we could build an experiment to observe gravity waves," he said. Gravity waves are tiny fluctuations in gravity propagating through spacetime theoretically generated by interactions between massive stars or black holes.

To filter out noise from Earth's gravity and other perturbations, like a passing truck, such an experiment would have to involve at least two atom interferometers separated by a large distance. An ideal spot for the experiment, he said, would be the Deep Underground Science and Engineering Laboratory at the former Homestake mine in South Dakota.

The research is supported by National Science Foundation, the U.S. Air Force Office of Scientific Research, the David and Lucile Packard Foundation, and the National Institute of Standards and Technology. For more information please contact: Sarabjit Jagirdar, Email:- htsyndication@hindustantimes.com.

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DIALOG(R)

NASA'S CHANDRA REVEALS ORIGIN OF KEY COSMIC EXPLOSIONS,

US Federal News,

Thursday, February 18, 2010

TEXT:

WASHINGTON, Feb. 17 -- NASA issued the following press release:

New findings from NASA's Chandra X-ray Observatory have provided a major advance in understanding a type of supernova critical for studying the dark energy that astronomers think pervades the universe. The results show mergers of two dense stellar remnants are the likely cause of many of the supernovae that have been used to measure the accelerated expansion of the universe.

These supernovae, called Type 1a, serve as cosmic mile markers to measure expansion of the universe because they can be seen at large distances, and they follow a reliable pattern of brightness. However, until now, scientists have been unsure what actually causes the explosions.

"These are such critical objects in understanding the universe," said Marat Gilfanov of the Max Planck Institute for Astrophysics in Germany and lead author of the study that appears in the Feb. 18 edition of the journal Nature. "It was a major embarrassment that we did not know how they worked. Now we are beginning to understand what lights the fuse of these explosions."

Most scientists agree a Type 1a supernova occurs when a white dwarf star - a collapsed remnant of an elderly star - exceeds its weight limit, becomes unstable and explodes. Scientists have identified two main possibilities for pushing the white dwarf over the edge: two white dwarfs merging or accretion, a process in which the white dwarf pulls material from a sun-like companion star until it exceeds its weight limit.

"Our results suggest the supernovae in the galaxies we studied almost all come from two white dwarfs merging," said co-author Akos Bogdan, also of Max Planck. "This is probably not what many astronomers would expect."

The difference between these two scenarios may have implications for how these supernovae can be used as "standard candles" - objects of a known brightness - to track vast cosmic distances. Because white dwarfs can come in a range of masses, the merger of two could result in explosions that vary somewhat in brightness.

Because these two scenarios would generate different amounts of X-ray emission, Gilfanov and Bogdan used Chandra to observe five nearby elliptical galaxies and the central region of the Andromeda galaxy. A Type 1a supernova caused by accreting material produces significant X-ray

emission prior to the explosion. A supernova from a merger of two white dwarfs, on the other hand, would create significantly less X-ray emission than the accretion scenario.

The scientists found the observed X-ray emission was a factor of 30 to 50 times smaller than expected from the accretion scenario, effectively ruling it out. This implies that white dwarf mergers dominate in these galaxies.

An open question remains whether these white dwarf mergers are the primary catalyst for Type 1a supernovae in spiral galaxies. Further studies are required to know if supernovae in spiral galaxies are caused by mergers or a mixture of the two processes. Another intriguing consequence of this result is that a pair of white dwarfs is relatively hard to spot, even with the best telescopes.

"To many astrophysicists, the merger scenario seemed to be less likely because too few double-white-dwarf systems appeared to exist," said Gilfanov. "Now this path to supernovae will have to be investigated in more detail."

In addition to the X-rays observed with Chandra, other data critical for this result came from NASA's Spitzer Space Telescope and the ground-based, infrared Two Micron All Sky Survey. The infrared brightness of the galaxies allowed the team to estimate how many supernovae should occur.

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, can be found at: <http://chandra.nasa.gov> And <http://chandra.harvard.edu> For more information please contact: Sarabjit Jagirdar, Email:- htsyndication@hindustantimes.com.

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Record - 10

DIALOG(R)

NASA supernova study photo 02 17

AP Alert - Business

Wednesday, February 17, 2010

NASA's Chandra Reveals Origin of Key Cosmic Explosions

WASHINGTON, Feb 17 /PRNewswire-USNewswire/ -- New findings from NASA's Chandra X-ray Observatory have provided a major advance in understanding a type of supernova critical for studying the dark energy that astronomers think pervades the universe. The results show mergers of two dense stellar remnants are the likely cause of many of the supernovae that have been used to measure the accelerated expansion of the universe.

(Logo: <http://www.newscom.com/cgi-bin/prnh/20081007/38461LOGO>)

These supernovae, called Type 1a, serve as cosmic mile markers to measure expansion of the universe because they can be seen at large distances, and they follow a reliable pattern of brightness. However, until now, scientists have been unsure what actually causes the explosions.

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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, can be found at:

<http://chandra.nasa.gov>

and

<http://chandra.harvard.edu>

SOURCE NASA

-0- 02/17/2010

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Record - 11

DIALOG(R)

For the record,
Boston Globe (MA), p14,
Wednesday, February 17, 2010

TEXT:

Correction: Because of a reporting error, the obituary of Babette Whipple in Monday's Metro section incorrectly stated her late husband's profession. Fred Whipple was an astronomer, a Harvard professor of astronomy, and a director of the Smithsonian Astrophysical Observatory in Cambridge.

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Record - 12

DIALOG(R)

Goal for NASA: To Mars, or Not Quite?
New York Times (NY), Late Edition - Final ed, p26
Tuesday, February 16, 2010

TEXT:

To the Editor:

Re "A New Space Program" (editorial, Feb. 9):

Your editorial calling for a new goal for NASA and suggesting Mars is right in spirit, wrong in particulars.

Mars is not yet a feasible goal. Instead, the proposed 2011 NASA budget is all about developing United States capabilities to expand and exploit the inner solar system. Part of the initiative is to "scout" resources."

Let me suggest that this should be the whole goal: NASA's prime task should be developing space resources.

Just as the United States Geological Survey and the Army helped miners and settlers move west in the United States in the 19th century, NASA -- perhaps together with other agencies -- should make it possible to exploit the huge wealth available in space. With the right investments, the risk involved in bringing these resources back to Earth will become low enough that venture capitalists will find the enterprise worth the risk, for huge profits.

How big are the resources? A single small asteroid of the right type contains billions of dollars' worth of platinum alone -- about a year's production on Earth. Surveys under way will soon find hundreds of small asteroids in accessible orbits. But picking the right one will take a lot of work, as will developing the remote mining methods.

Astronomers, planetary scientists, geologists, aerospace engineers, miners and astronauts will all be needed to make this vision a success. The payoff for the United States, and for all on Earth, could be endless.

Martin Elvis
Cambridge, Mass., Feb. 10, 2010

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

To the Editor:

As a former director for public information for the National Space Society (Philadelphia office), I would like to point out that many of the solutions we seek today were advanced 25 years ago. Space industrialization offers practical investments in technologies that would yield benefits in energy, materials and products. That path was rejected by NASA in favor of a Mars mission that holds no economic promise for the future or the American public.

A return to the Moon for mining, fuel production and in-space manufacturing offers nearer term economic benefits through investment in our

technologies, our economy and our people. Exploration means little when we refuse the benefits of the assets we've developed.

Technologies like the solar power satellite and the solar sail offer solutions for a resource-starved world and a series of economic and political options we do not have today. We need energy, not Captain Kirk.

Michael Calabrese
Cincinnati, Feb. 10, 2010

To the Editor:

You are spot on regarding the missing goals for NASA's new space plan. The Vision for Space Exploration was conceived in 2004 as a robust plan to expand stepwise to the Moon and beyond, exploiting resources and linking robotic missions to human exploration. Underfinancing, including an unanticipated bill for Katrina damage, left the program with a clear goal (the Moon) but weak technology and robotic mission foundations.

The new plan finances technology and robotics, but has no other clear goal. Perhaps we should listen to the Augustine Commission, which concluded last fall that the program was simply underfinanced. With \$787 billion of stimulus money already spent, you would think that an extra \$3 billion for this national treasure would be warranted.

Dave Murrow
Highlands Ranch, Colo., Feb. 9, 2010

The writer, a former employee of NASA's Jet Propulsion Laboratory, is a consultant and engineering service provider to the aerospace industry, specifically robotic mission and launch vehicle providers.

To the Editor:

I propose the idea of assembling our next manned spacecraft at the International Space Station. The ship could be assembled using modules created on Earth and transported to the space station using low-cost unmanned rockets. We would no longer need superexpensive heavy-lift rockets for manned Earth launchings.

Private companies could develop smaller, single-stage space planes that could take astronauts to and from the space station, returning them to Earth at space ports like the one being built in New Mexico.

If we use the space station as our base to launch and maintain manned spacecraft, I believe that we will have taken a major step toward a sustainable manned space program. From the space station we could go to

Mars, the Moon, or other moons, planets or asteroids. It is time to break free of Earth's gravity in an affordable way.

David Kaye
Woodland Hills, Calif., Feb. 9, 2010

The writer is a retired aerospace engineer.

To the Editor:

Do we really need a space program that will carry astronauts to Mars?

According to the Nobel laureate Steven Weinberg, the manned space program "masquerades as science." You could say it is a spectator sport, having about the same relationship to science that intercollegiate football has to education.

V. K. Balakrishnan
Cedar Park, Tex., Feb. 9, 2010

DRAWING (DRAWING BY LULU WOLF)

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Record - 13

DIALOG(R)

Babette Whipple, 91; was psychotherapist, wife of noted astronomer,
Gloria Negri,
Boston Globe (MA), p10,
Monday, February 15, 2010

TEXT:

Her fire-engine red Volvo was well known around Belmont. The license plate, COMETS, left no doubt who was behind the wheel

Babette Whipple, wife of the late Harvard astronomy professor Fred L. Whipple, was en route to one of her many commitments

Mrs. Whipple's husband was considered the world's foremost authority on comets and first director of the Smithsonian Astrophysical Observatory in Cambridge

She also had a doctorate, from Harvard, in psychology, and had had a long practice in that field. But, she preferred "Mrs. Whipple" to "Dr. Whipple,"

because there was already a "Dr. Whipple" in the family, said her daughter Laura, of Los Angeles. She was just Babbie to others.

Mrs. Whipple was driving her latest red Volvo into mid-December, running errands, downsizing her possessions, cleaning her garage with the help of a neighbor, when, a week before Christmas, she was taken to Mount Auburn Hospital in Cambridge with severe abdominal pains. Doctors began surgery and found widespread cancer, her daughter said

Mrs. Whipple, who inspired and was a founder of a community music school in Belmont and who was treating patients with psychological disorders at her home into her 70s, died at Mount Auburn on Dec. 18. She was 91 and had lived in Belmont since 1957

Age may have slowed her, but it did not stop her. Longtime friend Richard Held of Cambridge, a Massachusetts Institute of Technology neuroscience researcher, said a favorite story among friends was Mrs. Whipple calling Democratic Party officials in the last presidential election offering to drive elderly people to the polls. "She was passionately supportive of Obama," he said

"Mother was just fearless," said another daughter, D. Sandra, of Merion, Pa.. "When she wanted to get something done, she did it. She loved connecting with people and loved music. She was a complete Polyanna." Mrs. Whipple's neighbor, Jeffrey Krasner, a former Globe reporter, said that when he last saw her in December, she "looked fantastic and would have passed for 70 in an instant. She had an impish and very animated face. She was perfectly active."

Just days before she died, she had flown to Philadelphia for Sandra's birthday

Mrs. Whipple not only connected with people, but she also made lifelong friends. She and Aili Chin, of Lexington, had been friends since they were roommates at Harvard. "After Babette and I were both married, we kept in touch," she said. "She had her babies a bit before I did, so she was my adviser in raising them."

She was born Babette Samelson in Memphis. Her family said her parents were divorced when she was an infant, and much of her early life was spent traveling with her mother. She believed she had attended more than 20 schools, relatives said

In 1934 and 1935, she attended the Lycee Emile Jacquemain in Brussels. She returned to the United States at 17, speaking fluent French

After graduating from Wellesley College in 1939 with a bachelor's degree in classics and philosophy, she earned her master's degree in philosophy in

1941 from Radcliffe College at Harvard. She changed her discipline and earned her doctorate in psychology from Harvard in 1945. She began working in what was then known as the Massachusetts Habit Clinics, focusing on behavioral problems of preschool children.

She met Fred Whipple at a New Year's Eve party on Beacon Hill and after "a whirlwind courtship," Laura said, they were married in 1946. "While raising her children," she added, "she continued part time with her psychology research in the child psychiatry department of Massachusetts General Hospital."

From 1962 to 1965, Mrs. Whipple had a private practice of psychotherapy, mostly at her Belmont home. She later lectured and consulted in that field at public schools and colleges, and returned to private practice. She also published work in her field.

Busy though she was, Mrs. Whipple was the perfect faculty wife, hosting parties for large groups of astronomers and their families, often with little notice, for students and faculty. In the basement of her home, her family said, are the 50 teacups and saucers she used for regular gatherings of astronomers' wives.

Also in her basement was a photography dark room where she developed her professional-quality photographs of places and people. Many used her photographs in books they wrote.

The Whipples traveled far and often. In 1958, the year of the Soviet Union Sputnik, they traveled the world, as Fred Whipple visited satellite observing stations he had been instrumental in setting up and attended international scientific meetings.

In August that year, they were in Moscow for meetings, including the International Astronomical Union.

In Belmont in 1964, Mrs. Whipple decided the town needed a cultural center, so she got a small group of people to form the Belmont Community Center, which became the site of community music festivals and instruction. It is now the Powers Music School, named for one of its founders.

Sandra Rosenblum, of Belmont, who was among the founders, said: "It was Babbie's idea. She got us together to brainstorm, and today the school is thriving."

Mrs. Whipple was brilliant, friends said, in learned and practical ways. When Paul Wender of Cambridge, a rocket scientist and friend of 40 years, was visiting the Whipples at their home in the British Virgin Islands, he went for a swim while Mrs. Whipple was in a boat.

"Suddenly, I was aware of a 10-foot shark," he said. "I called to Babbie, and she called back, 'If you're not bleeding or wearing anything shiny, you're all right.' "

After her husband's death in 2004, Mrs. Whipple got to the task of downsizing belongings. She joined a memoir club in Cambridge. One of her last memoirs in September was titled "Old and Determined."

The folders held the story of her life "from childhood to Fred's death."

They made her realize, she wrote, that her life had been "busy, busy - quite different from the pace of my life today. Although it is of necessity much slower, I remain as determined as ever to get as much done each day as I possibly can."

In addition to her two daughters, Mrs. Whipple leaves a stepson, Earle R., of Barcelona; two grandchildren, and two step-grandchildren

A memorial service will be held at 2 p.m. on April 10 at the Wellesley College Club.

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Record - 14

DIALOG(R)

Latest Montana news, sports, business and entertainment:

AP Alert – Montana,
Sunday, February 7, 2010

TEXT:

Information from: Billings Gazette, <http://www.billingsgazette.com>

MSU-SPACE TELESCOPES

MSU helped design solar telescopes

BOZEMAN, Mont. (AP) _ Solar physicists at Montana State University helped design four telescopes that are scheduled to be launched into space Tuesday from the Kennedy Space Center in Florida.

MSU research professor Piet Martens and associate research professor David McKenzie plan on being in Florida for the launch, scheduled for between 8:30 a.m. and 9:30 a.m. Mountain.

McKenzie and Martens helped design the ultraviolet telescopes with partners at the Lockheed Martin Solar and Astrophysics Laboratory and the Harvard-Smithsonian Center for Astrophysics. They've been working on the

project for about six years.

The telescopes will spend about three years collecting ultraviolet images from the sun's atmosphere to help scientists understand the physics behind the activity on the sun's corona, which drives space weather.

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1. **A - Research & Development**, FedBizOpps, Tuesday, February 23, 2010

Record -1

DIALOG(R)

A - Research & Development

FedBizOpps

Tuesday, February 23, 2010

TEXT:

National Aeronautics and Space Administration

NASA/George C. Marshall Space Flight Center, Procurement Office, Marshall
SpaceFlight Center, AL 35812

Notice Type: Presolicitation Notice

Posted Date: 19-FEB-10

Agency: National Aeronautics and Space Administration

Office Address: NASA/George C. Marshall Space Flight Center, Procurement
Office, Marshall Space Flight Center, AL 35812

Subject: A--DESIGN FABRICATE ASSEMBLE AND TEST MARSHALL GRAZING INCIDENCE
X-RAY SPECTROMETER

Classification Code: A - Research & Development

Solicitation Number: 4200326079

Contact: Mark R. Stiles, Contracting Officer, Phone 256-544-0381, Fax
256-544-6062, Email mark.r.stiles@nasa.gov - Belinda F Triplett, Contract
Specialist, Phone 256-961-7650, Fax 256-961-7524, Email
belinda.f.triplett@nasa.gov mark.r.stiles@nasa.gov - Mark R. Stiles

Description: National Aeronautics and Space Administration

George C. Marshall Space Flight Center

Procurement Office

NASA/MSFC has a requirement to complete the design and fabrication of Optics alignment hardware and support integration and test in the Marshall Grazing Incidence X-ray Spectrometer (MaGIXS) prototype assembly in a the Stray Light test facility at Marshall Space Flight Center (MSFC) in order to verify the optical performance. NASA/MSFC intends to purchase this effort from Smithsonian Astrophysical Observatory (SAO).

This is a follow-on effort to the design of the MaGIXS performed by SAO In collaboration with MSFC during Fiscal year 2009 and relies upon technology originally developed by SAO for the NASA instrument the X-Ray Telescope (XRT) currently operating a part of the Hinode observatory. The Government does not intend to acquire a commercial item using FAR Part 12.

See Note26. Interested organizations may submit their capabilities and qualifications to perform the effort in writing to the identified point of contact not later than 4:30 p.m. local time on March 05, 2010. Such capabilities/qualifications will be evaluated solely for the purpose of determining whether or not to conduct this procurement on a competitive basis. A determination by the Government not to compete this proposed effort on a full and open competition basis, based upon responses to this notice, is solely within the discretion of the government. Oral communications are not acceptable in response to this notice. All responsible sources may submit an offer which shall be considered by the agency. An Ombudsman has been appointed. See NASA Specific Note "B". Any referenced notes may be viewed at the following URLs linked below.

Link/URL: <https://www.fbo.gov/spg/NASA/GMSFC/POVA/4200326079/listing.html>

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Wolbach Library: CfA in the News ~ Week ending 7 March 2010

1. **Astronomers discover star that's almost as old as the universe itself**, Hindustan Times, Thursday, March 4, 2010

Record - 1

DIALOG(R)

Astronomers discover star that's almost as old as the universe itself,
Hindustan Times,
Thursday, March 4, 2010

TEXT:

Washington, March 4 -- Astronomers have discovered a relic from the early universe - a star that may have been among the second generation of stars to form after the Big Bang.

Located in the dwarf galaxy Sculptor some 290,000 light-years away, the star has a remarkably similar chemical make-up to the Milky Way's oldest stars.

Its presence supports the theory that our galaxy underwent a "cannibal" phase, growing to its current size by swallowing dwarf galaxies and other galactic building blocks.

"This star likely is almost as old as the universe itself," said astronomer Anna Frebel of the Harvard-Smithsonian Center for Astrophysics. Dwarf galaxies are small galaxies with just a few billion stars, compared to hundreds of billions in the Milky Way.

In the "bottom-up model" of galaxy formation, large galaxies attained their size over billions of years by absorbing their smaller neighbors.

"If you watched a time-lapse movie of our galaxy, you would see a swarm of dwarf galaxies buzzing around it like bees around a beehive," explained Frebel.

"Over time, those galaxies smashed together and mingled their stars to make one large galaxy - the Milky Way," she said.

If dwarf galaxies are indeed the building blocks of larger galaxies, then the same kinds of stars should be found in both kinds of galaxies, especially in the case of old, "metal-poor" stars.

Surveys over the past decade have failed to turn up any such extremely metal-poor stars in dwarf galaxies, however.

Team member Evan Kirby, a Caltech astronomer, developed a method to estimate the metal abundances of large numbers of stars at a time, making it possible to efficiently search for the most metal-poor stars in dwarf galaxies.

Among stars he found in the Sculptor dwarf galaxy was one faint, 18th-magnitude speck designated S1020549.

Spectroscopic measurements of the star's light with Carnegie's Magellan-Clay telescope in Las Campanas, Chile, determined it to have a metal abundance 6,000 times lower than that of the Sun; this is five times lower than any other star found so far in a dwarf galaxy.

The researchers measured S1020549's total metal abundance from elements such as magnesium, calcium, titanium, and iron.

The overall abundance pattern resembles those of old Milky Way stars, lending the first observational support to the idea that these galactic stars originally formed in dwarf galaxies.

The researchers expect that further searches will discover additional metal-poor stars in dwarf galaxies. Published by HT Syndication with permission from Asian News International. For more information on news feed please contact Sarabjit Jagirdar at htsyndication@hindustantimes.com

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Wolbach Library: CfA in the News ~ Week ending 14 March 2010

1. **Milky Way's fastest stars circle each other at 500 kms a second**, Hindustan Times, Saturday, March 13, 2010
2. **LAWRENCE LIVERMORE NATIONAL LABORATORY MULTILAYER MIRRORS FLY ON NASA'S SOLAR DYNAMICS OBSERVATORY**, US Federal News, Tuesday, March 9, 2010
3. **Primitive star discovered**, UPI Science News, Monday, March 8, 2010

Record - 1

DIALOG(R)

Milky Way's fastest stars circle each other at 500 kms a second,
Hindustan Times,
Saturday, March 13, 2010

TEXT:

Washington, March 13 -- Astronomers have confirmed that two extremely dense stars in an intimate dance are spinning around each other in just 5.4 minutes at about 500 kilometers a second, making them the fastest known stellar partners in the galaxy.

The whirling duo, known as HM Cancri, also has the tightest orbit of any known "binary" star system.

Both stars are white dwarfs-the dense, white-hot remnants left behind when sunlike stars die.

The stellar corpses are separated by no more than three times the width of Earth.

In such tight quarters, hot gases flow between the two stars, releasing huge amounts of energy.

"This is the most extreme example of one of these double white dwarf systems we have so far," study co-author Danny Steeghs of the University of Warwick in the UK, told National Geographic News.

Study leader Gijs Roelofs, of the Harvard-Smithsonian Center for Astrophysics, was part of the team that first detected periodic x-ray emissions from HM Cancri in 1999.

Initial observations had suggested a 5.4-minute orbit, but the researchers weren't sure if the pulses of light were coming from two circling stars or one superfast spinner.

To confirm the stars' dizzying tango, Roelofs and colleagues turned to the world's second largest optical telescope, at the W. M. Keck Observatory in Hawaii, where they measured "wobbles" in the system's brightness. "The amplitude of the wobble gives you an idea of the orbit period and the masses" of the stars, co-author Steeghs said.

What's more, light emissions from the stars were found to be moving in opposite directions, as such emissions would for two orbiting bodies, cinching the case for a binary system.

HM Cancri's record-breaking orbit couldn't get much quicker, Steeghs added, since the stars would merge if they got any closer, triggering a massive explosion known as a type Ia supernova.

"Overall, three minutes would be the fastest a binary white dwarf system could get," he said. Published by HT Syndication with permission from Asian News International. For more information on news feed please contact Sarabjit Jagirdar at htsyndication@hindustantimes.com

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Record - 2

DIALOG(R)

LAWENCE LIVERMORE NATIONAL LABORATORY MULTILAYER MIRRORS FLY ON NASA'S SOLAR DYNAMICS OBSERVATORY,

US Federal News,
Tuesday, March 9, 2010

TEXT:

LIVERMORE, Calif., March 8 -- The U.S. Department of Energy's Lawrence Livermore National Laboratory issued the following press release:

A Lab technology that originally was developed to make computer chips smaller, faster and more powerful is now being used in space to take images of the sun every 10 seconds with 10 times better resolution than high-definition television.

Lab-developed extreme ultraviolet (EUV) multilayer mirrors are part of the Atmospheric Imaging Assembly (AIA), which is one of three instruments on

board NASA's Solar Dynamics Observatory (SDO) spacecraft. Launched in mid-February, the SDO's mission is to evaluate the complex mechanisms of the sun and is NASA's most advanced solar mission to date.

Extreme ultraviolet lithography (EUVL) technology, first demonstrated in the late 1990s, offered the potential to manufacture computer chips with dozens of times more speed and hundreds of times more memory than today's integrated circuits. At the height of the research venture, about 175 scientists, engineers and technicians at three national laboratories, including LLNL, worked on overcoming the hurdles to allow EUVL to be utilized for future integrated circuit production.

Now the same technology is being put to a different use. A Lab team, led by Physics Division's Regina Soufli, designed, developed and fabricated the state-of-the-art reflective multilayer coatings - similar to what was used with EUVL - that allow for optimum imaging performance of the mirrors placed in four telescopes on board the SDO. Soufli's team also had developed the multilayer coatings for two of the most advanced EUVL camera systems from 2000-2002.

But achieving the SDO coatings was no easy task. Each curved mirror requires two reflective multilayer coatings, each covering about half of the 200 millimeter-diameter primary or 80 millimeter-diameter secondary mirror. Each coating needed to be deposited with thickness precision on the order of an atomic diameter.

Moreover, Soufli said masking off the point where the two coatings met was challenging. "We had to get the mask close to the mirror surface without touching it, and had to shape the mask edge using a special design, to minimize detrimental 'shadowing' effects on the area being coated."

By playing a clever optimization game, the team - Soufli, Eberhard Spiller, Jeff C. Robinson, Sherry Baker and Jay Ayers - was able to shrink the area where the two coatings overlap from 20 millimeters down to two millimeters.

"This way it enables optimal imaging," Soufli said. "Now we will be able to use every photon of the sun to get the best details and resolution in the images."

NASA's Solar Dynamics Observatory launched in mid-February. The AIA instrument on the SDO spacecraft consists of an array of four telescopes that provides an unprecedented view of the solar corona, taking images that span 1.3 solar diameters in 10 different spectral bands every 10 seconds, at a resolution of 1 arcsecond. AIA will produce essential data for quantitative studies of the evolving coronal magnetic field and its plasma that will be used to significantly improve the understanding of the physics

behind the activity displayed by the sun's atmosphere.

The team had another hurdle to overcome. Before the multilayer coatings were deposited on the polished mirror substrates, the team had to find out if there were any defects or roughness on the surface. They used atomic force microscopy, which revealed features that proved crucial in the performance analysis of the mirrors.

"We had to assess each substrate before we coated them," Soufli said. "We had to know from the beginning what the roughness was because if it was more than originally budgeted, we could lose a significant fraction or all of the reflectivity."

SDO's findings will revolutionize the study of solar events such as sunspots, flares and coronal mass ejections, which can affect air travel, the electric power grid, satellite communications and astronaut safety. SDO will observe the sun, from its deep interior to the outermost layers of solar atmosphere by snapping a full disk image in 10 wavelengths every 10 seconds. The satellite has a high-data-rate contact with a dedicated ground station at the White Sands Complex in southern New Mexico.

SDO will send down about 1.5 terabytes of data per day, equivalent to downloading half a million songs each day. That is 50 times more science data than any mission in NASA history.

All solar images will be 4096 pixels by 4096 pixels - almost IMAX quality - providing details of the sun and its features that have rarely been seen before.

There are a total of seven EUV and three UV-visible channels on the four telescopes. Four of the EUV wavelength bands open new perspectives on the solar corona, having never been imaged or imaged only during brief rocket flights.

The set of six EUV channels that observe ionized iron emission lines allow the construction of relatively narrow-band temperature maps of the solar corona.

The Laboratory team also designed and performed the in-band and off-band calibrations of the mirrors at beamline 6.3.2. of the Advanced Light Source at Lawrence Berkeley National Laboratory. These calibrations are essential for the accurate interpretation of the data transmitted by the AIA instrument.

"We took knowledge we gained from EUVL and advanced it," Soufli said.

Funding for this work was provided by the Smithsonian Astrophysical

Observatory. For more information please contact: Sarabjit Jagirdar, Email:-
htsyndication@hindustantimes.com.

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Record - 3

DIALOG(R)

Primitive star discovered,

UPI Science News,

Monday, March 8, 2010

TEXT:

U.S. astronomers say they found a star containing 6,000 times fewer heavy elements than Earth's sun, meaning it formed very early in the universe's history.

The scientists said the star, located about 290,000 light-years from Earth, supports the theory that Earth's galaxy underwent a "cannibal" phase, growing to its current size by swallowing dwarf galaxies and other galactic building blocks.

Researchers said the star -- which might have been among the second generation of stars to form after the Big Bang -- has a remarkably similar chemical makeup to the Milky Way's oldest stars.

"This star likely is almost as old as the universe itself," said astronomer Anna Frebel of the Harvard-Smithsonian Center for Astrophysics, lead author of the report.

Dwarf galaxies are small galaxies with just a few billion stars, compared with hundreds of billions in the Milky Way. The scientists said in the "bottom-up model" of galaxy formation, large galaxies attained their size over billions of years by absorbing their smaller neighbors.

The discovery by astronomers at the Harvard-Smithsonian Center for Astrophysics and the Observatories of the Carnegie Institution appears in the journal Nature.

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Wolbach Library: CfA in the News ~ Week ending 21 March 2010

1. **NASA's Spitzer Unearths Primitive Black Holes**, National Aeronautics and Space Administration Documents, Wednesday, March 17, 2010
2. **Why nebulae around massive stars don't disappear**, Hindustan Times, Wednesday, March 17, 2010
3. **Stars in their own field**, ABIGAIL THATCHER ALLEN, Dallas Morning News, EDITION1 ed, pB06, Tuesday, March 16, 2010
4. **Collin College students discover asteroid, earn nod from NASA**, Abigail Thatcher Allen, Dallas Morning News, Monday, March 15, 2010
5. **'She's original'**, Rajendran, P, India Abroad; New York edition, v40, n24, pM56, Friday, March 12, 2010

Record - 1

DIALOG(R)

NASA's Spitzer Unearths Primitive Black Holes,
National Aeronautics and Space Administration Documents,
Wednesday, March 17, 2010

TEXT:

MEDIA RELATIONS OFFICE JET PROPULSION LABORATORY CALIFORNIA INSTITUTE OF TECHNOLOGY NATIONAL AERONAUTICS AND SPACE ADMINISTRATION PASADENA, CALIFORNIA 91109. TELEPHONE 818-354-5011 <http://www.jpl.nasa.gov>

Whitney Clavin 818-354-4673 Jet Propulsion Laboratory, Pasadena, Calif.
whitney.clavin@jpl.nasa.gov

News release: 2010-088 - - - - March 17, 2010

NASA's Spitzer Unearths Primitive Black Holes

The full version of this story with accompanying images is at:

<http://www.jpl.nasa.gov/news/news.cfm?release=2010-088&cid=release2010-088>

Astronomers have come across what appear to be two of the earliest and most primitive supermassive black holes known. The discovery, based largely on observations from NASA's Spitzer Space Telescope, will provide a better

understanding of the roots of our universe, and how the very first black holes, galaxies and stars came to be.

"We have found what are likely first-generation quasars, born in a dust-free medium and at the earliest stages of evolution," said Linhua Jiang of the University of Arizona, Tucson. Jiang is the lead author of a paper announcing the findings in the March 18 issue of Nature.

Black holes are beastly distortions of space and time. The most massive and active ones lurk at the cores of galaxies, and are usually surrounded by doughnut-shaped structures of dust and gas that feed and sustain the growing black holes. These hungry, supermassive black holes are called quasars.

As grimy and unkempt as our present-day universe is today, scientists believe the very early universe didn't have any dust -- which tells them that the most primitive quasars should also be dust-free. But nobody had seen such immaculate quasars -- until now. Spitzer has identified two -- the smallest on record -- about 13 billion light-years away from Earth.

The quasars, called J0005-0006 and J0303-0019, were first unveiled in visible light using data from the Sloan Digital Sky Survey. That discovery team, which included Jiang, was led by Xiaohui Fan, a coauthor of the recent paper at the University of Arizona. NASA's Chandra X-ray Observatory had also observed X-rays from one of the objects. X-rays, ultraviolet and optical light stream out from quasars as the gas surrounding them is swallowed.

"Quasars emit an enormous amount of light, making them detectable literally at the edge of the observable universe," said Fan.

When Jiang and his colleagues set out to observe J0005-0006 and J0303-0019 with Spitzer between 2006 and 2009, their targets didn't stand out much from the usual quasar bunch. Spitzer measured infrared light from the objects along with 19 others, all belonging to a class of the most distant quasars known. Each quasar is anchored by a supermassive black hole weighing more than 100 million suns.

Of the 21 quasars, J0005-0006 and J0303-0019 lacked characteristic signatures of hot dust, the Spitzer data showed. Spitzer's infrared sight makes the space telescope ideally suited to detect the warm glow of dust that has been heated by feeding black holes.

"We think these early black holes are forming around the time when the dust was first forming in the universe, less than one billion years after the Big Bang," said Fan. "The primordial universe did not contain any molecules

that could coagulate to form dust. The elements necessary for this process were produced and pumped into the universe later by stars."

The astronomers also observed that the amount of hot dust in a quasar goes up with the mass of its black hole. As a black hole grows, dust has more time to materialize around it. The black holes at the cores of J0005-0006 and J0303-0019 have the smallest measured masses known in the early universe, indicating they are particularly young, and at a stage when dust has not yet formed around them.

Other authors include W.N. Brandt of Pennsylvania State University, University Park; Chris L. Carilli of the National Radio Astronomy Observatory, Socorro, N.M.; Eiichi Egami of the University of Arizona; Dean C. Hines of the Space Science Institute, Boulder, Colo.; Jaron D. Kurk of the Max Planck Institute for Extraterrestrial Physics, Germany; Gordon T. Richards of Drexel University, Philadelphia, Pa.; Yue Shen of the Harvard Smithsonian Center for Astrophysics, Cambridge, Mass.; Michael A. Strauss of Princeton, N.J.; Marianne Vestergaard of the University of Arizona and Niels Bohr Institute in Denmark; and Fabian Walter of the Max Planck Institute for Astronomy, Germany. Fan and Kurk were based in part at the Max Planck Institute for Astronomy when this research was conducted.

The Spitzer observations were made before the telescope ran out of its liquid coolant in May 2009, beginning its "warm" mission.

NASA's Jet Propulsion Laboratory, Pasadena, Calif., manages the Spitzer Space Telescope mission for NASA's Science Mission Directorate in Washington. Science operations are conducted at the Spitzer Science Center at the California Institute of Technology in Pasadena. Caltech manages JPL for NASA. For more information about Spitzer, visit <http://www.spitzer.caltech.edu/spitzer> and <http://www.nasa.gov/spitzer>.

-end-

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Record - 2

DIALOG(R)

Why nebulae around massive stars don't disappear,

Hindustan Times,

Wednesday, March 17, 2010

TEXT:

Washington, March 17 -- A team of scientists, using computer simulations,

has solved a 20-year-old riddle about why nebulae around massive stars don't disappear.

Massive stars are dense enough to fuse hydrogen while they're still gathering material from the gas cloud, so it was a mystery why their brilliant radiation does not heat the infalling gas and blow it away.

New simulations by researchers affiliated with the University of Heidelberg, American Museum of Natural History, the National Autonomous University of Mexico, and the Harvard-Smithsonian Center for Astrophysics show that as the gas cloud collapses, it forms dense filamentary structures that absorb the star's radiation when it passes through them. A result is that the surrounding heated nebula flickers like a candle flame.

"To form a massive star, you need massive amounts of gas," said Mordecai-Mark Mac Low, a co-author and curator in the Department of Astrophysics at the Museum. "Gravity draws that gas into filaments that feed the hungry baby stars," he added.

Stars form when huge clouds of gas collapse.

Once the central density and temperature are high enough, hydrogen begins to fuse into helium and the star begins to shine.

The most massive stars, though, begin to shine while the clouds are still collapsing.

Their ultraviolet light ionizes the surrounding gas, forming a nebula with a temperature of 10,000 degrees Celsius.

This suggests that the growth of a massive star should taper off or even cease because the surrounding gas should be blown away by the heating.

First author Thomas Peters, a researcher at the Center of Astronomy at the University of Heidelberg and a former Annette Kade Fellow at the Museum, and colleagues ran gas dynamical simulations on supercomputers at the Texas Advanced Computing Center funded by the National Science Foundation and at the Leibniz and Juelich Computing Centers in Germany.

The team's results show that interstellar gas around massive stars does not fall evenly onto the star, but instead forms filamentary concentrations because the amount of gas is so great that gravity causes it to collapse locally while falling to the star.

The local areas of collapse form spiral filaments.

When the massive star passes through them, they absorb its ultraviolet radiation, shielding the surrounding gas.

This shielding explains not only how gas can continue falling in, but why the ionized nebulae observed with radio telescopes are so small.

The nebulae shrink again as they are no longer ionized, so that over thousands of years, the nebula appears to flicker, almost like a candle. Published by HT Syndication with permission from Asian News International. For more information on news feed please contact Sarabjit Jagirdar at htsyndication@hindustantimes.com

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Record - 3

DIALOG(R)

Stars in their own field,
ABIGAIL THATCHER ALLEN,
Dallas Morning News, EDITION1 ed, pB06,
Tuesday, March 16, 2010

TEXT:

Stargazers from around the world fixed their sights on a vast asteroid field between Mars and Jupiter last month.

But it was a group of Collin College students who found something no one else had laid eyes on: asteroid 2010 CK12.

NASA will recognize the three students - Adrian Boysselle, David Golynskiy and Deepak Joseph - who competed against groups from nine countries in North America, Asia, Europe and South America through the International Asteroid Search Campaign.

Mike Broyles, a physics professor and project supervisor, said the international competition was fierce, making their discovery that much more impressive.

"I was really excited for them," he said.

The Collin students, who spotted the giant rock Feb. 12, got off to a rocky start because they had to train on their equipment first.

"They certainly took the bull by the horns," said physics professor Greg

Sherman, who assisted the students on the project from when it started Feb. 1.

It's part of the Collin College Center for Advanced Studies in Mathematics and Natural Sciences.

The images the students analyzed came from NASA's Wide-Field Infrared Survey Explorer satellite, launched in December. Then it was a race to see who could identify the objects the quickest.

2010 CK12 is one of about 100,000 main belt asteroids in a region between Mars and Jupiter. And while it's larger than a football field and probably a couple of kilometers wide, Broyles said, the students "weren't even sure it was an asteroid at first."

The students' names will be published along with their finding by the Minor Planet Center, part of the Harvard-Smithsonian Center for Astrophysics.

"They reaped the rewards of their hard work," Sherman said.

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Record - 4

DIALOG(R)

Collin College students discover asteroid, earn nod from NASA,

Abigail Thatcher Allen,
Dallas Morning News,
Monday, March 15, 2010

TEXT:

Mar. 15--Stargazers from around the world fixed their sights on a vast asteroid field between Mars and Jupiter last month.

But it was a group of Collin College students who found something no one else had laid eyes on: asteroid 2010 CK12.

NASA will recognize the three students -- Adrian Boysselle, David Golynskiy and Deepak Joseph -- who competed against groups from nine countries in North America, Asia, Europe and South America through the International Asteroid Search Campaign.

Mike Broyles, a physics professor and project supervisor, said the international competition was fierce, making their discovery that much more impressive.

"I was really excited for them," he said. "They were really happy."

The Collin students, who spotted the giant rock Feb. 12, got off to a rocky start because they had to train on their equipment first.

"They certainly took the bull by the horns," said physics professor Greg Sherman, who assisted the students on the project since it began Feb. 1. It's part of the Collin College Center for Advanced Studies in Mathematics and Natural Sciences.

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The students' names will be published along with their finding by the Minor Planet Center, part of the Harvard-Smithsonian Center for Astrophysics. "They reaped the rewards of their hard work," Sherman said.

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Record - 5

DIALOG(R)

'She's original',

Rajendran, P,

India Abroad; New York edition, v40, n24, pM56,

Friday, March 12, 2010

TEXT:

HEADNOTE

Her peers explain why Priyamvada Natarajan is a rising star of cosmology

The way (Priyamvada Natarajan) thinks about the problem (at hand) is more philosophical, more conceptual. It's a broad view of things. It's more conceptual. Most people work on the technical details. But she's thinking more about the concepts. That's a novelty. I think we need more people like that. New horizons are opened by people that have the broader perspective and are not just worried about the details. I enjoy speaking with her

because she's original and she's broad. There aren't many people like that. This is a dying breed..." That was Avi Loeb, professor of astronomy at Harvard University, who has worked with Natarajan on a paper on black holes.

He describes her as being very original and often coming up with new ideas that benefit the theoretical physics community.

He describe one of her original ideas - the relationship she came up with for the size of black holes in the center of galaxies to the mass of the galaxy itself. She was able to make predictions of what would happen to the way the spinning black holes at their centers aligned while the galaxies merged, increasing the size of the resulting galaxy.

According to David Spergel, chair of the Department of Astrophysical Sciences at Princeton University, Natarajan is one of the rising stars of cosmology.

"She's bright and creative. Many people in astrophysics focus on one particular problem and become experts in that. She's already shown a significant intellectual range in her work."

"Personally, she's a warm person, pleasant to interact with - cares about ... her students, the people she interacts with," says Spergel.

Margaret Geller, a senior scientist at the Smithsonian Astrophysical Observatory who worked on mapping dark matter in the universe, speaks of how Natarajan went out of her way to help one of Geller's students, Ken Rines, who was a post-doc at Yale.

"She encouraged him to look at the data he had, the distribution of mass in the clusters (of galaxies)... It broadened his view."

"I know her as a very energetic, creative young scientist. I think her work on the growth of black holes, gravitational lens and looking at the distribution of matter in the universe is fascinating."

"She's very young. She has all the hallmarks of a leader ... and great personal warmth."

Geller says she has watched Natarajan grow in stature. "She has a nose for very good problems and she really has a kind of sparkle in science, which is very nice to see."

While Natarajan does not stray far from observational data, Geller says, "She has a lot of insights into the observation of gravitational lensing. There aren't so many theorists who do that."

She really tries to think about how observations constrain theory, says Geller. "She's very good at that. She's very sane in her approach to looking at the data and the theory and making the connection between the two."

- P Rajendran

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Wolbach Library: CfA in the News ~ Week ending 28 March 2010

1. **Research on life sciences published by A. Frebel et al**, Blood Weekly, p275, Thursday, April 1, 2010
2. **Harvard-Smithsonian Center for Astrophysics describes research in life sciences**, Blood Weekly, p711, Thursday, April 1, 2010
3. **Heated discussions; Feature**, Andrew Montford, Times Higher Education Supplement, p42, Thursday, March 25, 2010
4. **United States : Astronomers get sharpest view ever of star factories in distant galaxy**, TendersInfo, Wednesday, March 24, 2010
5. **Quick View: New Galaxy Found**, Indian Express, Tuesday, March 23, 2010

Record - 1

DIALOG(R)

Research on life sciences published by A. Frebel et al
Blood Weekly, p275
Thursday, April 1, 2010

TEXT:

2010 APR 1 - () -- "Current cosmological models(1,2) indicate that the Milky Way's stellar halo was assembled from many smaller systems (see also). On the basis of the apparent absence of the most metal-poor stars in present-day dwarf galaxies, recent studies(3) claimed that the true Galactic building blocks must have been vastly different from the surviving dwarfs," scientists writing in the journal Nature report.

"The discovery of an extremely iron-poor star (S1020549) in the Sculptor dwarf galaxy based on a medium-resolution spectrum(4) cast some doubt on this conclusion. Verification of the iron-deficiency, however, and measurements of additional elements, such as the a-element Mg, are necessary to demonstrate that the same type of stars produced the metals found in dwarf galaxies and the Galactic halo. Only then can dwarf galaxy stars be conclusively linked to early stellar halo assembly. Here we report high-resolution spectroscopic abundances for 11 elements in S1020549, confirming its iron abundance of less than 1/4,000th that of the Sun, and showing that the overall abundance pattern follows that seen in low-metallicity halo stars, including the a-elements," wrote A. Frebel and colleagues.

The researchers concluded: "Such chemical similarity indicates that the systems destroyed to form the halo billions of years ago were not fundamentally different from the progenitors of present-day dwarfs, and suggests that the early chemical enrichment of all galaxies may be nearly identical."

Frebel and colleagues published their study in Nature (Linking dwarf galaxies to halo building blocks with the most metal-poor star in Sculptor. Nature, 2010;464(7285):72-75).

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

The publisher of the journal Nature can be contacted at: Nature Publishing Group, Macmillan Building, 4 Crinan St., London N1 9XW, England.

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Record - 2

DIALOG(R)

Harvard-Smithsonian Center for Astrophysics describes research in life Sciences,

Blood Weekly, p711,

Thursday, April 1, 2010

TEXT:

2010 APR 1 - () -- Investigators publish new data in the report 'Linking dwarf galaxies to halo building blocks with the most metal-poor star in Sculptor.' According to recent research published in the journal Nature, "Current cosmological models indicate that the Milky Way's stellar halo was assembled from many smaller systems (see also). On the basis of the apparent absence of the most metal-poor stars in present-day dwarf galaxies, recent studies claimed that the true Galactic building blocks must have been vastly different from the surviving dwarfs."

"The discovery of an extremely iron-poor star (S1020549) in the Sculptor dwarf galaxy based on a medium-resolution spectrum cast some doubt on this conclusion. Verification of the iron-deficiency, however, and measurements of additional elements, such as the alpha-element Mg, are necessary to demonstrate that the same type of stars produced the metals found in dwarf galaxies and the Galactic halo. Only then can dwarf galaxy stars be conclusively linked to early stellar halo assembly. Here we report high-resolution spectroscopic abundances for 11 elements in S1020549,

confirming its iron abundance of less than 1/4,000th that of the Sun, and showing that the overall abundance pattern follows that seen in low-metallicity halo stars, including the alpha-elements," wrote A. Frebel and colleagues, Harvard-Smithsonian Center for Astrophysics.

The researchers concluded: "Such chemical similarity indicates that the systems destroyed to form the halo billions of years ago were not fundamentally different from the progenitors of present-day dwarfs, and suggests that the early chemical enrichment of all galaxies may be nearly identical."

Frebel and colleagues published their study in Nature (Linking dwarf galaxies to halo building blocks with the most metal-poor star in Sculptor. Nature, 2010;464(7285):72-5).

For additional information, contact A. Frebel, Harvard-Smithsonian Center for Astrophysics, Cambridge, Massachusetts 02138 USA.

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Record - 3

DIALOG(R)

Heated discussions; Feature,

Andrew Montford,

Times Higher Education Supplement, p42,

Thursday, March 25, 2010

TEXT:

The email conversations at the heart of 'Climategate' suggest a campaign to nobble journals, marginalise climate-change sceptics and withhold data from other researchers, says Andrew Montford.

The leaking, or perhaps hacking, of hundreds of emails from the servers of the Climatic Research Unit at the University of East Anglia late last year has thrown the already turbulent world of climatology into turmoil. The significance of the emails is hotly disputed, but sceptics of the so-called consensus position allege that they contain evidence of the undermining of the peer-review process, attempts to pressurise journals, the withholding of data and code from outsiders, and at least one episode of the manipulation of results.

The accusations and denials will fly for months to come. So far, no fewer than five inquiries have been announced into various aspects of what has come to be known as Climategate, and some of these will not report until the middle of the year. However, regardless of the outcome, the affair

raises ethical issues that will be of interest far beyond the narrow confines of climate science. Some of the most important concern the world of academic publishing.

Among the most serious allegations to emerge in the wake of the leaked emails is that CRU scientists tried to "noble" scientific journals that accepted papers from sceptics. There are suggestions in the emails that as many as four different journals may have had their normal procedures interfered with.

One particular series of emails dating back to 2003 is a case in point. The story unfolds in messages exchanged by some of the most prominent names in climatology, including Michael Mann, the author of the famous "hockey stick" paper, Phil Jones, the CRU director who has stood aside in the wake of the Climategate affair, and Mike Hulme, at that point the director of the Tyndall Centre for Climatic Change Research and now a prominent media commentator on climatology and its policy implications.

In the messages, the scientists discuss how to deal with the recent publication of a paper in the journal *Climate Research* by Willie Soon and Sallie Baliunas, two prominent climate-change sceptics from the Harvard-Smithsonian Center for Astrophysics. Mann and his team speak of encouraging colleagues to stop treating *Climate Research* as a valid publication for scientific findings, and of "getting rid of" both the paper's editor, Chris de Freitas, and the journal's editor-in-chief, Hans von Storch. Another plan involved trying to precipitate a mass resignation from the editorial board. In the event, four of the journal's editors did in fact resign in protest, including von Storch.

Clearly readers who object strongly to elements of the content of a journal have the right to protest - the readers of, say, the *Journal of Evolutionary Biology* could not be expected to accept the publication of articles about creationism. Few would see the submission of a letter of complaint to the editor as crossing any ethical boundaries in these circumstances. However, when more aggressive measures are adopted by unhappy readers, the nature of the protest and the circumstances that precipitate it must give journal editors pause for thought.

While intelligent design may be objectionable in a scientific journal, Soon and Baliunas' paper was clearly within the boundaries of the scientific method - a valid contribution to the literature, albeit perhaps a flawed one. In these circumstances, how should a journal editor respond to a letter of protest? A single letter may be shrugged off, but what about a campaign of letter writing? This may appear much more like an attempt to impose an orthodoxy than a valid protest. There are, after all, well-established approaches to dealing with the publication of flawed

papers, namely the submission of formal comments and critiques.

There are other ways of registering a protest, too. Readers can simply threaten to take their subscriptions elsewhere, and perhaps their authored contributions, too. There is an interesting hint of this sort of behaviour elsewhere in the Climategate emails from 2007 onwards, where scientists discuss the possibility that the International Journal of Climatology might accede to sceptics' requests and force the disclosure of all research materials, including intermediate results.

A discussion ensues in which there appears to be an agreement that this would be unacceptable and that mainstream scientists should refuse to publish in the journal if such a policy were put in place. This brings us to another somewhat nuanced question: what is an ethical way to deal with a journal?

Clearly scientists are free to read whatever journals they like and to publish wherever they choose, but is there a difference between cancelling a subscription and organising a campaign of threats to do so? If it is valid to choose to publish in a different journal, is it still valid to inform a journal that the most prominent practitioners of the specialism it covers will shun it if it does not toe the line? At what point does valid protest elide into something more sinister?

In the case of the International Journal of Climatology, it appears that while the journal was approached regarding its policy, there is no evidence that any threats were ever made. It is perhaps worth noting, however, that at the time of writing, the journal has still to finalise its policy on data sharing.

Issues of the availability of data and computer code have been a constant bone of contention between sceptics and mainstream climatologists. While newspaper headlines have been dominated by what appear to be attempts by CRU staff and their associates in North America to delete correspondence requested under the Freedom of Information Act, the more important story in terms of the conduct of science in this country concerns the repeated refusals of CRU staff to release the data and code underlying their global-temperature index.

As far back as 2005, Jones rejected a request for the data, telling Warwick Hughes, a sceptic and self-described "freelance earth scientist" with several peer-reviewed publications to his name: "Even if (the World Meteorological Organization) agrees, I will still not pass on the data. We have 25 or so years invested in the work. Why should I make the data available to you, when your aim is to try and find something wrong with it?"

Similar obstruction is revealed in attempts by Steve McIntyre, a sceptic and the editor of the blog ClimateAudit.org, to obtain the data underpinning the famous Yamal tree-ring chronology, which was published by the CRU's Keith Briffa and became a critical ingredient in most of the important global-temperature reconstructions.

Having had a direct approach turned down by Briffa, McIntyre approached Science, the journal in which the series had most recently been published. It excused itself by saying that the chronology had been published earlier in a different article, and suggested that McIntyre approach the author of the earlier publication. With the author being Briffa, continued non-disclosure was a foregone conclusion. When the journal in question, Quaternary Science Reviews, also turned down a materials request, a dead end was reached.

Only in 2008, when a third journal finally enforced its own data policy and made Briffa release his figures, was it revealed that parts of this critical dataset were based on just a handful of trees, raising major questions over the data's reliability and role in important public policy decisions.

Is it valid to refuse to release research materials to opponents? It is known that the CRU temperature dataset was sent to a sympathetic researcher in the US just months before a request for the same data from a sceptic was turned down on the grounds that confidentiality agreements prevented their release. In this light, the CRU's claims that the data are confidential look far-fetched.

Sceptics are universally of the opinion that the scientific method requires all research materials to be released to friend and foe alike, but the Climategate emails suggest paranoia among some mainstream climatologists - a sense that sceptics were on a campaign to do them down. This appears to have enabled them to justify to their consciences a steadfast refusal to provide information to their opponents.

If, as the emails suggest, some scientists are in fact putting illegitimate pressure on journals, either to influence the peer-review process or to prevent the release of data, it is easy to see how editors may find it difficult to respond. In the face of a threat by the most prominent scientists in any specialism to shun a given publication, many would surely capitulate.

But given the centrality of replication to the scientific method and of climatology to political policy decisions, a way must be found to ensure that data and code are universally available. If journals were to present a

united front on the issue of the availability of materials, it would be a valuable start.

Andrew Montford is the author of 'The Hockey Stick Illusion: Climategate and the Corruption of Science' (2010). He works in scientific publishing.

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Record - 4

DIALOG(R)

United States : Astronomers get sharpest view ever of star factories in distant galaxy,

TendersInfo,

Wednesday, March 24, 2010

TEXT:

Reports indicate that astronomers have combined a natural gravitational lens and a sophisticated telescope array to get the sharpest view ever of "star factories" in a galaxy over 10 billion light-years from Earth. They found that the distant galaxy, known as SMM J2135-0102, is making new stars 250 times faster than our Galaxy, the Milky Way. They also pinpointed four discrete star-forming regions within the galaxy, each over 100 times brighter than locations (like the Orion Nebula) where stars form in our Galaxy. This is the first time that astronomers have been able to study properties of individual star-forming regions within a galaxy so far from Earth. "To a layperson, our images appear fuzzy, but to us, they show the exquisite detail of a Faberge egg," said Steven Longmore of the Harvard-Smithsonian Center for Astrophysics (CfA). Due to the time it takes light to travel to us, we see the galaxy as it existed just 3 billion years after the Big Bang. It was Milky Way-sized at the time. If we could see it today, 10 billion years later, it would have grown into a giant elliptical galaxy much more massive than our own. "This galaxy is like a teenager going through a growth spurt," said Mark Swinbank of Durham University. "If you could see it today as an 'adult', you'd find the galactic equivalent of Yao Ming the basketball player," he added. The Submillimeter Array (SMA) data revealed four extremely bright star-forming regions. The large luminosities, 100 times greater than typical for nearby galaxies, imply a very high rate of star formation. "We don't fully understand why the stars are forming so rapidly, but our result suggests that stars formed much more efficiently in the early universe than they do today," said Swinbank.

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Record - 5

DIALOG(R)

Quick View,

Indian Express,

Tuesday, March 23, 2010

TEXT:

New galaxy found

A massive galaxy that is making new stars 250-times faster than the Milky Way has been found over 10 billion light years from the earth. Astronomers from the Durham University in UK have found the distant galaxy, known as SMM J2135-0102. "To a layman, our images appear fuzzy, but to us, they show the exquisite detail of a Faberge egg," said Steven Longmore of the Harvard-Smithsonian Centre for Astrophysics.

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Wolbach Library: CfA in the News ~ Week ending 4 April 2010

1. **This (starry) life**, Joan Edison, The Australian, 5 - All-round Review ed, p2, Saturday, April 3, 2010
2. **OUT OF THIS WORLD**, Reneke, David, Australasian Science, v31, n3, p42, Thursday, April 1, 2010
3. **FRONTIERS OF SCIENCE LECTURE: SEARCHING FOR EARTH-LIKE PLANETS ORBITING OTHER SUNS**, US Federal News, Thursday, April 1, 2010
4. **Ashes to Ashes, Dust to Dust: Chandra/Spitzer Image**, National Aeronautics and Space Administration Documents, Monday, March 29, 2010
5. **EDUCATION NOTES**, Dallas Morning News, EDITION1 ed, pB04, Sunday, March 14, 2010

Record - 1

This (starry) life,

Joan Edison,
The Australian, 5 - All-round Review ed, p2
Saturday, April 3, 2010

TEXT:

OUR cat is a star. No, not the usual family personality -- that goes without saying -- but a true star in the sky

Otherwise known as No 600217 in the Sydney Southern Star Catalogue, or No 232165 in the Smithsonian Astrophysical Observatory Catalogue, it has been named Dolly, thanks to the Sydney Observatory's Name a Star program

We wanted to honour our little puss on her 17th birthday and thought a star was a great way to do it. The observatory said most people chose stars for birthdays, anniversaries and deaths. We were apparently the first people to name a star after a live pet. Friends and family thought we'd gone a bit crackers. "I hear title plots on the moon are going for a song," one emailed. "Have you heard about this nice little bridge? It's in Brooklyn." For \$300 you name a date and the observatory chooses a star that is visible for seven weeks either side of that date. They then send you its exact location, its brightness level and the co-ordinates for viewing with the naked eye, binoculars or telescope. For an extra \$50 you can have a private viewing through the observatory's telescopes for four people. You also get a dedication certificate in which you can write a few words. We naturally

chose The Owl and the Pussycat: "The owl looked up to the stars above, and sang to a small guitar, what a beautiful pussy you are, you are, what a beautiful pussy you are." The money from naming stars helps fund the observatory's work

An amateur astronomer friend has discovered that our star -- in the constellation of Phoenix -- was first recorded nearly a century ago. He tells us it's a singular star and a little-known fact is half the visible stars are multiple star systems orbiting each other. It is also in a catalogue used to position the Hubble space telescope

It's been a long journey from the gutter to the universe for our old lady. We found her badly injured one wet winter's night in a Sydney laneway. She'd been run over. Her internal organs had been pushed through her chest cavity into her throat, so she could barely breathe. The nerve had been crushed in one leg and she would always walk with a limp. Did we want to spend the money to save her, the vet asked. A gentle lick on the hand and a purr said it all

A friend was staying with us when we got the vet's bill. What do you think we should call her, I asked. "Dollars," was the reply. We shortened it to Dolly

Dolly has repaid us a thousand times over by being a loving, friendly cat. Despite her limp, she runs and jumps, especially when she spots an available lap. She has given us years of pleasure

The least we could do was buy her a star

Review welcomes submissions to This Life

To be considered for publication, the work must be original and between 500 and 550 words in length. Submissions may be edited for clarity

Send emails to thislife@theaustralian.com.au

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Record - 2

DIALOG(R)

OUT OF THIS WORLD,

Reneke, David,

Australasian Science, v31, n3, p42,

Thursday, April 1, 2010

TEXT:

Australian Lakes May Hold Clues to Martian Life

Mars: the very name conjures up visions of technologically advanced creatures harbouring malignant intentions towards planet Earth. Beings, as H.G. Wells put it, who were scrutinising us like we might study the myriad microbes that live and multiply in a drop of water.

Sadly, Wells' fabled Martians do not exist. Neither do the intelligently dug "canals" that Giovanni Schiaparelli and Percival Lowell claim to have found through their telescopes. It's all a mistake or, at best, a figment of everybody's imagination.

So, after studying this enigmatic world and crawling over its surface with our probes for almost 40 years we are inclined to ask: "Is there anything out there?" Well, not exactly. Sure we've found evidence of past water flows on Mars and tantalising traces in the soil that may indicate fertility, but if there is (or ever was) life on Mars, the red planet is doing a very good job of hiding the evidence.

But things may be about to change. Maybe we aren't looking in the right place - or even on the right planet. Soon scientists on Earth will know more about the potential for life on Mars because of microorganisms that live in Australian lakes.

Microbiologists like Dr Melanie Mormile of the Missouri University of Science and Technology are studying organisms found in the saltwater lakes of Western Australia that have an acidic pH because the lakes' conditions are similar to those found on Mars. Mormile found that prokaryotes, simple organisms that lack a nucleus, were able to survive in these unusual conditions.

Mormile hopes to return to Australia to isolate and characterise the bacteria in the lakes. Knowing the types of metabolism present in these acidic and highly saline lakes would help researchers to understand the metabolism required for life on Mars.

Mormile and her colleagues showed that life does exist in the extreme environments found in acidic saltwater lakes in Australia, and only these prokaryotes have the metabolic capability to survive the Martian ecosystem. There are also possibilities for bioremediation, and that can only be a good thing for future Martian colonisation.

Eavesdropping on ET

With a little bit of luck and some improved technology we may soon be

eavesdropping on signals from galactic civilisations. "This is the first time in history that humans will be capable of finding a civilisation like ours among the stars," said Dr Avi Loeb of the Harvard Smithsonian Centre for Astrophysics recently.

Loeb, and researchers like him, will be looking for transmission "leakage" equivalent to our broadcast television or military radars. Various SETI programs have had the technical capability to detect intentional signals beamed at Earth with the equivalent power of military radars. Loeb's search will further expand the frequency range over which searches are conducted.

Loeb pointed out that their newly installed system is designed to study frequencies of 80-300 Megahertz. By staring at the sky for a month, he and his team feel they stand a good chance of detecting Earth-like radio signals from a distance of up to 30 light years and spanning more than 1000 stars. If E.T. is "radio-active" - in other words, using TV or radio to communicate - he would intentionally or unintentionally be announcing his presence to the outside Universe and we would hear him.

On Earth, military radars are the most powerful broadcast sources, followed by television and FM radio. If similar broadcast sources exist on other planets, we might detect them too. Future observatories like the Square Kilometre Array could detect Earth-like transmissions from ten times farther away, which would encompass more than 100 million stars.

Similarly, the upcoming Allen Telescope Array using programmable electronics will form a "big ear" - an astonishing 350-dish complex with up to 16 virtual antennas each making independent observations.

E.T. may soon phone, but it won't be home he's calling.

AUTHOR_AFFILIATION

David Reneke is an astronomy educator, writer and broadcaster who edits Astro Space News (www.davidreneke.com) and represents Australasian Science on more than 60 networked radio stations across Australia. He also produces a range of educational CD-ROMS on astronomy and space exploration for beginners, and runs an astronomy outreach program for schools throughout NSW.

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Record - 3

DIALOG(R)

FRONTIERS OF SCIENCE LECTURE: SEARCHING FOR EARTH-LIKE PLANETS ORBITING

OTHER SUNS,

US Federal News,
Thursday, April 1, 2010

TEXT:

SALT LAKE CITY, March 31 -- The University of Utah issued the following news release:

Place: Aline Wilmot Skaggs Biology Building Auditorium, University of Utah
FREE AND OPEN TO THE PUBLIC

Date: Wednesday, April 7, 2010

Time: 7:30 p.m.

Ronald Walsworth, senior physicist at the Harvard-Smithsonian Center for Astrophysics, and his colleagues have developed a new laser-measuring technology that is sensitive enough to discover Earth-sized planets orbiting other suns.

Walsworth will discuss the new "astro-comb" and planet-finding techniques during a free public lecture at the University of Utah.

"Over the next few years, a historic event is expected to take place - the discovery of a planet similar to the Earth that orbits another star," Walsworth says. "This discovery will open the door for exploration of habitable environments in the universe, and could greatly advance our understanding of the origins of life both on Earth and elsewhere."

To date, more than 400 planets have been discovered orbiting nearby stars. However, these planets are large - somewhat like Jupiter, Saturn and Neptune in our solar system. Telescopes haven't been sensitive enough to find small, Earth-like planets.

The two main techniques to detect "exoplanets" rely on a planet's tiny effect on its star. One method measures the star's "wobble" due to the orbiting planet's gravity. The other measures the dimming of a star's light as a planet passes in front of it.

The sensitivity of these measurements has been greatly enhanced by two major technological advances: the launch of the Kepler space telescope and development of a laser-based calibration tool known as the "astro-comb." The astro-comb uses femto-second (one millionth of one billionth of a second) pulses of laser light linked to an atomic clock to provide a precise standard against which light from a star can be measured. Walsworth, in whose lab the astro-comb was developed, says it might

increase the resolution of the star "wobble" technique by about 100 times, which would allow detection of a planet the size of Earth.

Kepler was launched by NASA in March 2009 and should be able to identify a few dozen candidate "sister Earths" over the next few years by detecting small dips in the light from stars as orbiting planets pass in front. However, such detections by Kepler will only determine the diameter of these planets, not their mass. Knowing the planetary mass is essential to distinguish planets that largely consist of water and ice from true sister Earths - rocky Earth-like planets that are thought to be optimal for life.

"Over the next decade, new space-based telescopes will probe the spectrum of reflected light from these sister Earths to search for the chemical signatures of life and to acquire high-resolution images of these new worlds," says Walsworth. "It is likely that we will soon know whether planets like the Earth are common or rare in the universe."

The Frontiers of Science lecture series is sponsored by the College of Science and the College of Mines and Earth Sciences. Lectures are free and open to the public, but tickets are required to guarantee seating. Call (801) 581-6958 to reserve tickets. For more information about USfednews please contact: Sarabjit Jagirdar, US Fed News, email:- htsyndication@hindustantimes.com

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Record - 4

DIALOG(R)

Ashes to Ashes, Dust to Dust: Chandra/Spitzer Image,
National Aeronautics and Space Administration Documents,
Monday, March 29, 2010

TEXT:

MEDIA RELATIONS OFFICE JET PROPULSION LABORATORY CALIFORNIA INSTITUTE OF TECHNOLOGY NATIONAL AERONAUTICS AND SPACE ADMINISTRATION PASADENA, CALIFORNIA 91109. TELEPHONE 818-354-5011 <http://www.jpl.nasa.gov>

Whitney Clavin 818-354-4673 Jet Propulsion Laboratory, Pasadena, Calif.
whitney.clavin@jpl.nasa.gov

Megan Watzke 617-496-7998 Chandra X-ray Center, Cambridge, Mass.
mwatzke@cfa.harvard.edu

IMAGE ADVISORY: 2010-102 - - - - March 29, 2010

Ashes to Ashes, Dust to Dust: Chandra/Spitzer Image

The full version of this story with accompanying images is at:

<http://www.jpl.nasa.gov/news/news.cfm?release=2010-102&cid=release2010-102>

PASADENA, Calif. -- A new image from NASA's Chandra and Spitzer space telescopes shows the dusty remains of a collapsed star. The dust is flying past and engulfing a nearby family of stars.

"Scientists think the stars in the image are part of a stellar cluster in which a supernova exploded," said Tea Temin of the Harvard-Smithsonian Center for Astrophysics, Cambridge, Mass., who led the study. "The material ejected in the explosion is now blowing past these stars at high velocities."

The composite image of G54.1+0.3 is online at <http://photojournal.jpl.nasa.gov/catalog/?IDNumber=pia12982>. It shows the Chandra X-ray Observatory data in blue, and data from the Spitzer Space Telescope in green (shorter wavelength) and red-yellow (longer). The white source near the center of the image is a dense, rapidly rotating neutron star, or pulsar, left behind after a core-collapse supernova explosion. The pulsar generates a wind of high-energy particles -- seen in the Chandra data -- that expands into the surrounding environment, illuminating the material ejected in the supernova explosion.

The infrared shell that surrounds the pulsar wind is made up of gas and dust that condensed out of debris from the supernova. As the cold dust expands into the surroundings, it is heated and lit up by the stars in the cluster so that it is observable in infrared. The dust closest to the stars is the hottest and is seen glowing in yellow in the image. Some of the dust is also being heated by the expanding pulsar wind as it overtakes the material in the shell.

The unique environment into which this supernova exploded makes it possible for astronomers to observe the condensed dust from the supernova that is usually too cold to emit in infrared. Without the presence of the stellar cluster, it would not be possible to observe this dust until it becomes energized and heated by a shock wave from the supernova. However, the very action of such shock heating would destroy many of the smaller dust particles. In G54.1+0.3, astronomers are observing pristine dust before any such destruction.

G54.1+0.3 provides an exciting opportunity for astronomers to study the freshly formed supernova dust before it becomes altered and destroyed by shocks. The nature and quantity of dust produced in supernova explosions is a long-standing mystery, and G54.1+0.3 supplies an important piece to the

puzzle.

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.

The Spitzer observations were made before the telescope ran out of its coolant in May 2009 and began its "warm" mission. NASA's Jet Propulsion Laboratory in Pasadena, Calif., manages Spitzer for NASA's Science Mission Directorate, Washington. Science operations are conducted at the Spitzer Science Center at the California Institute of Technology in Pasadena. Caltech manages JPL for NASA.

More information on the Spitzer Space Telescope is online at:
<http://www.spitzer.caltech.edu/spitzer> and <http://www.nasa.gov/spitzer>.
More information on the Chandra X-ray Observatory is at:
<http://chandra.harvard.edu> and <http://chandra.nasa.gov>.

-end-

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Record - 5

DIALOG(R)

EDUCATION NOTES,

Dallas Morning News, EDITION1 ed, pB04,
Sunday, March 14, 2010

TEXT:

Collin College students find asteroid

Three Collin College students - Adrian Boysselle, David Golynskiy and Deepak Joseph - discovered a main belt asteroid between Mars and Jupiter. The students will receive NASA research awards for finding 2010 CK12 as part of the International Asteroid Search Campaign. The Minor Planet Center, an office of the International Astronomical Union at the Harvard-Smithsonian Center for Astrophysics, will publish their names with their finding.

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Wolbach Library: CfA in the News ~ Week ending 11 April 2010

1. Associated Press Utah Daybook, AP Alert - Utah, SCIENCE LECTURE, Wednesday, April 7, 2010

2. Is anybody out there? Lecturer hunts for Earth-like planets: His device launched into orbit last year can improve the search., Brian Maffly, Salt Lake Tribune, Tuesday, April 6, 2010

Record - 1

DIALOG(R)

Associated Press Utah Daybook,
AP Alert – Utah,
SCIENCE LECTURE,
Wednesday, April 7, 2010

NEW

April 7. 7:30 p.m. SCIENCE LECTURE _ The College of Science and College of Mines and Earth Sciences will host Ronald Walsworth, senior physicist at the Harvard-Smithsonian Center for Astrophysics, to discuss "Searching for Earth-like Planets Around Other Stars." Walsworth is available for interviews April 7-8.

Location: University of Utah, Aline W. Skaggs Biology building, Salt Lake City

Contacts: James R. DeGooyer (University of Utah College of Sciecnee), (801) 581-3124

The AP-Salt Lake City

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Record - 2

DIALOG(R)

Is anybody out there? Lecturer hunts for Earth-like planets: His device launched into orbit last year can improve the search.

Brian Maffly,
Salt Lake Tribune,
Tuesday, April 6, 2010

TEXT:

Apr. 6--Ronald Walsworth is on a quest to find rocky mid-sized planets, "sister" Earths that may be capable of supporting life. The Harvard scientist has helped develop a technology known as the astro-comb and is putting it to use in search of such planets in distant solar systems.

The hunt for hidden planets is the subject of Walsworth's Frontiers of Science lecture Wednesday at the University of Utah.

"Over the next few years, a historic event is expected to take place -- the discovery of a planet similar to the Earth that orbits another star," said Walsworth, senior physicist at the Harvard-Smithsonian Center for Astrophysics, in a news release. "This discovery will open the door for exploration of habitable environments in the universe, and could greatly advance our understanding of the origins of life both on Earth and elsewhere."

Astronomers have so far discovered only 400 planets, but these are almost all large, Jupiter-sized orbs of frozen gases and water. Considering the universe is filled with billions upon billions of stars, it's a good bet sister Earths abound, but telescopes are not yet sensitive enough to detect these smaller bodies.

But astrophysicists like Walsworth are developing methods of detecting planets' tiny effects on the stars they orbit. One measures stars' minute wobble from the gravitational pull of planets, while another looks for dimming of stars' light.

The astro-comb, a laser-based calibration tool launched into orbit last year with the Kepler space telescope, enhances these techniques.

"Over the next decade, new space-based telescopes will probe the spectrum of reflected light from these sister Earths to search for the chemical signatures of life and to acquire high-resolution images of these new worlds," Walsworth said. "It is likely that we will soon know whether planets like the Earth are common or rare in the universe."

Frontiers of Science

Ronald Walsworth, a senior physicist at the Harvard-Smithsonian Center for Astrophysics, will talk about hidden planets.

When -- Wednesday, 7:30 p.m.

Where -- Skaggs Biology Building auditorium at the University of Utah.

Cost -- Free, but reserved seating is required. Call 801-581-6958.

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Wolbach Library: CfA in the News ~ Week ending 18 April 2010

1. FISCAL 2011 APPROPRIATIONS: INTERIOR AND ENVIRONMENT - Part 1, Congressional Testimony via FDCH, Thursday, April 15, 2010

2. WESTERN KENTUCKY UNIVERSITY CHAPTER OF PHYSICS HONOR SOCIETY TO CELEBRATE 50TH ANNIVERSARY APRIL 24, US Federal News, Wednesday, April 14, 2010

3. WALSWORTH OF HARVARD - SMITHSONIAN CENTER TO DELIVER LECTURE AT MARSHALL UNIVERSITY, US Federal News, Tuesday, April 13, 2010

Record - 1

DIALOG (R)
FISCAL 2011 APPROPRIATIONS: INTERIOR AND ENVIRONMENT - Part 1 Congressional Testimony via FDCH,
Thursday, April 15, 2010

TEXT:
xftde FISCAL-2011-INTERIOR sked

TESTIMONY

April 14, 2010

DR. G. WAYNE CLOUGH

SECRETARY

THE SMITHSONIAN INSTITUTION

HOUSE APPROPRIATIONS
Interior, Environment, and Related Agencies

FISCAL 2011 APPROPRIATIONS: INTERIOR AND ENVIRONMENT - Part 1

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copyright or other notice from copies of the content. Statement of Dr. G.
Wayne Clough Secretary The Smithsonian Institution

Committee on House Appropriations Subcommittee on Interior, Environment,
and Related Agencies

April 14, 2010

Mr. Chairman and Members of the Subcommittee,

It is my privilege to appear before the Subcommittee to testify on behalf of the Institution`s FY 2011 budget request, and share with you the future direction of the Smithsonian Institution as outlined in our Fiscal Year 2010-2015 Strategic Plan. I would like to express my appreciation for your continued support of the Smithsonian and its activities.

Over the next decade, the Smithsonian is committed to becoming more engaged than ever before with the great issues of our day. The Institution completed an unprecedented, year-long, planning activity resulting in a Strategic Plan that is interdisciplinary and entrepreneurial, and which has been embraced by both internal and external stakeholders. It calls for us to broaden access and reach new audiences by bringing the resources of our museums and research centers to people where they learn and live. It was approved enthusiastically by the Smithsonian`s Board of Regents.

The plan identifies four Grand Challenges that bring focus to what we do, and allow for cross-cutting activities to flourish within the Institution and with external partners. These challenges are: Unlocking the Mysteries of the Universe; Understanding and Sustaining a Biodiverse Planet; Valuing World Cultures; and Understanding the American Experience. Our aspiration is to shape the future by preserving our heritage, discovering new knowledge and sharing our resources with the world. We have structured our FY 2011 budget request around these themes and we have re-positioned our organizational structure so that we can achieve our ambitious goals.

As the largest museum and research complex in the world, the Smithsonian is uniquely positioned to meet the challenges and goals spelled out in the plan. The Institution is supported by authoritative scholarship that connects Americans to their cultural heritage and also acts as an international leader in scientific research and exploration. The Smithsonian consists of 19 museums and galleries, a system of 20 libraries, numerous research centers, and the National Zoological Park. All but two of the museums are located in the Washington, DC metropolitan area; Cooper-Hewitt, National Design Museum and the George Gustav Heye Center of the National Museum of the American Indian are located in New York City. In addition, the Smithsonian has research facilities in eight states and the District of Columbia, and has activities in nearly 100 countries, at sites ranging from the equator to both poles.

The Institution's collections include a remarkable 137 million artifacts, works of art, and scientific specimens. The Smithsonian preserves and displays many of our nation's greatest artistic, scientific, and cultural treasures, including objects that speak to our country's inquisitiveness, bold vision, creativity, and courage: Edison's light bulb, the Wright flyer, Lewis and Clark's compass, the only national collection of presidential portraits outside the White House, the world's largest meteorite collection, the only Neanderthal skeleton in this hemisphere, and Mark Twain's self-portrait.

To experience our unique collections, nearly 30 million individuals from across the country and around the world came to the Smithsonian during the past fiscal year (six million more than in 2008), and more than 188 million visited our various websites. This is our highest visitation level since FY 2000, and offers an indication that the Smithsonian plays a key role in the lives of Americans during difficult economic times. High visitation levels continue in 2010. The millions who make the effort and travel long distances to visit our museums speak to the quality and relevance of the 90 new exhibitions the Smithsonian launched in 2009, and the hard work of everyone staff, carpenters, curators, security officers, scholars, scientists, and historians to make the Smithsonian an exciting, inspiring place.

The Smithsonian has more than 6,000 employees, including approximately 650 scientists and scholars, and more than 6,600 dedicated volunteers. Additionally, the Institution has built a network of 167 affiliate museums in 41 states, the District of Columbia, Puerto Rico, and Panama so we can share our collections and expertise with others. The Smithsonian Institution Traveling Exhibition Service, the largest traveling exhibition service in the world, reaches roughly five million people throughout the country each year. This combination of volunteer support, philanthropic support, and our national and international reach makes the Smithsonian's activities a very good value for the appropriations invested by the federal Government each year. The support of the Administration, the Congress, and the American people is vital to all Smithsonian activities and the success of our mission.

I believe that our FY 2011 request is a strong budget that, when combined with our fund raising, business activities, and increased grant activity, will allow us to make great strides toward fulfilling of our Strategic Plan. If we are able to do this, we will make strong inroads towards our intention to significantly increase the audiences we reach and the people who look to us as a trusted source of information. The Smithsonian's total request for FY 2011 is \$797.6 million. After addressing most of our non-discretionary needs with an increase of \$13.8 million for items such as legislated pay raises and inflation-related increases in rent and utilities, the requested Salaries and Expenses increase for programs and support activities amounts to \$14.6 million. These increases are partially offset by savings from an Institution-wide buyout and a small maintenance reduction that, together, total \$4.4 million. We also seek \$136.75 million to continue our Facilities Capital program.

Salaries and Expenses

For FY 2011, the Institution's Salaries and Expenses request includes four new line items that are tied directly to research and program activities embodied within the Grand Challenges of the Strategic Plan. The Four Grand Challenges articulated in the plan are intended to allow integration of the work of many disciplines. To make the most of our intellectual capital, we are creating centers, or consortia, to advance each of the Grand Challenges. These consortia are not new programmatic units, but leanly staffed offices that will focus and coordinate the work of existing museums and research centers to facilitate innovative scholarship and outreach. We set the expectation for them to attract additional funds in the form of grants, contracts, private contributions, and build partnerships with other research entities so we can leverage the federal funding we hope to receive.

Focusing on Grand Challenges

Unlocking the Mysteries of the Universe

Since the late 1800's the Smithsonian has played a lead role in developing the understanding of the fundamental nature of the universe, dark matter and galaxy formation. The Smithsonian, particularly the Smithsonian Astrophysical Observatory, will focus on applying the integrative research of its scientists to today's big questions regarding the origin and evolution of the Earth, planets, stars, galaxies, and the universe, thereby harnessing the collaborative energy of scientists, scholars, and cultural experts.

For FY 2011, we are seeking an increase of \$500,000 to conduct research through the Universe theme interdisciplinary consortium, using the Smithsonian's world-class collections and scholarly resources. Areas of astrophysical specific focus will be the study of the origin and evolution of the Earth and solar system; the effects of geologic and meteoric phenomena on Earth's atmosphere and biosphere; research into the discovery and characterization of exo-planets in the habitable zone; research using our rich collections, including the national meteorite collection; and research into the next generation of ground- and space-based astronomical telescope mirrors and instrumentation that will enable the next generation of research.

Understanding and Sustaining a Biodiverse Planet

The FY 2011 request includes an increase of \$2 million for research that will be conducted through the Biodiversity theme interdisciplinary consortium, using the Smithsonian's world-class collections, field stations, and scholarly resources. Research will focus on such questions as: how to sustain a biologically diverse Earth; how does this diversity change across geography and through time; and how do we better understand the life-sustaining services of ecosystems and best sustain their contributions to human well-being locally and globally? 4

The Smithsonian's request also includes \$4 million to address global climate change issues that support many strands of the U.S. Global Change Research Program (USGCRP) by providing baseline data, measurements, and monitoring of change to the biosphere and atmosphere. These funds will support observation and monitoring capabilities to ensure a long-term, high-quality, and high-resolution record of the state of the natural variability and change in climate; improve our understanding of the natural and human-induced forces of change; and increase the accuracy of environmental models and projections of future conditions.

Within this \$4 million request for Global Change Research, \$2 million will be focused on forests through the expansion and sustainment of the

Smithsonian Institution Global Earth Observatories (SIGEO) network. SIGEO is a leader in the world in forming international partnerships involving twenty countries that have joined together to promote large-scale environmental monitoring and maintain banks of data allowing for sophisticated analyses. The request also would allow \$1 million to develop an important marine analog to SIGEO, with a global array of assessment sites focusing on coastal marine environments, and \$1 million for additional USGCRP priorities. SIGEO is also supported by about \$20 million in in-kind and financial support from government, private and international partners.

The FY 2011 request includes a \$1 million increase to maintain the Smithsonian's leadership in DNA barcoding. The Smithsonian is a leader in this international initiative devoted to developing DNA barcoding 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. As the recognized U.S. leader in DNA barcoding, the Smithsonian seeks to increase its capacity in research and training. The funds requested are part of a larger funding strategy that includes private support and collaboration with other Government agencies and international science funding agencies. The requested funds will allow us to make ongoing commitments to core infrastructure, which will also leverage external funding for more research activities. These activities directly support the biodiversity theme of our Strategic Plan, and also link to access initiatives, such as the Encyclopedia of Life and SIGEO.

This request includes a \$1 million increase to support the Encyclopedia of Life, (EOL at www.eol.org), an ambitious project at the National Museum of Natural History (NMNH), which 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 private foundations. It is expected to encompass the 1.9 million known species of animals, plants, and other life forms in about 10 years. The database will be configurable for all types of audiences, from students and scientists, to policy makers and the general public, and is intended to allow free access to all. The NMNH is uniquely positioned to contribute to this global effort of documenting every known species currently living on Earth, through its extensive and broad collections as well as through the scientific staff who provide the context for these specimens. The specimens require scientific expertise to provide related ecological and evolutionary information.

This unprecedented research initiative is designed to broaden access to Smithsonian collections and knowledge, and share these resources with America and the world. It includes collaboration with other parts of the

Smithsonian and leading institutions across the country and abroad. The first phase of this initiative was developed with support from the MacArthur and Sloan Foundations, and currently provides access to 180,000 species pages, as well as 20 million pages of literature related to biological diversity, through the Biodiversity Heritage Library. The next phase of this project will expand information to 500,000 species pages and some 50 million pages of literature, as well as develop resources for students and teachers across the nation over the next three years.

Valuing World Cultures

Globalization has brought peoples and cultures of different backgrounds around the world closer together, heightening the need and the desire for greater mutual understanding, appreciation, and communication. The United States is increasingly engaging people around the world through cultural exchange and partnerships in an effort to promote human rights and democratic values, a major cornerstone of which is respect for a diversity of people and cultures. Leaders of museums and cultural institutions around the world look to the United States, and particularly the Smithsonian, for expertise and aid in preserving their own cultural heritage from preserving the manuscripts of Timbuktu, the treasures of ancient Mesopotamia in the Baghdad Museum, and Indus Valley archaeological sites in Pakistan, to documenting dying languages and the knowledge systems they carry among indigenous peoples of Africa, the Pacific, and the Americas.

The Smithsonian, with its position of respect, its unparalleled collections of cultural artifacts from around the globe, its breadth and depth of cultural expertise, and its capacities as cultural convener and instructor, can help our Government help others safeguard world cultural treasures, document and preserve priceless knowledge, and participate in forums for intercultural dialogue. Currently, for example, we are taking a lead role and working closely with the U.S. Department of State, the President's Committee for Arts and Humanities, and numerous American and international cultural organizations to help rescue and preserve Haiti's cultural heritage the artwork, artifacts and archives severely endangered in the aftermath of the earthquake.

Our FY 2011 request includes an increase of \$500,000 that will allow the Smithsonian to focus more attention on manuscript preservation, materials science, site preservation, and knowledge systems, with expertise in Asian, African, and Latin American cultures at the National Museum of African Art, the Freer and Sackler Gallery, the National Museum of Natural History Department of Anthropology, the National Museum of the American Indian Latin American Research unit, the Center for Folklife and Cultural Heritage, and the Museum Conservation Institute. Specialists will work on the preservation of Smithsonian collections, energize their colleagues, and provide support for international exchange and engagement by expanding

preservation knowledge through training and professional activities with cultural institutions around the world, particularly with those in Asia, Africa and the Americas.

Understanding the American Experience

The United States continues to evolve into a more diverse society, where no single racial, ethnic, or religious group will constitute a majority, and where the impact of global movements of people and ideas is felt across the country. Understanding how diverse peoples have become one nation; how that nation has been shaped by various communities, individuals, leaders, inventors, heroes, and artists; how it has changed over time; and how our history, art, and culture connect to the world are of vital concern today. Exploring these issues helps us assess current challenges and opportunities and become responsible members of society.

As holder of the national collections invaluable American art works; historical and technological artifacts and images; and extensive photographic, sound, and documentary archives the Smithsonian is at the forefront of research institutions interpreting the American experience. The fourth Grand Challenge of the Smithsonian's Strategic Plan is to better document, interpret, and publicly present the rich and diverse cultures that have forged a national heritage that is uniquely American.

The FY 2011 request includes an increase of \$1 million to expand the Smithsonian's research activities in history, art, and culture in areas that have not kept pace with the demographic changes in the United States, and the increasing knowledge of the varied accomplishments, achievements, and stories of diverse communities which both historically and today form the fabric of America. The resources will provide curators and scholars greater opportunity to conduct the research and acquire the collections, where they presently lack artifacts and artworks, photographs and documentary records that represent varied communities.

Additionally, the development of an Institution-wide center for Understanding the American Experience will enable the Smithsonian to support and coordinate efforts across Smithsonian museums and research centers; encourage interdisciplinary teams; foster partnerships with other scholarly organizations; develop new strategies for disseminating research results; and develop new sources of research funding. With these enhanced capabilities, the Smithsonian can develop a comprehensive approach to major research questions, creating exhibitions, symposia, publications, and on-line offerings on such topics as the Civil War and Civil Rights, Immigration and Migration, American Landscapes, American Democracy, and U.S. Aerospace History.

In addition to the increases for research in our Four Grand Challenges, the FY 2011 request includes increases in three other broad areas that support our plan: Broadening Access to all of our activities, collections, and technology, Strengthening Collections, and Mission Enabling activities that support the Institution`s overall mission.

Broadening Access

The Smithsonian has the potential to become one of the most trusted and referenced sources of information on the World Wide Web by taking advantage of new technologies to share its vast collections and extensive research, along with the expertise of its scholars, scientists, researchers, museum specialists, and curators. Key to achieving this potential is developing enterprise systems, common processes, and shared resources and services to create and deliver digital assets. We have already tested pilot activities that have demonstrated the considerable value of online learning techniques. The FY 2011 request includes \$1.5 million to build the underlying systems and processes to create a framework for future content delivery that will enable users everywhere to experience the national collections at the Smithsonian through technology.

The requested funding will allow us to continue building the infrastructure needed to digitize our resources, and to make existing digital assets more open and available; and will help guarantee that all digitization efforts move in concert toward the ideal of a unified, digital Smithsonian. As the Institution embraces the potential of sharing our knowledge and collections virtually, our Digitization Strategic Plan will ensure that digital assets are created and managed to maximize access and use, both internally and externally.

Also in the area of Broadening Access, our request provides an increase of \$100,000 for Latino programs. This increase will allow the Smithsonian to increase support for research, collections, public and educational programs, and exhibitions that will generate and advance knowledge and understanding of the contributions of Latinas and Latinos to U.S. history, culture, arts, music, and science at a national level.

There is an increasing awareness at the Smithsonian of the need to ensure diversity and equity by including Latino perspectives, and of the opportunities inherent in such diversity. Latinos are the nation`s fastest-growing minority and, consequently, the Smithsonian`s potentially largest new constituency. Latino scholars, writers, scientists, and artists are making extraordinary contributions to our common fund of knowledge and culture. The increase will be applied to projects that are currently underfunded, and also initiate additional projects that reach a national audience. The requested increase will also allow the production of more

virtual and traveling exhibitions and public programs, and offer more opportunities for participants in fellowship programs throughout the United States.

Strengthening Collections

This request includes a \$2.5 million increase for Collections care funding needed to improve the quality of preservation, storage, documentation, and accessibility of collections across the Smithsonian. Collections play a central role in carrying out the research and program activities in each of the Grand Challenges. Collections serve as the intellectual base for our scholarship, exhibition, education, and public programming activities. It is, therefore, imperative that we ensure that collections are properly preserved, stored, documented, and made accessible for researchers around the globe, federal agencies, and the general public.

Thousands of works of art, historical artifacts, and natural science specimens have been stabilized and catalogued with funds provided in previous years. Examples of progress made include the archival rehousing of the Apollo and Lunar Orbiter photographic collection, major improvement in the storage of spacesuit collections at the National Air and Space Museum, and inventory and preservation of the U.S. Armed Forces uniform collection at the National Museum of American History. In 2009, the Institution piloted the first survey of collections conditions across units. This request provides essential resources to address some of the identified needs. The request allows the Institution to meet professional standards of collections care and reduce the percentage of collections at risk of deterioration.

The request includes funds for the National Museum of Natural History to replace substandard storage that is currently detrimental and hazardous to collections and staff, and to digitize original handwritten collection ledgers, thereby increasing their accessibility for scholarly use. In addition, the request includes resources to improve animal welfare and safety for the living collections at the National Zoo, which is critical to maintaining the Zoos` accreditation by the Association of Zoos and Aquariums and compliance with the Animal Welfare Act. Our collections care initiative and FY 2011 request reinforce the Institution`s commitment to the stewardship of federal scientific collections in support of the Smithsonian`s strategic goal of Strengthening Collections and maintaining America`s excellence and leadership in science and technology.

Mission Enabling

The Institution`s request for FY 2011 includes an increase of \$700,000 to complete implementation of a revised, comprehensive security staffing plan that began in FY 2010. The new plan increases overall security staffing by

creating positions for lower level gallery attendants and also addresses attrition problems by creating mid-level positions that help to provide a clear career ladder for the security force. It provides for an increase in security staffing without a permanent increase in cost. The plan will also allow us to attract candidates with skills better aligned for security officer positions. The request also provides \$620,000 to strengthen the Institution`s governance and financial internal controls, as recommended by the Board of Regents.

Buyouts

The Smithsonian implemented an Institution-wide Buyout program as part of our effort to restructure our workforce in accordance with the Institution`s Strategic Plan, and to help fill the anticipated gap in funding for salaries and benefits and other fixed expenses. Savings of \$3.7 million realized from the buyout in FY 2011 are included in the request as a partial offset to total increases.

Facilities Capital Program

The FY 2011 budget request of \$136.75 million for the Facilities Capital Program will improve the deteriorating condition of some of the Institution`s oldest buildings and maintain the current condition of other facilities through systematic renewal and repair. The FY 2011 request includes baseline revitalization requirements of \$106.2 million, as well as \$10.6 million for facilities planning and design, and \$20 million for design of the National Museum of African American History and Culture.

Major projects in our request for Facilities Revitalization include \$11.45 million to upgrade the utilities infrastructure and Sea Lion support systems at the National Zoological Park, and \$17.6 million to continue long-term renovation of the National Museum of Natural History building on the Mall. The request includes \$5 million to complete the alteration of the Museum Support Center Pod 3 in Suitland, Maryland, to provide appropriate storage for art and anthropological collections.

The request also includes \$16 million to begin renovation through replacement of an outdated facility and trailers with a reconfigured laboratory facility at the Smithsonian Environmental Research Center in Edgewater, Maryland, and \$7 million to continue the conversion of an uninhabitable school house at the Smithsonian Tropical Research Institute in Panama into urgently needed research and laboratory facilities. Together, these projects will provide more than 120,000 square feet of code-compliant laboratory and support space. The improved facilities will incorporate sustainable technologies and building methods that will reduce energy and maintenance costs.

For FY 2011, the Institution requests \$18 million to continue revitalization of the National Museum of American History building on the Mall by replacing components of the HVAC and power-distribution systems, and concluding the conversion of existing garage space to office and swing space for future revitalization projects. The request also includes \$8.9 million for the 64-room Carnegie Mansion, of the Cooper-Hewitt, National Design Museum in New York. The building was built between 1899 and 1902 and requires interior and exterior renovation work. Requested funds will upgrade the Museum's electrical distribution and emergency systems. The planned renovation and improvement of this facility is estimated to cost \$54 million, of which \$33 million is to be provided by private donations and the City and State of New York.

The Institution also requests \$22.3 million for critical revitalization projects which each cost under \$5 million.

In conclusion, this budget provides a strong impetus to our Strategic Plan so that we can better serve the American people and people around the world. It contains the first significant increase the Smithsonian has received for research in many years. We will use it wisely. The FY 2011 budget request supports our great exhibitions, museums, and research centers, and our passionate professionals who care so much about their work. The requested program increases will enable us to make even greater research contributions, and to enhance our relevance and expand our service to the country and the world.

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Record - 2

DIALOG(R)

WESTERN KENTUCKY UNIVERSITY CHAPTER OF PHYSICS HONOR SOCIETY TO CELEBRATE 50TH ANNIVERSARY APRIL 24,
US Federal News,
Wednesday, April 14, 2010

TEXT:

BOWLING GREEN, Ky., April 13 -- Western Kentucky University issued the following news release:

WKU's chapter of Sigma Pi Sigma physics honor society will celebrate its 50th anniversary on April 24 at its annual banquet and induction ceremony.

The celebration will begin at 6 p.m. at the Kentucky Library and Museum.

The Sigma Pi Sigma chapter was established on May 25, 1960, and has 263 members. The official honor society of the physics profession honors outstanding scholarship in physics, encourages interest in physics among students at all levels, promotes an attitude of service of its members, and provides a fellowship of persons who have excelled in physics.

Four WKU students have been invited to join the WKU chapter and will be inducted at the banquet. They are: Jacob Daniel Baxley, a junior physics major from Hartford; Kyle Wayne Cook, a senior physics and mathematics major from Bowling Green; James Robert Phelps, a senior physics major from Morgantown; and Schuyler Grace Wolff, a junior physics and mathematics major from Tulsa, Okla.

To receive this honor these students had to meet high standards of general scholarship and excellence in physics scholarship, including an overall GPA of 3.0 out of 4.0, a GPA in all their physics courses of at least 3.3 out of 4.0, and completion of a set of core physics courses.

Cook, Phelps and Wolff also will receive the Department of Physics and Astronomy's 2010 awards for scholarship, research and service.

Phelps is the 2010 recipient of the Dr. George V. and Sadie Skiles Page Award for Excellence in Scholarship, which is awarded to the graduating physics major with the highest academic standing.

Phelps' association with the Cyber Defense Laboratory at WKU led to an opportunity to develop software for the Army Research Laboratory in Adelphi, Md. He currently works for Electronic Warfare Associates specializing in network security and plans to pursue a graduate degree in computer science or other technology related fields.

Wolff is the 2010 recipient of the Dr. Randall Harper Award for Outstanding Research in Physics and Astronomy, which is awarded to the junior or senior student with research exhibiting significance, effort, originality, and creativity.

Wolff is a student in the Honors College, a member of Phi Mu Epsilon, an Ogden Dean's List honoree, and a President's List honoree. She has won scholarships from the Gatton Academy for Mathematics and Science and the Kentucky Space Grant Consortium. She has presented her work in supernova progenitor studies at several regional and national conferences, won Best in Session at the 40th WKU Student Research Conference and won her Research Experiences for Undergraduates (REU) with the University of Göttingen and the Harvard-Smithsonian Center for Astrophysics. After graduation, she plans to earn her doctorate in astrophysics and pursue a career in professional astronomy as an academic at a research institution.

Cook is the 2010 recipient of the Dr. Douglas Humphrey Award for Outstanding Service, which is awarded to the junior or senior student with a record of service within the department and to science outreach to the community.

Cook receives the Humphrey service award for an unprecedented third year in a row because of the overall good citizenship that he portrays in his interactions with faculty and students in the department. He has been instrumental in revitalizing the Hilltopper Astronomy Club and has served as an undergraduate laboratory technician. In addition, he has assisted with student recruitment by visiting high schools, has assisted with outreach activities such as Physics Olympics and as an undergraduate student researcher with Professor Mike Carini on a Blazar monitoring project for which he has gained national recognition by receiving the Chambliss Student Astronomy Achievement Award from the American Astronomical Society. This summer Cook will enter the graduate program at Texas A&M University to pursue a doctorate in astrophysics.

To honor the history of the WKU Chapter of Sigma Pi Sigma, alumni from each of the five decades of the chapter's existence - Dr. William G. Buckman Sr., Dr. Dwight P. Russell, Melissa Smith Rudloff, Dr. Idelfonso J. Guilaran and Dr. Gavi E. Begtrup - will speak about their experiences during and after their studies at WKU.

Additional information about the banquet, induction and awards is available online. For more information about USfednews please contact: Sarabjit Jagirdar, US Fed News, email:- htsyndication@hindustantimes.com

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Record - 3

DIALOG(R)
WALSWORTH OF HARVARD - SMITHSONIAN CENTER TO DELIVER LECTURE AT MARSHALL UNIVERSITY,
US Federal News,
Tuesday, April 13, 2010

TEXT:
HUNTINGTON, W.Va., April 12 -- Marshall University issued the following news release:

Dr. Ron Walsworth, a senior lecturer with the Harvard-Smithsonian Center

for Astrophysics and the Department of Physics of Harvard University, will present a free public lecture Thursday, April 15 in the Memorial Student Center, Room BE5 on Marshall University's Huntington campus.

Walsworth's lecture is made possible by a grant to Marshall University Professor Thomas Wilson of the MU Department of Physics from the American Physical Society Division of Laser Science "Distinguished Traveling Lecturer Program" and with support from the MU College of Science and Department of Physics.

The lecture, titled "The Search for Earth-like Planets Around Other Stars," runs from 7 to 8 p.m. A reception will follow.

According to Walsworth, a historic event is expected to take place over the next several years - the discovery of a planet similar to the Earth that orbits another star. This discovery will open the door for exploration of habitable environments in the Universe, and could greatly advance our understanding of the origins of life both on Earth and elsewhere.

"To date, more than 400 planets have been discovered orbiting nearby stars," Walsworth explains in his abstract for the lecture. "However, all these planets are large - somewhat like Jupiter, Saturn and Neptune in our solar system. The reason only large planets have been discovered is that telescopes have not been sensitive enough to detect small, Earth-like planets. Now, this is all about to change, due to two major technological advances - the launch of the Kepler space telescope and the development of a laser-based calibration tool known as the 'astro-comb.'"

"Kepler was launched by NASA in March 2009 into an Earth-trailing orbit. Freed from the obscuring effects of Earth's atmosphere, Kepler should identify a few dozen candidate "Sister Earths" over the next few years, by detecting small dips in the light from stars as orbiting planets pass in front. However, such detections by Kepler will only determine the diameter of these planets - not their mass. Knowing the planetary mass is essential to distinguish planets that largely consist of water and ice from true Sister Earths - rocky Earth-like planets that are thought to be optimal for life.

"The astro-comb uses very short ("femtosecond") pulses of laser light, synchronized by an atomic clock, to provide a precise standard for telescopes that measure the wavelength of light coming from stars. The astro-comb corrects for inaccuracy and drift in the spectral sensitivity of such telescopes, thereby allowing detection of very small Doppler shifts induced in the spectrum of stars by the gravitational tug of orbiting Earth-like planets."

Walsworth and his colleagues at Harvard, MIT and the Smithsonian

Institution have led the development of astro-comb spectral calibrators, and will soon perform observations of promising planets located by Kepler, so that true Sister Earths can be identified. Over the next decade, new space-based telescopes - now in the planning stages - will probe the spectrum of reflected light from these Sister Earths to search for the chemical signatures of life and to acquire high-resolution images of these new worlds. For more information about USfednews please contact: Sarabjit Jagirdar, US Fed News, email:- htsyndication@hindustantimes.com

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Wolbach Library: CfA in the News ~ Week ending 25 April 2010

1. **CROWD VIEWS NEW SOLAR IMAGES THAT MONTANA STATE UNIVERSITY HELPED CAPTURE**, US Federal News, Thursday, April 22, 2010

Record - 1

DIALOG(R)

CROWD VIEWS NEW SOLAR IMAGES THAT MONTANA STATE UNIVERSITY HELPED CAPTURE,

US Federal News,
Thursday, April 22, 2010

TEXT:

BOZEMAN, Mont., April 21 -- Montana State University issued the following press release:

Stunning new images of the sun beamed onto the Montana State University campus Wednesday afternoon, drawing a crowd that wanted to see solar photographs that MSU scientists helped capture.

Researchers who played a major part in obtaining those images and others gathered in the lobby of the Engineering Physical Sciences Building to view the first images from the Solar Dynamics Observatory. They watched solar flares dancing, plasma erupting at one million m.p.h., and much more.

Even for a hardcore physicist, the images provoked a sense of wonder and awe, SDO program scientist Madhulika Guhathakurt said from NASA headquarters during a live feed of a news conference to unveil the images.

Piet Martens, an MSU research professor who led MSU's part of the project with David McKenzie, associate research professor, said the images are so clear that they will help scientists understand more than they've ever known about the sun.

Martens and McKenzie helped design and calibrate four telescopes that were launched Feb. 11 on the Solar Dynamics Observatory from the Kennedy Space Center in Florida. They were partners with scientists at the Lockheed Martin Solar and Astrophysics Laboratory and the Harvard-Smithsonian Center for Astrophysics. Graduate student Jason Scott helped design and test the

software that's operating the cameras on the telescopes. MSU graduate student Andres Munoz wrote the programs to carry out the simulations of solar magnetic fields that are featured on the SDO Web site, and that will be tested with SDO observations. His video is featured on the SDO Web.

The telescopes - together called the Atmospheric Imaging Assembly or AIA - will spend at least three years collecting ultraviolet images from the sun's atmosphere, McKenzie said in February. Each of the four telescopes will collect ultraviolet rays at two different wavelengths. Together, they will yield 1,500 gigabytes of data every day.

The observatory is now producing so many images that no one can look at them all, Martens said. For that reason, he is heading a second NASA-funded project, which involves scientists at 10 institutions worldwide. Together in the Solar Dynamics Observatory Science Center, the scientists are developing feature recognition software so they will be notified when the telescopes have picked up solar flares or other features that interest them. The software will know when the telescopes have picked up those images, then alert scientists and the NOAA, the U.S. agency responsible for space weather forecasting. The software will also automatically create movies of the features and make them available online within minutes.

McKenzie said the main goal of the UV telescopes is to help scientists understand the physics behind the activity on the sun's corona, which drives space weather. The ultimate goal is to use this information to develop advanced forecasting tools in NASA's Living With a Star program. The Solar Dynamics Observatory is the first mission in the program.

Martens said Wednesday that MSU's involvement in the Solar Dynamics Observatory not only advances science, but it created opportunities for graduate and undergraduate students to become involved in research.

In relation to that, Angela Des Jardins, director of the Montana Space Grant Consortium, announced a new scholarship on the one-year anniversary of the death of William A. Hiscock. Hiscock, former director of the MSGC and former head of MSU's physics department, died April 21, 2009. For more information on the Hiscock Memorial Scholarship, see <http://spacegrant.montana.edu> For more information about USfednews please contact: Sarabjit Jagirdar, US Fed News, email:- htsyndication@hindustantimes.com

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Wolbach Library: CfA in the News ~ Week ending 9 May 2010

1. **Studies from P. Jonsson and colleagues reveal new findings on astronomy**, Science Letter, p633, Tuesday, May 11, 2010
2. **New astronomy research from S.J. Bush et al outlined**, Science Letter, p142, Tuesday, May 11, 2010
3. **New astronomy research from R. Chornock et al outlined**, Science Letter, p141, Tuesday, May 11, 2010
4. **New astronomy data have been reported by N.J. Wright and co-authors**, Science Letter, p135, Tuesday, May 11, 2010
5. **Is Halley's Comet an alien interloper?**, David Shiga, New Scientist, v206, n2759, p13, Saturday, May 8, 2010

Record - 1

DIALOG(R)

Studies from P. Jonsson and colleagues reveal new findings on astronomy,
Science Letter, p633,
Tuesday, May 11, 2010

TEXT:

"An updated version of the dust radiation-transfer code sunrise, including models for star-forming regions and a self-consistent calculation of the spatially dependent dust and PAH emission, is presented. Given a hydrodynamic simulation of a galaxy, this model can calculate a realistic 2D ultraviolet-submillimetre spectral energy distribution of the galaxy, including emission lines from H ii regions, from any viewpoint," scientists in the United States report (see also).

"To model the emission from star-forming regions, the mappingsiii photoionization code is used. The high wavelength resolution (similar to 1000 wavelengths) is made possible by the polychromatic Monte Carlo algorithm employed by sunrise. From the 2D spectral energy distributions (SEDs), images in any filter bands or integrated galaxy SEDs can be created. Using a suite of hydrodynamic simulations of disc galaxies, the output broad-band images and SEDs are compared with observed galaxies from the multiwavelength SINGS and SLUGS galaxy surveys. Overall, the output SEDs show a good match with observed galaxies in colours ranging from

far-UV to submillimetre wavelengths. The only possible exception is the 160/850 μm colour, which the simulations underestimate by a factor of similar to 5 compared to the SINGS sample. However, the simulations here agree with the SLUGS galaxies, which consistently have significantly larger amounts of cold dust than the SINGS galaxies. The sunrise model can be used to generate simulated observations of arbitrary hydrodynamic galaxy simulations," wrote P. Jonsson and colleagues.

The researchers concluded: "In this way, predictions of galaxy formation theories can be directly tested against observations of galaxies."

Jonsson and colleagues published their study in Monthly Notices of the Royal Astronomical Society (High-resolution panchromatic spectral models of galaxies including photoionization and dust. Monthly Notices of the Royal Astronomical Society, 2010;403(1):17-44).

For more information, contact P. Jonsson, Harvard Smithsonian Center Astrophysics, 60 Garden St., MS 51, 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)

New astronomy research from S.J. Bush et al outlined,
Science Letter, p142,
Tuesday, May 11, 2010

TEXT:

According to a study from the United States, "The outer regions of galactic disks have received increased attention since ultraviolet observations with Galaxy Evolution Explorer demonstrated that nearly 30% of galaxies have UV emission beyond their optical extents, indicating star formation activity. These galaxies have been termed extended UV (XUV) disks."

"Here, we address whether these observations contradict the gas surface density threshold for star formation inferred from Ha radial profiles of galaxies. We run smoothed particle hydrodynamic simulations of isolated disk galaxies with fiducial star formation prescriptions and show that over-densities owing to the presence of spiral structure can induce star formation in extended gas disks. For direct comparison with observations,

we use the three-dimensional radiative transfer code Sunrise to create simulated FUV and K-s-band images. We find that galaxies classified as Type I XUV disks are a natural consequence of spiral patterns, but we are unable to reproduce Type II XUV disks," wrote S.J. Bush and colleagues (see also).

The researchers concluded: "We also compare our results to studies of the Kennicutt-Schmidt relation in outer disks."

Bush and colleagues published their study in *Astrophysical Journal* (Spiral-induced Star Formation In The Outer Disks Of Galaxies. *Astrophysical Journal*, 2010;713(2):780-799).

For more information, contact S.J. Bush, Harvard Smithsonian Center Astrophysics, 60 Garden St., Cambridge, MA 02143, 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)

New astronomy research from R. Chornock et al outlined,
Science Letter, p141,
Tuesday, May 11, 2010

TEXT:

According to a study from the United States, "Type II-plateau supernovae (SNe IIP) are the results of the explosions of red supergiants and are the most common subclass of core-collapse supernovae. Past observations have shown that the outer layers of the ejecta of SNe IIP are largely spherical, but the degree of asphericity increases toward the core."

"We present evidence for high degrees of asphericity in the inner cores of three recent SNe IIP (SNe 2006my, 2006ov, and 2007aa), as revealed by late-time optical spectropolarimetry. The three objects were all selected to have very low interstellar polarization (ISP), which minimizes the uncertainties in ISP removal and allows us to use the continuum polarization as a tracer of asphericity. The three objects have intrinsic continuum polarizations in the range of 0.83%-1.56% in observations taken after the end of the photometric plateau, with the polarization dropping to almost zero at the wavelengths of strong emission lines. Our observations of SN 2007aa at earlier times, taken on the photometric plateau, show

contrastingly smaller continuum polarizations (similar to 0.1%). The late-time H alpha and [O I] line profiles of SN 2006ov provide further evidence for asphericities in the inner ejecta," wrote R. Chornock and colleagues (see also).

The researchers concluded: "Such high core polarizations in very ordinary core-collapse supernovae provide further evidence that essentially all core-collapse supernova explosions are highly aspherical, even if the outer parts of the ejecta show only small deviations from spherical symmetry."

Chornock and colleagues published their study in *Astrophysical Journal* (Large Late-time Asphericities In Three Type IIP Supernovae. *Astrophysical Journal*, 2010;713(2):1363-1375).

For more information, contact R. Chornock, 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 - 4

DIALOG(R)

New astronomy data have been reported by N.J. Wright and co-authors,
Science Letter, p135,
Tuesday, May 11, 2010

TEXT:

According to a study from the United States, "Cygnus OB2 is the nearest example of a massive star-forming region (SFR), containing over 50 O-type stars and hundreds of B-type stars. We have analyzed the properties of young stars in two fields in Cyg OB2 using the recently published deep catalog of Chandra X-ray point sources with complementary optical and near-IR photometry."

"Our sample is complete to similar to 1 M-circle dot (excluding A- and B-type stars that do not emit X-rays), making this the deepest study of the stellar properties and star formation history in Cyg OB2 to date. From Siess et al. isochrone fits to the near-IR color-magnitude diagram, we derive ages of $3.5(-1.0)(+0.75)$ and $5.25(-1.0)(+1.5)$ Myr for sources in the two fields, both with considerable spreads around the pre-main-sequence isochrones. The presence of a stellar population somewhat older than the present-day O-type stars, also fits in with the low fraction of sources

with inner circumstellar disks (as traced by the K-band excess) that we find to be very low, but appropriate for a population of age similar to 5 Myr. We also find that the region lacks a population of highly embedded sources that is often observed in young SFRs, suggesting star formation in the vicinity has declined. We measure the stellar mass functions (MFs) in this limit and find a power-law slope of $\Gamma = -1.09 \pm 0.13$, in good agreement with the global mean value estimated by Kroupa. A steepening of the slope at higher masses is observed and suggested as due to the presence of the previous generation of stars that have lost their most massive members," wrote N.J. Wright and colleagues (see also).

The researchers concluded: "Finally, combining our MF and an estimate of the radial density profile of the association suggests a total mass of Cyg OB2 of similar to $3 \times 10^4 M_{\odot}$, similar to that of many of our Galaxy's most massive SFRs."

Wright and colleagues published their study in *Astrophysical Journal* (The Massive Star-forming Region Cygnus Ob2. II. Integrated Stellar Properties And The Star Formation History. *Astrophysical Journal*, 2010;713(2):871-882).

For more information, contact N.J. Wright, 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 - 5

DIALOG(R)

Is Halley's Comet an alien interloper?

David Shiga,
New Scientist, v206, n2759, p13,
Saturday, May 8, 2010

TEXT:

OUR sun may have stolen the vast majority of its comets from other stars. The theft could explain the puzzling profusion of objects in a huge reservoir surrounding the sun called the Oort cloud.

The Oort cloud is a collection of comets thought to orbit the sun in a roughly spherical halo about 50,000 times as far from the sun as Earth - at the outer edge of the solar system. How did the comets get there? In the

standard picture, they formed much closer to the sun, then migrated outward in a two-stage process.

First, the gravity of the giant planets flung them into elongated orbits to form a population called the scattered disc. Objects in the scattered disc come about as close to the sun as Neptune, but venture dozens of times further out, to more than 1000 times the Earth-sun distance. That far from the sun, the gravitational pull of the galaxy becomes significant, so many of the scattered-disc objects get pulled out to populate the Oort cloud.

There is a problem with this picture, however. Simulations have long predicted that this process could only populate the Oort cloud with 10 times as many comets as are currently in the scattered disc, while estimates based on observed comets suggest the ratio is more like 700 to 1.

"This nice, beautiful picture we have been developing for the last 25 years or so just crashes and burns," Hal Levison of the Southwest Research Institute in Boulder, Colorado, said at a meeting of the American Astronomical Society's Division on Dynamical Astronomy in Boston last week.

Levison and his colleagues say many of the Oort-cloud objects may have been stolen from other stars born in the same stellar nursery as the sun. Most stars like the sun form in clusters of between 10 and 1000 members. According to the team's simulations, encounters between stars in this crowded environment tend to disturb their scattered discs and detach objects from them, creating a reservoir of free-floating comets.

When stars later leave the cluster, some of these objects move along with them, getting captured into wide, Oort cloud-like orbits. "They head off in the same direction together and eventually become bound," says Levison. That could explain the high number of Oort-cloud objects in our solar system. If most of the cloud's members were captured from other stars, then famous comets like Halley and Hale-Bopp, whose trajectories suggest they once resided in the Oort cloud, probably were too, Levison says.

Brian Marsden of the Harvard-Smithsonian Center for Astrophysics in Cambridge, Massachusetts, who was not involved in the study, says it is too soon to tell whether there really is an overabundance of Oort-cloud objects, since observations are not good enough to provide very precise estimates of the population there. But if the overabundance persists with better observations, the capture scenario could explain it, he says. "It's a very interesting idea and it might work."

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Wolbach Library: CfA in the News ~ Week ending 16 May 2010

1. **' Star Wars ' becoming real**, Dan Vergano, USA Today (USA), p1A, Friday, May 14, 2010

2. **Matter missing no more?**, Lee Roop, The Huntsville Times (Huntsville, AL), 2 ed, p1B, Wednesday, May 12, 2010

Record - 1

DIALOG(R)

' Star Wars ' becoming real,

Dan Vergano,
USA Today (USA), p1A,
Friday, May 14, 2010

TEXT:

Are we finally witnessing the dawn of the "death ray"?

Five decades after the creation of the laser, the ubiquitous technology of the modern era may be ready to serve up that Star Wars science-fiction staple: the laser blaster.

Advances in the technology have made it possible for military testers to shoot down incoming mortar rounds with land-based lasers, and military commanders are on the verge of being able to fire laser blasts from the air that could be aimed at tanks or mines.

"We literally are the invisible death ray, let me tell you," says Mike Rinn of Boeing's Airborne Laser Program in Seattle, a missile- defense effort, one among dozens of Defense Department-supported "directed energy" programs run by military contractors such as Boeing, Raytheon and Northrop Grumman.

"This beam is invisible to the naked eye; you can't see it."

Taking advantage of some simple physics, lasers have allowed humanity to harness light to cut holes in things and establish new forms of communication. The light from a light bulb or the sun, an unbunched blur of multiple wavelengths, is warm to our touch and can burn. Lasers' lenses focus the power of light into a tightly bunched beam to burn surfaces with fine accuracy. And the laser can read bar codes on consumer products and digitized recordings on DVDs and CDs by bouncing finely focused beams off

surfaces and using a "photodiode" sensor to read variations in reflected light as a code.

Lasers ring up groceries, play movies and transmit phone service, and they are involved in many other aspects of our lives.

"Our modern society basically runs on lasers," says Thomas Baer, head of the Stanford Photonics Research Center at Stanford (Calif.) University. He's also a spokesman for the American Physical Society's "Laser Fest," which is celebrating the 50th anniversary of the technology.

Since the 1980s, automotive companies have used lasers to cut the steel for their cars, today using ones in the 2,500- to 5,000-watt power range that can cut several hundred inches of steel a minute. Military research lasers now release 10 to 20 times more power, so there has been a leap in the potential to burn through metal in seconds.

Lasers increasingly are being used by the military, says Sharon Weinberger, author of *Imaginary Weapons: A Journey Through the Pentagon's Scientific Underworld*. Gun sights use lasers, targets are "painted" with lasers to help guide bombs dropped from aircraft, and secure lines of communication rely on the technology.

"That's where lasers are really making a difference," she says. "We just take it for granted now."

One of the main obstacles to developing lasers as weapons has been generating enough power for the kinds of laser blasts that battlefield planners have envisioned. But designers recently passed the 100-kilowatt (100,000 watts) benchmark (enough energy to power about six U.S. homes for a month), which was seen as a key milestone for their development. Engineers have improved lens coatings, laser cooling and miniaturized electronics to keep a bigger laser punch from burning up weapons in mid-operation.

Obstacles remain

So years of research finally have produced lasers that could be effective on the battlefield, with one possible exception -- ballistic missile defense -- the area of defense in which the notion of using lasers has attracted the most publicity.

Why? Cost is one reason. Defense Secretary Robert Gates last year canceled plans to buy a laser-equipped 747, saving taxpayers \$214 million this year. The program was eight years behind schedule and \$4 billion over cost. Gates also questioned the practicality of a laser that needed to be within about 80 miles of a missile to knock it down, meaning it would have to fly over

hostile anti-aircraft defenses -- probably a suicide mission.

"It's one thing to get a laser working aboard something as big as a 747. It's another to field something that makes sense as a weapon," says former Air Force chief scientist Mark Lewis, now at the University of Maryland. That would have been the military's second laser-outfitted plane. The existing "Airborne Laser Testbed" YAL-1 747 remains a research effort rather than a weapon. It's run by defense industry titans Northrup Grumman, Boeing and Lockheed Martin.

This year, the Defense Department's Missile Defense Agency announced that a 100-kilowatt laser aboard the research 747 had shot down Scud missiles in two tests, the first since a weaker laser knocked down smaller Sidewinder missiles in the 1980s.

But Air Force Gen. Norton Schwartz, who called the demonstration "a magnificent technical achievement," said the type of chemical lasers used for the system were too heavy and unreliable for wartime use. Electronic solid-state lasers, an approach pursued by the U.S. Navy, seem more practical, because of their smaller size, power needs, easier cooling and insensitivity to vibrations.

The missile defense systems are still works in progress, but lasers are making gains in other military arenas:

*Last year, a "Laser Avenger" mounted aboard a truck shot down unmanned aerial vehicles in tests at White Sands Missile Range in New Mexico.

*In October, a laser-equipped U.S. Air Force "Advanced Tactical Laser" C-130 airplane burned a hole in a slow-moving vehicle during a test at White Sands.

*The Pentagon's Defense Advanced Research Projects Agency (DARPA) signaled plans last year to develop a plane-mounted 150-kilowatt, 1,650-pound laser to knock down rockets and artillery shells in flight. Tests pointed to success shooting down mortar shells, the U.S. Army said.

*Not a weapon but a weapon tester, the Energy Department's National Ignition Facility is using the world's most powerful laser to simulate hydrogen bomb blasts on nuclear material.

In 2008, a National Research Council Report called for the U.S. Army to speed development of a \$470 million "mobile, 100,000-watt solid-state laser weapon system" to knock down mortar shells and rockets by 2018. The 100-kilowatt laser was demonstrated by Northrop in May last year. But it required a tractor-trailer-sized laser, Weinberger notes, not something that a Humvee could carry.

"There are a lot of people spending a lot of money and a lot of time looking for military uses of lasers," Lewis says. "The bottom line of this interest is that they haven't proven themselves yet, but they have overcome a lot of challenges."

Says Imaginary Weapons author Weinberger: "In the military world, one real question is: Why do we need them? What can lasers do that we can't do with bullets and missiles? Given their costs and the fact that they weigh too much and are unreliable, I don't see them as too useful."

Other observers are less kind. Joe Cirincione, author of *Bomb Scare: The History and Future of Nuclear Weapons*, derided laser weapons as "Flying White Elephants" in a Huffington Post report last year.

"The technical challenges are immense" to make lasers work, Weinberger notes. A 2008 report by the non-profit Institute for Defense Analysis, for example, urged the Pentagon not to rush immature laser technologies into development. And a National Research Council report on Navy lasers last year noted that the Defense Department has investigated such weapons for four decades with little success.

In March, Georgetown University physicist Francis Slakey called some laser technology dangerous in the journal *Nature*. He argued that improvements in laser enrichment of uranium fuel made it more likely that nations such as Iran would acquire an atomic bomb.

Still, Lewis and others see a military role for lasers.

"Lasers don't do the whole job," says Boeing's Greg Hyslop, a colleague of Rinn's. "But it will complement what we have today." He argues that lasers are faster and more precise than bullets or bombs and can be set to kill or be non-lethal.

Reducing "collateral damage" from bombs killing people around targets has emerged as a laser selling point, Hyslop says. In a speech April 21, 2008, Defense Secretary Gates said, "An unconventional era of warfare requires unconventional thinkers," specifically calling for munitions that reduce the chances of civilian deaths that cost public support for repelling insurgencies.

Lewis says that is "a real argument" for lasers, which theoretically would pinpoint targets in ways that explosives cannot. "I can tell you people in the military are considering very precise (conventional) munitions, with very proscribed blast radius, for just this reason," he says.

Power increases in military laser programs have been a surprise, Lewis

adds. The 100,000-watt (or more) laser aboard a 747 used in January packs enough punch to burn a hole in a moving missile in under two minutes.

"I was more skeptical just three years ago of lasers reaching some of the power levels we see now," Lewis says.

But that still leaves the challenge of reducing the weight of a laser weapon, Weinberger says. The Missile Defense Agency's chemical laser weighs more than 175,000 pounds, the National Research Council says. If you visit labs, Weinberger says, "you'll see the 'laser' is something the size of two buildings. You can't fit that onto a rifle barrel."

Says Boeing's Rinn: "All the science and physics are now proven" as far as how lasers work and what they can do. "Really what it is all about is national will and investment in engineering."

Legal restrictions further weigh down the chances of battlefield lasers, Lewis says. "We can kill 'em, but we can't blind 'em," he says, citing war crime rules that declare it illegal to blind enemy troops.

After World War I's experience with mustard gas, blinding soldiers was seen as a war crime, and a 1980 protocol of the Geneva Convention outlaws "blinding laser weapons." The Defense Science Board, a Pentagon science think tank, came to the conclusion two years ago that such policy considerations made fielding lasers as weapons particularly complicated and noted the Defense Department was looking at fewer laser technologies than in the 1990s.

So, lasers seem unlikely to directly replace bullets anytime soon.

"There has to be a practical viable application. Maybe we will be blinding unmanned aerial vehicles in the future, for example," Lewis says. "There is something to be said for a weapon that makes somebody uncomfortable enough to turn aside from whatever they are doing. We could use that, too."

Has it already begun?

In a certain sense, the laser era in the military may already be here.

Defense News reported in 2006 that China had illuminated a U.S. imaging satellite with a laser, potentially damaging the sensitive optics aboard the spacecraft. Donald Kerr, director of the Pentagon's National Reconnaissance Office, later told Reuters "it did not materially damage the U.S. satellite's ability to collect information."

Most likely, the Chinese weren't trying to blind the satellite but were

measuring its distance to better define its orbit, concluded astrophysicist Yousaf Butt of the Harvard-Smithsonian Center for Astrophysics.

About 40 "Satellite Laser Ranging" stations worldwide use laser pulses aimed at satellites to time how long it takes the light to return to Earth, which can answer questions about the planet's gravity and reveal satellites' orbits, important to know if you plan to hide activities from spy satellites.

U.S. military satellites probably have shutters to prevent blinding by lasers, says Benn Tannenbaum of the American Association for the Advancement of Science's Center for Science, Technology and Security Policy, but nothing legally prevents anyone from trying.

"Technology always has dual uses," says Georgetown's Slakey. "At any point where a technology develops and develops, we are going to see military uses."

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Record - 2

DIALOG(R)

Matter missing no more?

Lee Roop,
The Huntsville Times (Huntsville, AL), 2 ed, p1B,
Wednesday, May 12, 2010

TEXT:

NASA, Europeans say it may be located in enormous web of hot gas

NASA and European scientists think they may have found the "missing matter" that theories of the universe say has to be somewhere.

Using observations by NASA's Chandra X-ray Observatory and the European Space Agency's XMM-Newton, astronomers have announced a "robust detection" of intergalactic gas about 400 million light years from Earth.

The discovery is the strongest evidence yet, NASA says, that the "missing matter" in the nearby universe is located in an enormous web of hot, diffuse gas.

"The missing matter - which is different from dark matter - is composed of baryons, the particles, such as protons and electrons, that are found on the Earth, in stars, gas, galaxies, and so on," a NASA announcement said. "A variety of measurements of distant gas clouds and galaxies have provided

a good estimate of the amount of this 'normal matter' present when the universe was only a few billion years old. However, an inventory of the much older, nearby universe has turned up only about half as much normal matter, an embarrassingly large shortfall.

"The mystery then is where does this missing matter reside in the nearby universe? This latest work supports predictions that it is mostly found in a web of hot, diffuse gas known as the Warm-Hot Intergalactic Medium (WHIM)," NASA said. "Scientists think the WHIM is material left over after the formation of galaxies, which was later enriched by elements blown out of galaxies."

The results appear in the May 10 issue of The Astrophysical Journal. NASA's Marshall Space Flight Center in Huntsville 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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Wolbach Library: CfA in the News ~ Week ending 23 May 2010

- 1. Study findings from F. Massaro et al provide new insights into astronomy**, Science Letter, p897, Tuesday, May 25, 2010
- 2. Studies from P.C. Myers et al in the area of astronomy described**, Science Letter, p817, Tuesday, May 25, 2010
- 3. Studies from A.C. Seth and co-researchers in the area of hydrogen published**, Science Letter, p776, Tuesday, May 25, 2010
- 4. Research reports on astronomy from S.A. Mao and colleagues provide new insights**, Science Letter, p635, Tuesday, May 25, 2010
- 5. Reports summarize astronomy research from M. Gitti and co-authors**, Science Letter, p445, Tuesday, May 25, 2010
- 6. Calcium-rich supernova is a 'different kind of bang'; Exploding star spotted five years ago deserves class of its own, scientists say, but their findings are disputed**, Margaret Munro, Vancouver Sun (Canada), Final ed, pB5, Thursday, May 20, 2010
- 7. Forget milk, exploding star good for the bones; Scientists find, calcium-rich supernova**, Margaret Munro, Calgary Herald (Canada), Final ed, pA16, Thursday, May 20, 2010
- 8. Exploding stars source of calcium in our bones?**, Margaret Munro, Edmonton Journal (Canada), Final ed, pA4, Thursday, May 20, 2010
- 9. Calcium enhanced stardust good for our bones; Exploding star spewing element through galaxy**, Margaret Munro, Ottawa Citizen (Canada), Final ed, pA7, Thursday, May 20, 2010
- 10. Scientists discover calcium-rich supernova; Exploded star's bits land on Earth, end up in people**, MARGARET MUNRO, Montreal Gazette (Canada), Final ed, pA13, Thursday, May 20, 2010
- 11. POSSIBLE NEW CLASS OF SUPERNOVAE PUTS CALCIUM IN YOUR BONES**, US Federal News, Thursday, May 20, 2010
- 12. University of Toledo professor leads breakthrough on stars: Finding alters understanding of formation**, Claudia Boyd-Barrett, The Blade, The (Toledo, OH) Monday, May 17, 2010
- 13. Antarctica!**, Clough, G.Wayne, Smithsonian, v41, n2, p22(1), Saturday, May 1, 2010

Record - 1

DIALOG(R)

Study findings from F. Massaro et al provide new insights into astronomy,
Science Letter, p897,
Tuesday, May 25, 2010

TEXT:

"We report on our Chandra Cycle 9 program to observe half of the 60 (unobserved by Chandra) 3C radio sources at $z < 0.3$ for 8 ks each. Here we give the basic data: the X-ray intensity of the nuclei and any features associated with radio structures such as hotspots and knots in jets," investigators in the United States report (see also).

"We have measured fluxes in soft, medium, and hard bands and are thus able to isolate sources with significant intrinsic column density. For the stronger nuclei, we have applied the standard spectral analysis which provides the best-fit values of X-ray spectral index and column density," wrote F. Massaro and colleagues.

The researchers concluded: "We find evidence for intrinsic absorption exceeding a column density of 10^{22} cm^{-2} for one-third of our sources."

Massaro and colleagues published their study in Astrophysical Journal (CHANDRA OBSERVATIONS OF 3C RADIO SOURCES WITH $z < 0.3$: NUCLEI, DIFFUSE EMISSION, JETS, AND HOTSPOTS. Astrophysical Journal, 2010;714(1):589-604).

For additional information, contact F. Massaro, Harvard Smithsonian Astrophysics Observ, 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 - 2

DIALOG(R)

Studies from P.C. Myers et al in the area of astronomy described,
Science Letter, p817,
Tuesday, May 25, 2010

TEXT:

According to a study from the United States, "Initial conditions for star formation in clusters are estimated for protostars whose masses follow the

initial mass function from 0.05 to 10 solar masses. Star-forming infall is assumed equally likely to stop at any moment, due to gas dispersal dominated by stellar feedback."

"For spherical infall, the typical initial condensation must have a steep density gradient, as in low-mass cores, surrounded by a shallower gradient, as in the clumps around cores. These properties match observed column densities in cluster-forming regions when the mean infall stopping time is 0.05 Myr and the accretion efficiency is 0.5. The infall duration increases with final protostar mass, from 0.01 to 0.3 Myr, and the mass accretion rate increases from 3 to 300×10^{-6} solar masses yr^{-1} ," wrote P.C. Myers and colleagues (see also).

The researchers concluded: "The typical spherical accretion luminosity is similar to 5 solar luminosities, reducing the "luminosity problem" to a factor of similar to 3. The initial condensation density gradient changes from steep to shallow at radius 0.04 pc, enclosing 0.9 solar masses, with mean column density $2 \times 10^{22} \text{ cm}^{-2}$ and with effective central temperature 16 K. These initial conditions are denser and warmer than those for isolated star formation."

Myers and colleagues published the results of their research in *Astrophysical Journal* (Star-forming Gas In Young Clusters. *Astrophysical Journal*, 2010;714(2):1280-1289).

For additional information, contact P.C. Myers, 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 - 3

DIALOG(R)

Studies from A.C. Seth and co-researchers in the area of hydrogen published,
Science Letter, p776,
Tuesday, May 25, 2010

TEXT:

"We examine the nuclear morphology, kinematics, and stellar populations in nearby S0 galaxy NGC 404 using a combination of adaptive optics assisted near-IR integral-field spectroscopy, optical spectroscopy, and Hubble Space Telescope imaging. These observations enable study of the NGC 404 nucleus

at a level of detail possible only in the nearest galaxies," scientists writing in the *Astrophysical Journal* report (see also).

"The surface brightness profile suggests the presence of three components: a bulge, a nuclear star cluster (NSC), and a central light excess within the cluster at radii < 3 pc. These components have distinct kinematics with modest rotation seen in the NSC and counter-rotation seen in the central excess. Molecular hydrogen emission traces a disk with rotation nearly orthogonal to that of the stars. The stellar populations of the three components are also distinct, with half of the mass of the NSC having ages of similar to 1 Gyr (perhaps resulting from a galaxy merger), while the bulge is dominated by much older stars. Dynamical modeling of the stellar kinematics gives a total NSC mass of $1.1 \times 10^7 M_{\odot}$. Dynamical detection of a possible intermediate-mass black hole (BH) is hindered by uncertainties in the central stellar mass profile. Assuming a constant mass-to-light ratio, the stellar dynamical modeling suggests a BH mass of $< 1 \times 10^5 M_{\odot}$, while the molecular hydrogen gas kinematics are best fitted by a BH with a mass of $4.5(-2.0)(+3.5) \times 10^5 M_{\odot}$," wrote A.C. Seth and colleagues.

The researchers concluded: "Unresolved and possibly variable dust emission in the near-infrared and active galactic nucleus-like molecular hydrogen emission-line ratios do suggest the presence of an accreting BH in this nearby LINER galaxy."

Seth and colleagues published their study in *Astrophysical Journal* (The Ngc 404 Nucleus: Star Cluster And Possible Intermediate-mass Black Hole. *Astrophysical Journal*, 2010;714(1):713-731).

Additional information can be obtained by contacting A.C. Seth, 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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DIALOG UPDATE DATE: 20100520; 18:33:31 EST
JOURNAL SUBJECT: Science & Engineering

Record - 4

DIALOG(R)

Research reports on astronomy from S.A. Mao and colleagues provide new Insights,
Science Letter, p635,

Tuesday, May 25, 2010

TEXT:

"We present a study of the vertical magnetic field of the Milky Way toward the Galactic poles, determined from observations of Faraday rotation toward more than 1000 polarized extragalactic radio sources at Galactic latitudes vertical bar b vertical bar ≥ 77 degrees, using the Westerbork Radio Synthesis Telescope and the Australia Telescope Compact Array. We find median rotation measures (RMs) of 0.0 ± 0.5 rad m^{-2} and $+6.3 \pm 0.7$ rad m^{-2} toward the north and south Galactic poles, respectively, demonstrating that there is no coherent vertical magnetic field in the Milky Way at the Sun's position," scientists writing in the Astrophysical Journal report (see also).

"If this is a global property of the Milky Way's magnetism, then the lack of symmetry across the disk rules out pure dipole or quadrupole geometries for the Galactic magnetic field. The angular fluctuations in RM seen in our data show no preferred scale within the range approximate to 0 degrees.1 to approximate to 25 degrees," wrote S.A. Mao and colleagues.

The researchers concluded: "The observed standard deviation in RM of similar to 9 rad m^{-2} then implies an upper limit of similar to 1 μ G on the strength of the random magnetic field in the warm ionized medium at high Galactic latitudes."

Mao and colleagues published their study in Astrophysical Journal (A Survey Of Extragalactic Faraday Rotation At High Galactic Latitude: The Vertical Magnetic Field Of The Milky Way Toward The Galactic Poles. Astrophysical Journal, 2010;714(2):1170-1186).

Additional information can be obtained by contacting S.A. Mao, 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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DIALOG UPDATE DATE: 20100520; 18:33:31 EST
JOURNAL SUBJECT: Science & Engineering

Record - 5

DIALOG(R)

Reports summarize astronomy research from M. Gitti and co-authors,
Science Letter, p445,

Tuesday, May 25, 2010

TEXT:

According to a study from the United States, "We report on the results of an analysis of Chandra, XMM-Newton, and new Giant Metrewave Radio Telescope (GMRT) data of the X-ray bright compact group of galaxies HCG 62, which is one of the few groups known to possess clear, small X-ray cavities in the inner regions. This is part of an ongoing X-ray/low-frequency radio study of 18 groups, initially chosen for the availability of good-quality X-ray data and evidence for active galactic nucleus/hot gas interaction."

"At higher frequency (1.4 GHz), the HCG 62 cavity system shows minimal if any radio emission, but the new GMRT observations at 235 MHz and 610 MHz clearly detect extended low-frequency emission from radio lobes corresponding to the cavities. By means of the synergy of X-ray and low-frequency radio observations, we compare and discuss the morphology, luminosity, and pressure of the gas and of the radio source. We find that the radio source is radiatively inefficient, with a ratio of radio luminosity to mechanical cavity power of similar to 10^{-4} , and that the radio pressure of the lobes is about 1 order of magnitude lower than the X-ray pressure of the surrounding thermal gas. Thanks to the high spatial resolution of the Chandra surface brightness and temperature profiles, we also identify a shock front located at 36 kpc to the southwest of the group center, close to the southern radio lobe, with a Mach number similar to 1.5 and a total power which is about 1 order of magnitude higher than the cavity power. Such a shock may have heated the gas in the southern region, as indicated by the temperature map," wrote M. Gitti and colleagues (see also).

The researchers concluded: "The shock may also explain the arc-like region of enriched gas seen in the iron abundance map, as this may be produced by a non-Maxwellian electron distribution near its front."

Gitti and colleagues published the results of their research in *Astrophysical Journal* (Cavities And Shocks In The Galaxy Group Hcg 62 As Revealed By Chandra, Xmm-newton, And Giant Metrewave Radio Telescope Data. *Astrophysical Journal*, 2010;714(1):758-771).

For additional information, contact M. Gitti, 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 - 6

DIALOG(R)

Calcium-rich supernova is a 'different kind of bang'; Exploding star spotted five years ago deserves class of its own, scientists say, but their findings are disputed,

Margaret Munro,
Vancouver Sun (Canada), Final ed, pB5,
Thursday, May 20, 2010

TEXT:

An international team says it has found a new form of exploding star that spews calcium that eventually ends up in us all.

"It's surprisingly different," said Dae-Sik Moon, an astrophysicist at the University of Toronto and a member of the team that reports the find in the journal Nature today.

About half of the mass thrown out by the star, known as supernova SN2005E, was calcium and could explain why there is so much of the element in the universe and in our bodies, the researchers say. Stardust spreads around and, over time, some of it ends up in planets and incorporated into living tissues and bones.

They estimate that a couple of this new type of stellar explosion every century would be enough to produce the calcium seen in galaxies such as our own Milky Way, and the calcium present in all life on Earth.

Supernova SN2005E was spotted five years ago when Moon and several co-authors were post-doctoral fellows and graduate students in California. They pointed powerful telescopes at the far-off explosion and, after analyzing their data, have concluded it was a 'calcium-rich' supernova that belongs in a class of its own.

"It was clear that we were seeing a new type of supernova," lead author Hagai Perets, now at the Harvard-Smithsonian Center for Astrophysics, said in a summary of findings.

Supernova are the most energetic events in the universe and until now scientists have sorted the stellar explosions into two main classes: hot, young giant stars that explode violently and leave behind black holes or neutron stars; and old dense stars that blow up in thermonuclear explosions. SN2005E did not fit either category, Moon said in an interview.

He said one of its most defining features is that it was faint compared to other supernovae. The amount of material hurled into space was too small

for an exploding giant, and its chemical makeup didn't fit with a thermonuclear explosion.

"SN2005E was a different kind of 'bang,' " said co-author Alex Filippenko of the University of California Berkeley.

They say other recently spotted faint supernovae, including one called SN2005cz, resemble SN2005E and likely belong to the same new class of calcium-rich exploding white dwarfs.

However, not everyone is convinced.

Researchers from Hiroshima University in Japan argue in a separate paper, also in Nature this week, that SN2005cz was a massive star that had a core-collapse.

"We believe our arguments are more firm and correct, but it is not yet entirely clear -- so, as in much of science, further work is needed to obtain a more complete understanding," Filippenko said in an e-mail.

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Record - 7

DIALOG(R)

Forget milk, exploding star good for the bones; Scientists find calcium-rich supernova,

Margaret Munro,
Calgary Herald (Canada), Final ed, pA16,
Thursday, May 20, 2010

TEXT:

An international team says it has found a new form of exploding star that spews calcium and eventually ends up in us all.

"It's surprisingly different," said Dae-Sik Moon, an astrophysicist at the University of Toronto and a member of the team that reports the find in the journal Nature, set for release Thursday.

About half of the mass thrown out by the star, known as supernova SN2005E, was calcium and could explain why there is so much of the element in the universe and in our bodies, the researchers say. Stardust spreads around and, over time, some of it ends up in planets and incorporated into living tissues and bones.

They estimate that a couple of this new type of stellar explosion every

century would be enough to produce the calcium seen in galaxies like our own Milky Way, and the calcium present in all life on Earth. Supernova SN2005E was first spotted

five years ago when Moon and several co-authors were post-doctoral fellows and graduate students

in California. They pointed powerful telescopes on the far-off explosion and after analyzing their data have

concluded it was a "calcium-rich" supernova that belongs in a class of its own.

"It was clear that we were seeing a new type of supernova," lead author Hagai Perets, now at the Harvard-Smithsonian Center for Astrophysics, said in a summary of findings.

Supernova are the most energetic events in the universe and until now scientists have sorted the stellar explosions into two main classes: hot, young giant stars that explode violently and leave behind black holes or neutron stars; and old dense stars that blow up in thermonuclear explosions. SN2005E did not fit either category, Moon said. He said one of its most defining features is that it was faint compared to other supernovae. The amount of material hurled into space was too small for an exploding giant, and its chemical makeup didn't fit with a thermonuclear explosion.

"SN2005E was a different kind of 'bang'," said co-author Alex Filippenko of the University of California Berkeley.

They say other recently spotted faint supernovae, including one called SN2005cz, resemble SN2005E and likely belong to the same new class of calcium-rich exploding white dwarfs.

Colour Photo: AFP, Getty Images / A research team says they have found a new form of exploding star that shoots out calcium in its stardust, which eventually ends up on planets and is incorporated into living tissues and bones.

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Record - 8

DIALOG(R)

Exploding stars source of calcium in our bones?,

Margaret Munro,
Edmonton Journal (Canada), Final ed, pA4,
Thursday, May 20, 2010

TEXT:

An international team says it has found a new form of exploding star that spews calcium and eventually ends up in us all.

"It's surprisingly different," said Dae-Sik Moon, an astrophysicist at the University of Toronto and a member of the team that reports the find in the journal *Nature*, set for release today.

About half of the mass thrown out by the star, known as supernova SN2005E, was calcium and could explain why there is so much of the element in the universe and in our bodies, the researchers say. Stardust spreads around and, over time, some of it ends up in planets and incorporated into living tissues and bones.

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Supernova are the most energetic events in the universe and until now scientists have sorted the stellar explosions into two main classes: hot, young giant stars that explode violently and leave behind black holes or neutron stars; and old dense stars that blow up in thermonuclear explosions.

SN2005E did not fit either category, Moon said, adding one of its most defining features is that it was faint compared to other supernovae.

'SN2005E was a different kind of 'bang,' ' said co-author Alex Filippenko of the University of California Berkeley.

The team believes the original star was a low-mass white dwarf that stole helium from a companion star 'until the temperature and pressure ignited a thermonuclear explosion -- a massive fusion bomb -- that blew off at least the outer layers of the star and perhaps blew the entire star to

smithereens.'

Photo: NASA, Reuters, File / Remnants from a star that exploded thousands of years ago created a celestial portrait taken by NASA.

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Record - 9

DIALOG(R)

Calcium enhanced stardust good for our bones; Exploding star spewing element through galaxy,

Margaret Munro,
Ottawa Citizen (Canada), Final ed, pA7,
Thursday, May 20, 2010

TEXT:

An international team says it has found a new form of exploding star that spews calcium and eventually ends up in us all.

"It's surprisingly different," said Dae-Sik Moon, an astrophysicist at the University of Toronto and a member of the team that reports the find in the journal *Nature*, set for release today.

About half of the mass thrown out by the star, known as supernova SN2005E, was calcium and could explain why there is so much of the element in the universe and in our bodies, the researchers say. Stardust spreads around and, over time, some of it ends up in planets and incorporated into living tissues and bones.

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"SN2005E was a different kind of 'bang'," said co-author Alex Filippenko of the University of California Berkeley. The team believes the original star was a low-mass white dwarf that stole helium from a companion star 'until the temperature and pressure ignited a thermonuclear explosion -- a massive fusion bomb -- that blew off at least the outer layers of the star and perhaps blew the entire star to smithereens.'

They say other recently spotted faint supernovae, including one called SN2005cz, resemble SN2005E and likely belong to the same new class of calcium-rich exploding white dwarfs.

"We believe our arguments are more firm and correct, but it is not yet entirely clear -- so, as in much of science, further work is needed to obtain a more complete understanding,' Filippenko said in an e-mail.

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Record - 10

DIALOG(R)

Scientists discover calcium-rich supernova; Exploded star's bits land on Earth, end up in people,

MARGARET MUNRO,
Montreal Gazette (Canada), Final ed, pA13,
Thursday, May 20, 2010

TEXT:

An international team says it has found a new form of exploding star that spews calcium and eventually ends up in us all.

"It's surprisingly different," said Dae-Sik Moon, an astrophysicist at the University of Toronto and a member of the team that reports the find in the journal Nature, set for release today.

About half of the mass thrown out by the star, known as supernova SN2005E, was calcium and could explain why there is so much of the element in the universe and in our bodies, the researchers say. Stardust spreads around and, over time, some of it ends up in planets and incorporated into living tissues and bones.

The team estimates that a couple of this type of stellar explosion every century would be enough to produce the calcium seen in galaxies like our own Milky Way, and the calcium present in all life on Earth.

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One of its most defining features is that it was faint compared with other supernovas, he said. The amount of material hurled into space was too small for an exploding giant, and its chemical makeup didn't fit with a thermonuclear explosion.

"SN2005E was a different kind of 'bang,'" said co-author Alex Filippenko of the University of California Berkeley.

The team believes the original star was a low-mass white dwarf that stole helium from a companion star 'until the temperature and pressure ignited a thermonuclear explosion - a massive fusion bomb - that blew off at least the outer layers of the star and perhaps blew the entire star to smithereens.'

The team says other recently spotted faint supernovas, including SN2005cz, resemble SN2005E and probably belong to the same new class of calcium-rich exploding white dwarfs.

However, not everyone is convinced. Researchers from Hiroshima University in Japan argue in a separate paper, also in Nature this week, that SN2005cz was a massive star that underwent a core-collapse.

Record - 11

DIALOG(R)

POSSIBLE NEW CLASS OF SUPERNOVAE PUTS CALCIUM IN YOUR BONES,

US Federal News,
Thursday, May 20, 2010

TEXT:

BERKELEY, Calif., May 19 -- The University of California at Berkeley issued the following press release:

In the past decade, robotic telescopes have turned astronomers' attention to scads of strange exploding stars, one-offs that may or may not point to new and unusual physics.

But supernova (SN) 2005E, discovered five years ago by the University of California, Berkeley's Katzman Automatic Imaging Telescope (KAIT), is one of eight known "calcium-rich supernovae" that seem to stand out as horses of a different color.

"With the sheer numbers of supernovae we're detecting, we're discovering weird ones that may represent different physical mechanisms compared with the two well-known types, or may just be variations on the standard themes," said Alex Filippenko, KAIT director and UC Berkeley professor of astronomy. "But SN 2005E was a different kind of 'bang.' It and the other calcium-rich supernovae may be a true suborder, not just one of a kind."

Filippenko is coauthor of a paper appearing in the May 20 issue of the journal *Nature* describing SN 2005E and arguing that it is distinct from the two main classes of supernovae: the Type Ia supernovae, thought to be old, white dwarf stars that accrete matter from a companion until they undergo a thermonuclear explosion that blows them apart entirely; and Type Ib/c or Type II supernovae, thought to be hot, massive and short-lived stars that explode and leave behind black holes or neutron stars.

The team of astronomers, led by Hagai Perets, now at the Harvard-Smithsonian Center for Astrophysics, and Avishay Gal-Yam of the Weizmann Institute of Science in Rehovot, Israel, presents evidence that the original star was a low-mass white dwarf stealing helium from a binary companion until the temperature and pressure ignited a thermonuclear explosion - a massive fusion bomb - that blew off at least the outer layers of the star and perhaps blew the entire star to smithereens.

The researchers calculate that about half of the mass thrown out was calcium, which means that a couple of such supernova every 100 years would be enough to produce the high abundance of calcium observed in galaxies like our own Milky Way, and the calcium present in all life on Earth.

Interestingly, a team of researchers from Hiroshima University in Japan argue in the same issue of Nature that SN 2005E's original, or progenitor, star was massive - between 8 and 12 solar masses - and that it underwent a core-collapse similar to a Type II supernova.

"It's a confusing, muddy situation now," said Filippenko. "But we hope that, by finding more examples of this subclass and of other unusual supernovae and observing them in greater detail, we will find new variations on the theme and get a better understanding of the physics that's actually going on."

To make things even muddier, Filippenko and former UC Berkeley post-doctoral fellow Dovi Poznanski, currently at Lawrence Berkeley National Laboratory and also coauthor on the Nature paper, reported last November another supernova, SN 2002bj, that they believe explodes by a similar mechanism: ignition of a helium layer on a white dwarf.

"SN 2002bj is arguably similar to SN 2005E, but has some clear observational differences as well," Filippenko said. "It was likely a white dwarf accreting helium from a companion star, though the details of the explosion seem to have been different because the spectra and light curves differ."

Astronomers have so far found only one example of this beast, however.

Filippenko and UC Berkeley research astronomer Weidong Li first reported an unusual calcium-rich supernova in 2003, and since then, KAIT has discovered several more, including SN 2005E on Jan. 13, 2005. Because these supernovae, like Type Ib, show evidence for helium in their spectra shortly after they explode, and because in the later stages they show strong calcium emission lines, the UC Berkeley astronomers were the first to refer to them as "calcium-rich Type Ib supernovae."

It was SN 2005E, which went off about 110 million years ago in the spiral galaxy NGC 1032 in the constellation Cetus, that initially drew the attention of Perets, Gal-Yam and their colleagues. Using data provided by Filippenko and Li, as well as by the W. M. Keck Observatory in Hawaii, the Palomar Observatory in Los Angeles and the Liverpool Observatory in the United Kingdom (U.K.), they created a detailed picture of the explosion. The small amount of mass ejected in the explosion, estimated at 30 percent the mass of our sun, and the fact that the galaxy in which the explosion occurred was old with few hot, giant stars, led them to the conclusion that

a low-mass white dwarf was involved.

In addition, the newly discovered supernova threw off unusually high levels of the elements calcium and radioactive titanium, which are the products of a nuclear reaction involving helium rather than the carbon and oxygen involved in Type Ia supernovae.

"We know that SN 2005E came from the explosion of an old, low-mass star because of its specific location in the outskirts of a galaxy devoid of recent star formation," said Filippenko. "And the presence of so much calcium in the ejected gases tells us that helium must have exploded in a nuclear runaway."

The paper's authors note that, if these eight calcium-rich supernovae are the first examples of a common, new type of supernova, they could explain two puzzling observations: the abundance of calcium in galaxies and in life on Earth, and the concentration of positrons - the anti-matter counterpart of the electron - in the center of galaxies. The latter could be the result of the decay of radioactive titanium-44, produced abundantly in this type of supernova, to scandium-44 and a positron, prior to scandium's decay to calcium-44. The most popular explanation for this positron presence is the decay of putative dark matter at the core of galaxies.

"Dark matter may or may not exist," says Gal-Yam, "but these positrons are perhaps just as easily accounted for by the third type of supernova."

Filippenko and Li hope that KAIT and other robotic telescopes scanning distant galaxies every night in search of new supernovae will turn up more examples of calcium-rich or even stranger supernovae.

"The research field of supernovae is exploding right now, if you'll pardon the pun," joked Filippenko. "Many supernovae with peculiar new properties have been found, pointing to a greater richness in the physical mechanisms by which nature chooses to explode stars."

Other authors of the paper are UC Berkeley post-doctoral fellows S. Brad Cenko, Nevin N. Weinberg, Brian D. Metzger and Anthony L. Piro; UC Berkeley graduate student Mohan Ganeshalingam; Eliot Quataert, UC Berkeley professor of astronomy; Iair Arcavi and Michael Kiewe of the Weizmann Institute's Faculty of Physics; Paolo Mazzali of the Max-Planck Institute for Astrophysics, Germany and the Scuola Normale Superiore in Pisa, Italy; David Arnett from the University of Arizona; and researchers from across the United States, Canada, Chile and the U.K.

The research of the UC Berkeley investigators was funded by the National Science Foundation, the Department of Energy, the Katzman Foundation, Gary and Cynthia Bengier, the Goldman Fund, and the TABASGO Foundation, with

observational assistance from the University of California Lick Observatory and the W. M. Keck Observatory in Hawaii. For more information about USFednews please contact: Sarabjit Jagirdar, US Fed News, email:- htsyndication@hindustantimes.com

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Record - 12

DIALOG(R)

University of Toledo professor leads breakthrough on stars: Finding alters understanding of formation,

Claudia Boyd-Barrett,
Blade, The (Toledo, OH),
Monday, May 17, 2010

TEXT:

May 17--A team of international astronomers led by a University of Toledo professor has made a surprising discovery that alters understanding of how stars are formed.

Their finding -- a hole within the cloud of gas and dust that surrounds baby stars in the Orion constellation -- turns a previous scientific assumption on its head.

Often referred to as "The Hunter," Orion contains one of the closest star-forming areas to Earth.

Since at least the 1970s, astronomers believed the hole in Orion was simply a very dense section of cloud, said UT associate professor Tom Megeath.

But using an image from the European Space Agency's Herschel Space Observatory -- a powerful new infrared telescope -- Mr. Megeath and his team realized the black space they saw had nothing in it.

"We got this image and we looked at it and we thought: 'Gosh, that's weird,'-- " Mr. Megeath said. "-- 'What would cause a black shape like that?' It was just a striking feature."

After conducting additional observations on telescopes in Arizona and Chile, Mr. Megeath and his team concluded that the shape was, indeed, a hole.

The revelation is important because it helps unfurl a mystery about the "birth" of baby stars. Each star forms within a cloud, but scientists have

been trying to understand how those "babies" eventually emerged. The new Herschel image shows the stars are clearing the cloud away by making a large hole in it, Mr. Megeath said.

The forming stars, or protostars, make the holes by throwing out jet streams of material, Mr. Megeath said.

"These holes are really starting to show this process in action," Mr. Megeath said. "We can now understand the process in a much more clear way than we have before."

Eventually, Mr. Megeath and his team hope to put together a detailed picture of the different stages of star for-

mation. He said that will help scientists understand how our own sun, and the planets, came about.

There will be plenty more material to work with. The current discovery emerged from just one hour of observation, and the team has permission to use the telescope for 200 more hours. That data should be made available at the end of the summer.

"When you have a new telescope unlike anything that we've had before, even with just an hour of time you can do something unprecedented, revolutionary," Mr. Megeath said. "I am really excited about this."

Mr. Megeath arrived at UT in 2006 from the Harvard Smithsonian Center for Astrophysics.

Karen Bjorkman, chairman of the UT Department of Physics and Astronomy, said Mr. Megeath's work is bringing new attention to the university. She said she hopes this latest discovery will bring more experts and students to Toledo. "It's just great to have his expertise here," Ms. Bjorkman said. "It really makes the University of Toledo into a sort of center for a lot of this work on how stars form."

Contact Claudia Boyd-Barrett at:

cbarrett@theblade.com

or 419-724-6272.

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DIALOG(R)

Antarctica!

Clough, G.Wayne,
Smithsonian, v41, n2, p22(1),
Saturday, May 1, 2010

TEXT:

PENGUINS WATCHED US as we waited in our "big reds" (expedition parkas) to board a plane for a three-hour flight from McMurdo Research Station to the South Pole. In 1908-09, explorer Ernest Shackleton needed 73 days to travel from near McMurdo to within 112 miles of the pole, and then weather forced him and his team to turn back. Their return trek was a race against starvation, which they won just barely. Antarctica is the world's coldest, windiest and driest place; in some valleys, there has been no precipitation for two million years. In January, I became the first Smithsonian Secretary to travel--with a group of leaders of other scientific organizations--to this magnificent continent.

The Smithsonian's involvement in Antarctic research has been long and varied. The Wilkes Exploring Expedition (1838-42) proved that Antarctica is a continent; in 1858, the Institution received the expedition's collections. Today our Antarctic collections comprise more than 17,000 meteorites (including some extremely rare ones from the Moon and Mars) and nine million invertebrate specimens. Since 2001, the Institution has managed the National Science Foundation's Antarctic Diving Program, which trains some 35 scientists for under-ice diving each year. From 1995 to 2007, the Smithsonian Astrophysical Observatory operated the Antarctic Submillimeter Telescope and Remote Observatory.

December 1, 2009, marked the 50th anniversary of the signing of the Antarctic Treaty, which governs Antarctica in the "interests of science and the progress of all mankind." On the anniversary day, the Smithsonian hosted an Antarctic Treaty Summit to discuss science-policy interactions in the governance of international spaces.

This month I head to Alaska to celebrate a new Smithsonian exhibition at the Anchorage Museum of History and Art. The Arctic has been a focus of Smithsonian anthropological and other scientific studies almost continuously since 1857. The National Museum of Natural History's Arctic Studies Center regional office opened in Anchorage in 1994. I also plan to travel to St. Lawrence Island in the Bering Sea. The Smithsonian has extensive collections from the island, dating back to 1881, and our studies of Arctic cultures and environmental change are ongoing there. My Antarctic and Arctic trips follow our participation in the Fourth International Polar Year 2007-2008 (www.si.edu/ipyp), which highlighted our polar

research--including studies of astronomy biological organisms, environmental change, indigenous peoples and their cultures, and marine ecosystems. This research becomes particularly pertinent with the ever-increasing evidence that human activity is accelerating climate change--reflected in Arctic sea ice shrinkage and the shifting of food sources for Antarctic penguins.

G. WAYNE CLOUGH is Secretary of the Smithsonian Institution.

Learn more about the Secretary's trip to Antarctica at Smithsonian.com/journals

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Wolbach Library: CfA in the News ~ Week ending 30 May 2010

1. **SMITHSONIAN FOLKLIFE FESTIVAL TO TURN 'SMITHSONIAN INSIDE OUT,'** US Federal News, Friday, May 28, 2010
2. **PHYSICS PROFESSORS RECEIVE GRANT TO STUDY MISSING LINK IN EVOLUTION OF PULSARS,** US Federal News, Thursday, May 27, 2010
3. **Weizmann's supernova find may shed light on some universal mysteries,** JUDY SIEGEL, Jerusalem Post (Israel), p06, Monday, May 24, 2010
4. **WISE Makes Progress on its Space Rock Catalog,** National Aeronautics and Space Administration Documents, Monday, May 24, 2010

Record - 1

DIALOG(R)

SMITHSONIAN FOLKLIFE FESTIVAL TO TURN 'SMITHSONIAN INSIDE OUT,'
US Federal News,
Friday, May 28, 2010

TEXT:

WASHINGTON, May 27 -- The Smithsonian Institution issued the following press release:

Where can people discover a new species of insect, meet a master weaver of African baskets and uncover hidden mysteries of Antarctica all in the same day? The "Smithsonian Inside Out" program at the 44th annual Smithsonian Folklife Festival will give visitors the opportunity to go behind-the-scenes of the world's largest museum and research complex and learn how the work of the Institution's 6,000 staff members affects the world.

The Festival will be held Thursday, June 24, through Monday, June 28, and Thursday, July 1, through Monday, July 5, outdoors on the National Mall between Seventh and 14th streets. Admission is free. Festival hours are from 11 a.m. to 5:30 p.m. each day, with special evening events such as concerts and dance parties beginning at 5:30 p.m. The Festival is co-sponsored by the National Park Service.

A new forward-looking vision for the Smithsonian calls for workers across

the Institution's 19 museums, nine research centers and numerous outreach and education programs to "shape the future by preserving our heritage, discovering new knowledge and sharing our resources with the world." The program will allow Festival visitors to engage in a dialogue with Smithsonian staff about how the Institution is moving ahead into the future and how the work of the Institution reaches beyond the museums on the Mall.

"'Smithsonian Inside Out' is an opportunity for Institution staff to present their research, knowledge and passion to Festival visitors," said Betty Belanus, program curator. "We hope visitors will leave this program with a greater appreciation for the scope and scale of the work carried out by Smithsonian staff on a daily basis."

The program will be organized around four broad themes that cut across Smithsonian disciplines and museums: "Unlocking the Mysteries of the Universe," "Valuing World Cultures," "Understanding the American Experience" and "Understanding and Sustaining a Biodiverse Planet." Each tent will highlight the research, collections and current projects of Smithsonian museums, research centers and other units.

In these tents, visitors will be able to see fossilized vertebrae from the giant snake Titanaboa, which was found by researchers at the Smithsonian Tropical Research Institute. On Ocean Day (June 28), the Hyperbolic Crochet Coral Reef project, in partnership with the Natural History Museum, will be at the Festival, allowing visitors to crochet part of a coral reef to call attention to the disappearing wonders of the marine world. The Smithsonian Astrophysical Observatory will display pictures from the Chandra X-ray observatory, and visitors also can take a poll about democracy and have their opinions become part of a future exhibition at the American History Museum. On African Art Day (June 25) the African Art Museum will present storytelling and a drum circle.

In two "Behind the Scenes" tents, visitors can learn how Smithsonian staff care for and maintain the Institution's buildings, artifacts and living collections. Staff from the Office of Exhibits Central will show how they design and fabricate museums exhibitions, while curators and keepers from the National Zoo will discuss how they safely move the park's animals. Employees from the Office of Facilities Engineering and Operations will demonstrate how they "tend and mend" the hundreds of buildings the Smithsonian has around the world. Visitors can also create their own hanging baskets or learn about orchids with staff from the Smithsonian Gardens. Staff from the Office of Facilities and Management Reliability will demonstrate infrared cameras that detect roof leaks and share with visitors the latest efforts to make Smithsonian buildings more "green." Other areas of the program include a Family Activities tent where visitors can participate in hands-on activities such as science experiments and creating art. On the discussion stage, Smithsonian staff will participate in conversations about researching and designing popular exhibitions, keeping staff, visitors and collections safe, and new tools and techniques in museum conservation. In the "Ask the Smithsonian" tent, staff from the Institution's visitor's office, public relations offices and National Programs will answer general questions about the Institution and explain

its presence around the world.

During the Festival, visitors also can participate in the PhotoCity challenge to recreate all of the Smithsonian museums on the Mall in 3-D. Visitors can take pictures of the Smithsonian museums from every angle using their Smartphone and upload the images to www.photocitygame.com/smithsonian/, with the goal of creating models of all the Smithsonian museums.

About the Festival

The Smithsonian Folklife Festival, inaugurated in 1967, honors tradition bearers from across the United States and around the world. With approximately 1 million visitors each year, the Festival unites performers and visitors in the nation's capital to celebrate the diversity of cultural traditions. It is produced by the Smithsonian's Center for Folklife and Cultural Heritage. The Festival's website is <http://www.festival.si.edu>. For more information about USFednews please contact: Sarabjit Jagirdar, US Fed News, email:- htsyndication@hindustantimes.com

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Record - 2

DIALOG(R)

PHYSICS PROFESSORS RECEIVE GRANT TO STUDY MISSING LINK IN EVOLUTION OF PULSARS,

US Federal News,
Thursday, May 27, 2010

TEXT:

MORGANTOWN, W.Va., May 26 -- West Virginia University issued the following news release:

What makes a regular star into a super star? Hint; it's not a stint on American Idol. It is a process that causes regular, slowly spinning neutron stars to become a kind of rapidly rotating, super dense star called a pulsar.

Duncan Lorimer and Maura McLaughlin, assistant professors in the Department of Physics at West Virginia University, have won a \$46,089 grant from the Smithsonian Astrophysical Observatory to study a missing link of creation in the lives of millisecond pulsars, the fastest spinning stars in space.

"As far as astronomical objects go, pulsars are the next most exotic things out there after black holes," explains Lorimer. "They are great fun to study and one of the things we like to do is to piece together how they live their lives."

Lorimer and McLaughlin are part of an international research team that has been studying a pulsar that is undergoing a recycling process thought to be

the missing link that explains how these stars come to spin so quickly. This star system is called J1023.

These neutron stars have about the same mass as the sun, and yet they are only the size of an average city. Due to their great density, they have very large magnetic fields and can spin at a rate of hundreds of times per second.

Scientists believe that an adjacent star dumps material into these pulsar stars, and this material becomes a flat disk around them. The disk of rotating material then causes the star to spin faster and faster until the stream of material stops. During this process, x-rays are produced from the intense heat that is generated. These star systems are referred to as x-ray binary systems.

Recent evidence from J1023 has proved that it was previously a part of one of these x-ray binary systems, giving further evidence that these systems are the potential transitional link that turns a star into a pulsar.

During their research, the physicists will study the expected x-ray emissions from J1023.

"We will observe the system for five complete orbits and look for evidence of x-ray variability that will allow us to better understand the energetics of this environment," said Lorimer.

For more information, contact Duncan Lorimer, assistant professor of physics, at (304) 293-3422 or Duncan.Lorimer@mail.wvu.edu. For more information about USfednews please contact: Sarabjit Jagirdar, US Fed News, email:- htsyndication@hindustantimes.com

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Record - 3

DIALOG(R)

Weizmann's supernova find may shed light on some universal mysteries,
JUDY SIEGEL,
Jerusalem Post (Israel), p06,
Monday, May 24, 2010

TEXT:

Until now, scientists have been able to identify only two basic types of exploding stars known as supernovae. Now Weizmann Institute of Science astrophysicists and colleagues abroad have observed a third.

It is believed that the discovery of this new type could shed light on some universal mysteries in the heavens and even the human body.

The findings were reported last week in a four-page- long "letter"

published in the journal Nature, with a commentary by a University of Oklahoma astronomer in the same issue.

The supernova types that have long been known are hot, young giants that go out in a violent display as they collapse under their own weight, and old, dense white dwarves that blow up in a thermonuclear explosion.

However, the new type that began to appear in telescope images five years ago and about which data has been collected, measured and assessed for the supernovae's chemical makeup and type of material they threw off in the explosion is different. Dr. Avishay Gal-Yam, Hagai Perets, (now at the Harvard-Smithsonian Center for Astrophysics), Iair Arcavi and Michael Kiewe of the Rehovot institute's physics faculty found quickly that the new type did not belong to either of the known patterns. Seeing that it had recently begun the process of exploding, the Israelis obtained the help of by Paolo Mazzali of the Max-Planck Institute for Astrophysics in Germany and the Scuola Normale Superiore at the INAF/Padova Observatory Pisa, Italy; Prof. David Arnett from the University of Arizona; and researchers from across the USA, Canada, Chile and the UK, who began to collect and combine data at different telescope sites around the world. They team found that the new supernova did not fit either of the known patterns.

The amount of material hurled out from the supernova was too small for it to have come from an exploding giant. Its location - distant from the busy hubs where new stars form - implied it was an older star that had had time to wander off from its original location. Yet the supernova's chemical composition didn't match that commonly seen in the second type. "It was clear," said the paper's lead author Perets, "that we were seeing a new type of supernova." The scientists turned to computer simulations to see what kind of process could have produced such a result.

The common type of exploding white dwarf (a type Ia supernova) is mainly made up of carbon and oxygen, and the chemical composition of the ejected material reflects this. The newly discovered supernova had unusually high levels of the elements calcium and titanium; these are the products of a nuclear reaction involving helium, rather than carbon and oxygen.

"We've never before seen a spectrum like this one," said Mazzali. "It was clear that the unique chemical composition of this explosion held an important key to understanding it."

The simulations suggested that a pair of white dwarves were involved; one of them stealing helium from the other. When the thief star's helium load rises past a certain point, the explosion occurs. "The donor star is probably completely destroyed in the process, but we're not quite sure about the fate of the thief star," said Gal-Yam.

The scientists believe that several other previously observed supernovae may fit this pattern. In fact, these relatively dim explosions might not be all that rare; if so, their occurrence could explain some puzzling phenomena in the universe. For example, almost all the elements heavier

than hydrogen and helium have been created in and dispersed by supernovae; the new type could help explain the prevalence of calcium in both the universe and in our bodies. It might also account for observed concentrations of particles called positrons - identical to electrons, but with an opposite charge - in the center of our galaxy. Some scientists have hypothesized that the decay of yet unseen "dark matter" particles may be responsible for the positrons' presence.

But one of the products of the new supernova is a radioactive form of titanium that, as it decays, emits positrons. "Dark matter may or may not exist," said Gal- Yam, "but these positrons are perhaps just as easily accounted for by the third type of supernova."

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Record - 4

DIALOG(R)

WISE Makes Progress on its Space Rock Catalog,
National Aeronautics and Space Administration Documents,
Monday, May 24, 2010

TEXT:
Feature

May 24, 2010

WISE Makes Progress on its Space Rock Catalog

NASA's Wide-field Infrared Survey Explorer, or WISE, is busy surveying the landscape of the infrared sky, building up a catalog of cosmic specimens -- everything from distant galaxies to "failed" stars, called brown dwarfs.

Closer to home, the mission is picking out an impressive collection of asteroids and comets, some known and some never seen before. Most of these hang out in the Main Belt between Mars and Jupiter, but a small number are near-Earth objects -- asteroids and comets with orbits that pass within about 48 million kilometers (30 million miles) of Earth's orbit. By studying a small sample of near-Earth objects, WISE will learn more about the population as a whole. How do their sizes differ, and how many objects are dark versus light?

"We are taking a census of a small sample of near-Earth objects to get a better idea of how they vary," said Amy Mainzer, the principal investigator of NEOWISE, a program to catalog asteroids seen with WISE.

So far, the mission has observed more than 60,000 asteroids, both Main Belt and near- Earth objects. Most were known before, but more than 11,000 are new.

"Our data pipeline is bursting with asteroids," said WISE Principal Investigator Ned Wright of UCLA. "We are discovering about a hundred a day, mostly in the Main Belt."

About 190 near-Earth asteroids have been observed to date, of which more than 50 are new discoveries. All asteroid observations are reported to the NASA-funded International Astronomical Union's Minor Planet Center, a clearinghouse for data on all solar system bodies at the Smithsonian Astrophysical Observatory in Cambridge, Mass.

"It's a really exciting time for asteroid science," said Tim Spahr, who directs the Minor Planet Center. "WISE is another tool to add to our tool belt of instruments to discover and study the asteroid population."

A network of ground-based telescopes follows up and confirms the WISE finds, including the NASA-funded University of Arizona Spacewatch and Catalina Sky Survey projects, both near Tucson, Ariz., and the NASA-funded Magdalena Ridge Observatory near Socorro, N.M.

Some of the near-Earth asteroids detected so far are visibly dark, but it's too early to say what percentage. The team needs time to properly analyze and calibrate the data. When results are ready, they will be published in a peer-reviewed journal. WISE has not found an asteroid yet that would be too dark for detection by visible-light telescopes on the ground.

"We're beginning the process of sorting through all the objects we're finding so we can learn more about their properties," said Mainzer. "How many are big or small, or light versus dark?"

WISE will also study Trojans, asteroids that run along with Jupiter in its orbit around the sun and travel in two packs -- one in front of and one behind the gas giant. It has seen more than 800, and by the end of the mission, should have observed about half of all 4,500 known Trojans. The results will address dueling theories about how the outer planets evolved.

With its infrared vision, WISE is good at many aspects of asteroid watching. First, infrared light gives a better estimate of an asteroid's size. Imagine a light, shiny rock lying next to a bigger, dark one in the sunshine. From far away, the rocks might look about the same size. That's because they reflect about the same amount of visible sunlight. But, if you pointed an infrared camera at them, you could tell the dark one is bigger. Infrared light is related to the heat radiated from the rock itself, which, in turn, is related to its size.

A second benefit of infrared is the ability to see darker asteroids. Some asteroids are blacker than coal and barely reflect any visible light. WISE can see their infrared glow. The mission isn't necessarily hunting down dark asteroids in hiding, but collecting a sample of all different types. Like a geologist collecting everything from pumice to quartz, WISE is capturing the diversity of cosmic rocks in our solar neighborhood.

In the end, WISE will provide rough size and composition profiles for hundreds of near- Earth objects, about 100 to 200 of which will be new.

WISE has also bagged about a dozen new comets to date. The icy cousins to asteroids are easy for the telescope to spot because, as the comets are warmed by the sun, gas and dust particles blow off and glow with infrared light. Many of the comets found by WISE so far are so-called long-period comets, meaning they spend billions of years circling the sun in the frigid hinterlands of our solar system, before they are shuttled into the inner, warmer parts. Others are termed short-period comets -- they spend most of their lives hanging around the space near Jupiter, occasionally veering into the space closer to the terrestrial planets. WISE's measurements of these snowy dirtballs will allow scientists to study their size, composition and density. Measurements of the comets' orbits will help explain what kicks these objects out of their original, more distant orbits and in toward the sun.

WISE will complete one-and-a-half scans of the sky in October of this year. Visit <http://wise.astro.ucla.edu> to see selected WISE images released so far.

JPL manages WISE for NASA's Science Mission Directorate, Washington. The principal investigator, Edward Wright, is at UCLA. The mission was competitively selected under NASA's Explorers Program managed by the Goddard Space Flight Center, Greenbelt, Md. The science instrument was built by the Space Dynamics Laboratory, Logan, Utah, and 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.

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

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Wolbach Library: CfA in the News ~ Week ending 6 June 2010

1. **Study data from G. Torres and colleagues update understanding of astronomy**, Science Letter, p758, Tuesday, June 8, 2010
2. **Research on astronomy described by S.J. Wolk and colleagues**, Science Letter, p511, Tuesday, June 8, 2010
3. **How short can a planet's year be?**, Staff, New Scientist, v206, n2763, p14, Saturday, June 5, 2010
4. **Giant glowing hourglass found around Milky Way**, Rachel Courtland, New Scientist, v206, n2763, p12, Saturday, June 5, 2010
5. **WESTERN WASHINGTON UNIVERSITY'S KEN RINES RECEIVES GRANT FOR 'DARK ENERGY', ASTRONOMY RESEARCH**, US Federal News, Friday, June 4, 2010
6. **Asteroid-bound: Scientists look for a worthy rock: proximity and slow spin rate are desirable for exploration**, Sanders, Laura, Science News, v177, n11, p5(2), Saturday, May 22, 2010
7. **We're flying to an asteroid - but which one?**, David Shiga, New Scientist, v206, n2758, p12, Saturday, May 1, 2010

Record - 1

DIALOG(R)

Study data from G. Torres and colleagues update understanding of astronomy

Science Letter, p758

Tuesday, June 8, 2010

TEXT:

According to a study from the United States, "We report the discovery of HAT-P-14b, a fairly massive transiting extrasolar planet orbiting the moderately bright star GSC 3086-00152 ($V = 9.98$), with a period of $P = 4.627669 \pm 0.000005$ days. The transit is close to grazing (impact

parameter $0.891(-0.008)(+0.007)$) and has a duration of 0.0912 ± 0.0017 days, with a reference epoch of mid-transit of $T-c = 2,454,875.28938 \pm 0.00047$ (BJD)."

"The orbit is slightly eccentric ($e = 0.107 \pm 0.013$), and the orientation is such that occultations are unlikely to occur. The host star is a slightly evolved mid-F dwarf with a mass of $1.386 \pm 0.045 M_{\odot}$, a radius of $1.468 \pm 0.054 R_{\odot}$, effective temperature 6600 ± 90 K, and a slightly metal-rich composition corresponding to $[Fe/H] = +0.11 \pm 0.08$. The planet has a mass of $2.232 \pm 0.059 M_J$ and a radius of $1.150 \pm 0.052 R_J$, implying a mean density of $1.82 \pm 0.24 \text{ g cm}^{-3}$. Its radius is well reproduced by theoretical models for the 1.3 Gyr age of the system if the planet has a heavy-element fraction of about 50 M_{\oplus} plus (7% of its total mass)," wrote G. Torres and colleagues (see also).

The researchers concluded: "The brightness, near-grazing orientation, and other properties of HAT-P-14 make it a favorable transiting system to look for changes in the orbital elements or transit timing variations induced by a possible second planet, and also to place meaningful constraints on the presence of sub-Earth mass or Earth-mass exomoons, by monitoring it for transit duration variations."

Torres and colleagues published the results of their research in *Astrophysical Journal* (HAT-P-14b: A 2.2 M_J EXOPLANET TRANSITING A BRIGHT F STAR. *Astrophysical Journal*, 2010;715(1):458-467).

For additional information, contact G. Torres, 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 - 2

DIALOG(R)

Research on astronomy described by S.J. Wolk and colleagues

Science Letter, p511

Tuesday, June 8, 2010

TEXT:

According to recent research from the United States, "We report on a multiwavelength study of a partially embedded region of star formation

centered on the Herbig Be star LkH alpha 101. Using two 40 ks Chandra observations, we detect 213 X-ray sources in the approximate to 17' x 17' ACIS-I field."

"We combine the X-ray data with Two Micron All Sky Survey near-IR observations and Spitzer IRAC and MIPS 24 mu m observations to obtain a complete picture of the cluster. A total of 158 of the X-ray sources have infrared counterparts. Of these, we find nine protostars, 48 Class II objects, five transition objects, and 72 Class III objects. From the Spitzer data we identify an additional 10 protostars, 53 Class II objects, and four transition disk candidates which are not detected by Chandra. We obtained optical spectra of a sample of both X-ray-detected and non-X-ray-detected objects. Combining the X-ray, Spitzer, and spectral data, we obtain independent estimates of cluster distance and the total cluster size-excluding protostars. We obtain consistent distance estimates of 510(-40)(+ 100) pc and a total cluster size of 255(-25)(+50) stars. We find the Class II: III ratio is about 5:7 with some evidence that the Class III sources are spatially more dispersed," wrote S.J. Wolk and colleagues (see also).

The researchers concluded: "The cluster appears very young with three sites of active star formation and a median age of about 1 Myr."

Wolk and colleagues published their study in Astrophysical Journal (X-RAY AND INFRARED EMISSION FROM YOUNG STELLAR OBJECTS NEAR LkH alpha 101. Astrophysical Journal, 2010;715(1):671-695).

For additional information, contact S.J. Wolk, 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)

How short can a planet's year be?

Staff

New Scientist, v206, n2763, p14

Saturday, June 5, 2010

TEXT:

HOW short can a planet's year be? That's the question raised by a planet orbiting its star in less than an Earth day.

The planet, named 55 Cancri e, was discovered years ago. It is a "super-Earth" - a world with a mass several times that of Earth - and orbits a star like our sun.

Now Rebekah Dawson and Daniel Fabrycky at the Harvard-Smithsonian Center for Astrophysics in Cambridge, Massachusetts, say gaps in the observational record meant the planet's orbital period was miscalculated. Their analysis shows that the planet's true year is 17 hours and 41 minutes. There may be a planet around the star SWEEPS 10 with an even shorter year, but its existence is unconfirmed.

"We expect that 55 Cancri e will not hold the status of shortest orbital period for long," says Dawson. If a planet could orbit our sun at a distance equivalent to the sun's radius without burning up, its year would be about 3 hours. Planets orbiting more compact objects, such as white dwarfs, pulsars and black holes, might have even shorter years since they can get closer in. However, no confirmed planets have so far been found around white dwarfs or black holes.

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Record - 4

DIALOG(R)

Giant glowing hourglass found around Milky Way,

Rachel Courtland,

New Scientist, v206, n2763, p12,

Saturday, June 5, 2010

TEXT:

IS THE Milky Way blowing giant bubbles? A pair of gamma ray bubbles, shaped like an hourglass, seem to be spewing from the black hole we think lies at the centre of our galaxy. That is according to the latest maps from the Fermi Gamma-ray Space Telescope. Its large area telescope has been scanning the whole sky every three hours since June 2008.

The source of the bubbles is a mystery but it seems unlikely that dark matter is responsible. This was what Douglas Finkbeiner of the Harvard-Smithsonian Center for Astrophysics in Cambridge, Massachusetts, first suspected when he looked at the maps with his colleagues last year (arxiv.org/abs/0910.4583).

But a new analysis with more Fermi data suggests that the gamma radiation traces out a pair of distinct bubbles that span some 65,000 light years from end to end - towering above the 2000-light-year-thick disc of the galaxy. Such a well-defined shape is inconsistent with dark matter, which you would expect to be smoothly distributed and produce a diffuse glow, from gamma rays produced as dark matter particles meet and annihilate each other. "We are pretty sure the majority of emissions are not from dark matter," says Finkbeiner's student Meng Su.

Instead, they think the bubbles may have been blown out by the explosion of short-lived, massive stars born in a burst of new star formation about 10 million years ago. Alternatively, the bubbles may have been forged 100,000 years ago by high-speed jets of matter created when roughly 100 suns' worth of material fell into the black hole at the centre of our galaxy. The team presented its analysis last week at the American Astronomical Society meeting in Miami, Florida.

Fermi team members have also found more gamma radiation than expected in the region but say it's too soon to tell whether it forms an hourglass shape or what its source may be.

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Record - 5

DIALOG(R)

WESTERN WASHINGTON UNIVERSITY'S KEN RINES RECEIVES GRANT FOR 'DARK ENERGY'

ASTRONOMY RESEARCH

US Federal News

Friday, June 4, 2010

TEXT:

BELLINGHAM, Wash., June 3 -- Western Washington University issued the following news release:

Western Washington University Assistant Professor of Physics and Astronomy Ken Rines has been awarded \$35,000 from the Research Corporation for Science Advancement for use into dark energy and galaxy cluster research.

Rines research involves observing galaxy clusters using optical spectroscopy. The galaxy clusters Rines will study are about five billion light years away, so the light detected from them shows how they looked 5 billion years ago. By comparing galaxy clusters of the past to present

ones, Rines will observe how their evolution is influenced by dark energy - a hypothetical form of energy that permeates all of space.

According to Rines, galaxy clusters have more mass in the present than in the past because of their gravitational field. However, dark energy works to pull mass away from clusters in a sort of tug-of-war.

"Dark energy is a fairly recent discovery and has some bizarre consequences," Rines said. "By measuring how fast the clusters are growing, we hope to find out when dark energy starts to win this tug-of-war."

In addition to his research, Rines' grant will provide funding for student-research assistantships, travel to national and international observatories to gather data, and additional resources.

Rines received a doctorate in Astronomy from Harvard in 2003 and did postdoctoral work at Yale and Smithsonian Astrophysical Observatory before beginning his faculty position at WWU in 2008. He has been featured in several media outlets including Science News, BBC News, USA Today, and MSNBC.

For more information, contact Rines at (360) 650-7944 or Ken.Rines@wwu.edu. For more information about USfednews please contact: Sarabjit Jagirdar, US Fed News, email:- htsyndication@hindustantimes.com

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Record - 6

DIALOG(R)

Asteroid-bound: Scientists look for a worthy rock: proximity and slow spin rate are desirable for exploration.

Sanders, Laura

Science News, v177, n11, p5(2)

Saturday, May 22, 2010

TEXT:

The Little Prince, who stood tall on his fictional house-sized asteroid B612, may soon have company. Since President Obama announced last month that NASA plans to send people to an asteroid by 2025 (SN: 5/8/10, p. 10), scientists have been scrambling to fill in the details. Before astronauts can embark on such a journey, they need to choose a destination.

Already, researchers have begun culling the list of potential candidates. Martin Elvis of the Harvard-Smithsonian Center for Astrophysics in Cambridge, Mass., proposed criteria for identifying "potentially visitable objects" on April 28 in Brookline, Mass., at a meeting of the American

Astronomical Society's Division on Dynamical Astronomy.

Asteroids come in a menagerie of sizes, shapes and trajectories. Some are little more than giant loose rubble piles, while others are densely packed. Though Obama's proposal didn't point to any specific destinations, Elvis says that a worthy asteroid ought to have a few key features, including a slow spin rate, no problematic satellites and a solar orbit that allows for a long and recurring launch window.

"Are they spinning rapidly? Are they elongated? Is there strange, irregular gravity?" Elvis asks. If the asteroid is "lumpy and nasty, that's not good."

[ILLUSTRATION OMITTED]

The most important consideration, though, is that the asteroid is easy to get to. While the majority of asteroids reside in a belt between the orbits of Mars and Jupiter, some come close to Earth. A relatively nearby asteroid that circles the sun at a speed similar to the Earth's would be ideal, Elvis reported. So far, six of 6,699 known near-Earth asteroids seem to have amenable orbits.

For many researchers, the visit will be a mini-Mars-mission--a chance to test strategies and equipment before traveling to the Red Planet. A roundtrip journey to a nearby asteroid might take about half a year. A mission to Mars would take more than twice as long.

"If you want to climb Mount Everest, you don't climb K2 first," says astronaut and astronomer John Grunsfeld of the Space Telescope Science Institute in Baltimore. Practicing deep space maneuvers on a nearby asteroid would be like climbing Washington's Mount Rainier before tackling the Himalayas.

To find their Mount Rainier, astronomers first need to map all the asteroids. Scientists have pinpointed many of those big enough to destroy the Earth, but a lot of the rocks smaller than a kilometer in diameter haven't been identified, says planetary scientist Bill Bottke of the Southwest Research Institute in Boulder, Colo. Bottke recently coauthored a National Research Council report outlining possible approaches to cataloging all asteroids near Earth.

Once the asteroids are tallied, selection criteria such as those proposed by Elvis can be considered. (Regardless of choice, it is unlikely that the asteroid will have enough gravity to allow a landing. Rather, astronauts would probably tether their spacecraft to the asteroid and move as it moves, possibly zipping to the rock in a smaller vehicle.)

Planetary scientist Paul Abell of NASA's Johnson Space Center in Houston

says an asteroid's composition might also affect its desirability. Visiting an asteroid that holds water-ice, for example, might help astronauts figure out how to extract water for drinking and for fuel, a technique that could come in handy during pit stops on a long trip to Mars.

Of course, a crewed mission to an asteroid would garner rich scientific rewards in its own right. Visiting an asteroid "tells you about what existed back when planets were forming," Bottke says. Asteroids may host carbon-containing molecules, which could hold clues to the beginning of life on Earth. So far, scientists have gleaned much of their information about the early solar system from meteorites that have landed on Earth, but these samples lose a lot of material as they flame through the atmosphere, he says.

Though robots have successfully landed on two asteroids so far--Eros and Itokawa--people could accomplish experiments that robots couldn't. "Having humans in the mix gives you a lot of flexibility," Abell says. A human with a hammer could pick up a rock and then choose to discard it in favor of a more intriguing rock somewhere else.

But having "non-artificial intelligence," as planetary astronomer Andrew Rivkin of Johns Hopkins University's Applied Physics Laboratory in Laurel, Md., puts it, doesn't mean a thing unless the astronauts survive the trip. Keeping them safe on a long flight to an asteroid, as well as to Mars, will pose new challenges.

[ILLUSTRATION OMITTED]

"Going to an asteroid is a new idea, but I don't think all of the complications have been thought through," Bottke says. "I think everyone's being a little cavalier about jumping on the bandwagon."

For instance, researchers will need to quantify the doses of radiation that astronauts will experience on the journey. An inopportune solar flare could be deadly, and the requisite protective shielding could be too heavy to carry.

If researchers can identify a flight plan that will keep astronauts healthy and safe, Earth's homebodies may be protected as well. Another hope--and another reason to probe a nearby asteroid--is that such a mission could uncover new ways to deflect or destroy a life-threatening rock careening toward Earth.

"A lot of the objects that we'll be able to get to as human beings are the ones that represent the greatest threat," Abell says.

The difficulties of the proposed visit are great, but the morale boost from

accomplishing the mission is "powerful, if not tangible," Rivkin says.

Adds Grunsfeld, who has been on five space flights: "This is about the bigger picture. It's the start of humans going out and exploring the solar system."

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Record - 7

DIALOG(R)

We're flying to an asteroid - but which one?

David Shiga,

New Scientist, v206, n2758, p12,

Saturday, May 1, 2010

TEXT:

DECIDING to send astronauts to an asteroid is all very well, but now NASA will have to find the few space rocks that are suitable to visit, and work out how to rendezvous safely.

Last month, US president Barack Obama announced the next destination for NASA astronauts would be an asteroid, as early as 2025. The goal would be to gain experience of safely sending humans far from Earth, as a stepping stone towards longer journeys to Mars. Studying the interior of an asteroid up close could also prove important if we ever need to deflect one. Yet achieving the goal will mean overcoming daunting challenges.

Before landing on an asteroid, a spacecraft must enter its orbit, rather than simply whizzing by. That means matching the object's speed and direction of motion, which in most cases would require burning too much rocket fuel to be practical. The only way round this would be if the asteroid's motion happened to be very similar to Earth's at the time of its closest approach.

Even if a space rock passes that test, few have close approaches to Earth in the right time frame, in 2025 or the following few years, points out Martin Elvis of the Harvard-Smithsonian Center for Astrophysics in Cambridge, Massachusetts, who was to speak on the subject this week at a meeting of the American Astronomical Society's Division on Dynamical Astronomy in Boston.

A 2009 study led by Paul Abell of NASA's Johnson Space Center in Houston, Texas, found only seven asteroids that could be visited between 2025 and 2030, from a list of more than 1200 near-Earth objects (Meteoritics and Planetary Science , vol 44, p 1825). New discoveries since that study -

which only included asteroids known in 2006 - has increased that number to 42, but many of these could be rejected when further criteria are applied.

The rotation rate of most asteroids is unknown, but any fast-spinning objects will be off limits because they would be difficult for astronauts to hang onto. Combine that with potential mission delays, and it becomes clear that many more candidates are required, Elvis says. "I think people have not appreciated how many you need," he says. "NASA will need to survey huge numbers of asteroids to sift out the limited number of really good ones."

Abell is optimistic that telescopes like the Pan-STARRS observatory that recently opened in Hawaii will expand the list of candidates. "There could be many, many targets to go to," he says.

However, ground-based telescopes are hampered because asteroids in orbits similar to Earth's are often hidden by the glare of the sun, Elvis says. He advocates launching a space telescope to orbit the sun near Venus, from which it could look outward to see asteroids near Earth's orbit - an idea that has long been discussed by astronomers but never funded.

Even if enough suitable targets can be found, there are more problems to overcome. Small, irregularly shaped asteroids have lumpy gravity fields, so an orbiting spacecraft would follow a chaotic trajectory, making navigation much trickier than around Earth or the moon, says Daniel Scheeres of the University of Colorado in Boulder, who has simulated such orbits .

The surfaces of some asteroids may also be unstable, so astronauts could accidentally set off a landslide, Scheeres says, adding that it would be wise to send robots before humans. "We don't have the sort of data that you might want before you send an astronaut," he says.

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Wolbach Library: CfA in the News ~ Week ending 13 June 2010

1. **Study results from I.E. Gordon et al provide new insights into chalcogens**, Science Letter, p2138, Tuesday, June 15, 2010
2. **New astronomy study results from J.B. Nantais et al described**, Science Letter, p529, Tuesday, June 15, 2010
3. **The American Association for the Advancement of Science (AAAS) - Discussion**, Washington Daybook, Friday, June 11, 2010
4. **FREE CONCERT TO COINCIDE WITH INTERNATIONAL SOLAR MEETING AT MONTANA STATE UNIVERSITY**, US Federal News, Tuesday, June 8, 2010
5. **Far sighted.**, Clough, G. Wayne, Smithsonian, v41, n3, p24(1), Tuesday, June 1, 2010

Record - 1

DIALOG(R)

Study results from I.E. Gordon et al provide new insights into chalcogens,
Science Letter, p2138,
Tuesday, June 15, 2010

TEXT:

"Electric quadrupole transitions in the $a(1)\Delta(g)-X-3\Sigma(-)(g)$ band of O-16(2) near 1.27 μm are reported for the first time. They were first detected in atmospheric solar spectra acquired with a ground-based Fourier transform spectrometer (FTS) in Park Falls, WI," investigators in the United States report (see also).

"Subsequently high-sensitivity ON cavity ring down spectroscopy (CW-CRDS) experiments were carried out at Grenoble University in the 7717-7917 cm^{-1} region in order to provide quantitative intensity information for the electric quadrupole transitions. Measured intensities were used as input data for the calculation of the complete list of electric quadrupole transitions with $\Delta J = \pm 2, \pm 1$ and 0. The calculation was carried out for the intermediate coupling case and assuming that these transitions are possible only through mixing of the $\Omega=0$ component of the ground electronic state and $b(1)\Sigma(+)(g)$ state induced by spin-orbit coupling. The calculated line list agrees well with experimental measurements and was used to improve the residuals of the fitted solar atmospheric spectrum,"

wrote I.E. Gordon and colleagues.

The researchers concluded: "Emission probability for the electric quadrupole band was determined to be $(1.02 \pm 0.10) \times 10^{-6} \text{s}^{-1}$."

Gordon and colleagues published their study in the Journal of Quantitative Spectroscopy & Radiative Transfer (First identification of the $a(1) \Delta(G)-X-3 \Sigma(-)(G)$ electric quadrupole transitions of oxygen in solar and laboratory spectra. Journal of Quantitative Spectroscopy & Radiative Transfer, 2010;111(9 Sp. Iss.):1174-1183).

For additional information, contact I.E. Gordon, Harvard Smithsonian Center Astrophysics, Atom & Molecular Physics Division, Cambridge, MA 02138, USA.

The publisher of the Journal of Quantitative Spectroscopy & Radiative Transfer can be contacted at: Pergamon-Elsevier Science Ltd., the Boulevard, Langford Lane, Kidlington, Oxford OX5 1GB, England.

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Record - 2

DIALOG(R)

New astronomy study results from J.B. Nantais et al described,
Science Letter, p529,
Tuesday, June 15, 2010

TEXT:

"We obtained spectra of 74 globular clusters (GCs) in M81. These GCs had been identified as candidates in a Hubble Space Telescope (HST) Advanced Camera for Surveys I-band survey," investigators in the United States report (see also).

"Sixty-eight of these 74 clusters lie within $7'$ of the M81 nucleus. Sixty-two of these clusters are newly spectroscopically confirmed, more than doubling the number of confirmed M81 GCs from 46 to 108. We determined metallicities for our 74 observed clusters using an empirical calibration based on Milky Way GCs. We combined our results with 34 M81 GC velocities and 33 metallicities from the literature and analyzed the kinematics and metallicity of the M81 GC system. The mean of the total sample of 107 metallicities is -1.06 ± 0.07 , higher than either M31 or the Milky Way. We suspect that this high mean metallicity is due to an overrepresentation of metal-rich (MR) clusters in our sample created by the spatial limits of the HST I-band survey. The metallicity distribution shows marginal evidence for bimodality, with the mean metallicities of MR and metal-poor (MP) GCs

similar to those of M31 and the Milky Way. The GC system as a whole, and the MP GCs alone, show evidence of a radial metallicity gradient. The M81 GC system as a whole shows strong evidence of rotation, with V_r (deprojected) = $108 \pm 22 \text{ km s}^{-1}$ overall. This result is likely biased toward high rotational velocity due to overrepresentation of MR inner clusters," wrote J.B. Nantais and colleagues.

The researchers concluded: "The rotation patterns among GC subpopulations are roughly similar to those of the Milky Way: clusters at small projected radii and MR clusters rotate strongly, while clusters at large projected radii and MP clusters show weaker evidence of rotation."

Nantais and colleagues published their study in *Astronomical Journal* (Spectroscopy Of M81 Globular Clusters. *Astronomical Journal*, 2010;139(6):2620-2638).

For additional information, contact J.B. Nantais, 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 - 3

DIALOG(R)

The American Association for the Advancement of Science (AAAS) – Discussion,
Washington Daybook,
Friday, June 11, 2010

TEXT:

20100616 - The American Association for the Advancement of Science (AAAS)

TIME: 4 p.m.

EVENT: The American Association for the Advancement of Science (AAAS) holds a discussion on the future of the science and religion dialogue.

PARTICIPANTS: William Phillips, professor of physics at the University of Maryland, College Park, and 1997 Nobel Laureate in physics; David Anderson, founder and lead pastor at Bridgeway Community Church in Columbia, Maryland; Howard Smith, astrophysicist at the Smithsonian Astrophysical Observatory and author of "Let There Be Light: Modern Cosmology and Kabbalah"; and Rick Potts, director of the Smithsonian Institution's Human

Origins Program

DATE: June 16, 2010

LOCATION: AAAS, 1200 New York Avenue NW, Washington, D.C.

CONTACT: 202-326-6440, media@aaas.org; <http://www.aaas.org> [Note: Media should RSVP to Earl Lane at 202-326-6431 or elane@aaas.org]

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Record - 4

DIALOG(R)

FREE CONCERT TO COINCIDE WITH INTERNATIONAL SOLAR MEETING AT MONTANA STATE UNIVERSITY,

US Federal News,
Tuesday, June 8, 2010

TEXT:

BOZEMAN, Mont., June 7 -- Montana State University issued the following press release:

A free public concert incorporating dramatic images of the sun and music representing the human experience will be held June 18 in conjunction with an international gathering of solar scientists at Montana State University.

Approximately 30 astrophysicists from Japan and the United States will be in Bozeman June 16-18 for a team meeting to discuss findings and issues related to four telescopes on the Hinode space craft, said Piet Martens of MSU, a solar physicist and one of the local organizers. Scientists from the United States, the United Kingdom and Japan designed the telescopes to collect X-ray images for a variety of studies related to magnetic energy on the sun.

Eric Funk -- a composer, conductor, musician and MSU faculty member -- will conduct and perform with a chamber group on the last day of the team meeting. The concert, titled "Beyond Time," will begin at 7:30 p.m. Friday, June 18, in the Reynolds Recital Hall on the MSU campus. The recital hall is located in Howard Hall along 11th Avenue and across from the MSU duck pond.

The concert will begin with Martens showing solar images from Hinode and continue with selections from symphonies that Funk composed over the past

decade. Referring to the concert as a "musical hors d'oeuvre," Funk said that excerpts from his pentalogy "Beyond Time," a cycle of five symphonies that give an overview of human life, will be presented as transcribed for a chamber music ensemble. The works involved in the pentalogy are Symphony No. 6/Apocalypse-Phoenix Rising, No. 7/Time, No. 8/And Humankind Departed, No. 9/Time Bridge to Beyond Time, and a large work for tenor voice and orchestra, The Sojourner's Eye, from which most of the music for this concert was drawn.

Performing will be Bozeman actor Kent Davis; tenor Travis Mills, an MSU senior; Funk and Azusa Hokugo Komiya on the piano; Stephan Cepeda on violin, Mary Carson on viola, Peter Landeen on violoncello and Stephen Versaevel on percussion.

Martens said the Hinode X-ray Telescope Team meets every year to discuss technical issues related to the telescopes, scientific results and plans for future observations, but this will be the first time the team has assembled at MSU. This will also be the first time that a concert will be held in conjunction with the meeting. The hosts usually offer a public lecture.

"This concert is intended to bring the sciences and humanities together," Funk said.

Hinode was launched in September 2006 as a successor to the Yohkoh Soft X-Ray Telescope, which also involved MSU scientists. Continuously collecting images from the sun, Hinode observes solar magnetic fields, as well as the dissipation of magnetic energy. Dissipation takes a variety of forms, including solar flares.

Scientists attending the MSU meeting will come from the Harvard-Smithsonian Center for Astrophysics, NASA, the University of New Hampshire, MSU, the National Astronomical Observatory of Japan and the Japanese Space Agency. Dave McKenzie, MSU's Hinode Co-PI, is chairing the Scientific Organizing Committee and the Local Organizing Committee for the meeting.

The first day of the team meeting will be devoted to technical discussions. Scientific discussions will occur on June 17 and 18. For more details, see <http://solar.physics.montana.edu/HINODE/XRT/TeamMtg/>

For related stories, see: "MSU researchers say new telescope makes it easier to predict solar explosions" at <http://www.montana.edu/cpa/news/nwview.php?article=4902>

"MSU is part of new solar mission orbiting 431 miles up" at <http://www.montana.edu/cpa/news/nwview.php?article=4142>

"Sun goes on longer than normal without producing sun spots" at <http://www.montana.edu/cpa/news/nwview.php?article=5982>. For more information about USfednews please contact: Sarabjit Jagirdar, US Fed News, email:- htsyndication@hindustantimes.com

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Record - 5

DIALOG(R)

Far sighted.

Clough, G. Wayne

Smithsonian, v41, n3, p24(1)

Tuesday, June 1, 2010

TEXT:

HUMAN KNOWLEDGE OF THE COSMOS increased dramatically in the 20th century as large ground-based telescopes and orbiting observatories such as Hubble allowed us to see far beyond our galaxy. In the current century, investigations of dark energy, dark matter and other astronomical mysteries promise even greater understanding.

Smithsonian astrophysicist Harvey Tananbaum, a pioneer in X-ray astronomy, is the director of the Chandra X-Ray Center at the Smithsonian Astrophysical Observatory (SAO) in Cambridge, Massachusetts. Over the past 30 years, NASA funding has enabled SAO to build a high-resolution camera, play a leading role in overseeing the design and construction of the unique Chandra X-ray telescope and control Chandra's science and flight operations following its launch in 1999. With its unrivaled ability to produce high-resolution X-ray images, Chandra has allowed scientists all over the world to observe a fantastic range of phenomena. It has also provided the most direct evidence to date that most of the universe's matter is "dark," its presence detected only indirectly by observing its gravitational pull on normal matter.

"Chandra has helped track how dark energy has slowed the growth of galaxy clusters and offered us clues about what the universe's ultimate destiny might be," Tananbaum says. Chandra can follow matter heated to temperatures of millions of degrees as it swirls toward the black holes that lurk in most galaxies. Near the black hole, an instability can trigger winds of hot gas and jets of energetic particles. These outflows then limit the further growth of large, massive galaxies. Chandra has also revealed amazing details about the dynamics of shock waves generated by exploding stars. Its many accomplishments are explained in detail on its award-winning Web site

(www.chandra.harvard.edu).

SAO has participated in other NASA-funded astronomy programs, such as developing an infrared camera on the Spitzer Space Telescope and an extreme ultraviolet imager on the recently launched Solar Dynamics Observatory. In addition, SAO researchers are contributing to NASA's Kepler Mission, a space telescope that has discovered five new planets orbiting five different stars outside our solar system. If life is eventually found on planets like these, Kepler will have played a key role in the discovery. In the 21st century, with our superb facilities, innovative researchers and strong partners, the Smithsonian will continue to develop next-generation technologies and lead missions to uncover the secrets of the cosmos.

G. WAYNE CLOUGH is Secretary of the Smithsonian Institution

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John G. Wolbach Library: CfA in the News ~ Week ending 20 June 2010

1. **New astronomy research reported from F. Rahoui and co-authors**, Science Letter, p828, Tuesday, June 22, 2010
2. **Astronomers Observing Birth Of Star**, World News Connection, Saturday, June 19, 2010
3. **Yale University: Astronomers Witness a Star Being Born**, M2 PressWIRE, Friday, June 18, 2010
4. **Astronomers witness birth of a star**, Hindustan Times, Friday, June 18, 2010
5. **PAN-STARRS 1 TELESCOPE BEGINS SCIENCE MISSION**, US Federal News, Thursday, June 17, 2010
6. **Is Human Activity a Substantial Cause of Global Climate Change? New ProCon.org Website Shows Latest Pro and Con Research in Climate Change Debate**, PR Newswire, Tuesday, June 15, 2010
7. **In the Hunt for Planets, Who Owns the Data?**, DENNIS OVERBYE, New York Times (NY), Late Edition - Final ed, p1, Tuesday, June 15, 2010
8. **Energy and What's Ahead**, Reed Miller, Industrial Heating, v78, n6, p12 Tuesday, June 1, 2010

Record - 1

DIALOG(R)

New astronomy research reported from F. Rahoui and co-authors,
Science Letter, p828,
Tuesday, June 22, 2010

TEXT:

According to a study from the United States, "To date, mid-infrared properties of Galactic black hole binaries have barely been investigated in the framework of multi-wavelength campaigns. Yet, studies in this spectral domain are crucial to get complementary information on the presence of dust and/or on the physical processes such as dust heating and thermal bremsstrahlung."

"Here, we report a long-term multi-wavelength study of the microquasar GRS 1915+105. On the one hand, we aimed at understanding the origins of the mid-infrared emission, and on the other hand, at searching for correlation

with the high-energy and/or radio activities. We observed the source at several epochs between 2004 and 2006 with the photometer IRAC and spectrometer IRS, both mounted on the Spitzer Space Telescope. When available, we completed our set of data with quasi-simultaneous RXTE/INTEGRAL high-energy and/or Ryle radio observations from public archives. We then studied the mid-infrared environment and activities of GRS 1915+105 through spectral analysis and broadband fitting of its radio to X-ray spectral energy distributions. We detected polycyclic aromatic hydrocarbon molecules in all but one IRS spectra of GRS 1915+105 which unambiguously proves the presence of a dust component, likely photoionized by the high-energy emission. We also argue that this dust is distributed in a disk-like structure heated by the companion star, as observed in some Herbig Ae/Be and isolated cool giant stars. Moreover, we show that some of the soft X-ray emission emanating from the inner regions of the accretion disk is reprocessed and thermalized in the outer part. This leads to a mid-infrared excess that is very likely correlated to the soft X-ray emission," wrote F. Rahoui and colleagues (see also).

The researchers concluded: "We exclude thermal bremsstrahlung as contributing significantly in this spectral domain."

Rahoui and colleagues published the results of their research in *Astrophysical Journal* (Long-term Multi-wavelength Studies Of Grs 1915+105. I. A High-energy And Mid-infrared Focus With Rxte/integral And Spitzer. *Astrophysical Journal*, 2010;715(2):1191-1202).

For additional information, contact F. Rahoui, 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 - 2

DIALOG(R)

Astronomers Observing Birth of Star,
World News Connection,
Saturday, June 19, 2010

TEXT:

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Astronomers Observing Birth of Star

TEHRAN (FNA)- Astronomers have glimpsed what could be the youngest known star at the very moment it is being born. Not yet fully developed into a true star, the object is in the earliest stages of star formation and has just begun pulling in matter from a surrounding envelope of gas and dust. The subject has come to the focus of a new study that appears in the current issue of the *Astrophysical Journal*. The study's authors -- who include astronomers from Yale University, the Harvard-Smithsonian Center for Astrophysics and the Max Planck Institute for Astronomy in Germany -- found the object using the Submillimeter Array in Hawaii and the Spitzer Space Telescope. Known as L1448-IRS2E, it's located in the Perseus star-forming region, about 800 light years away within our Milky Way galaxy.

Stars form out of large, cold, dense regions of gas and dust called molecular clouds, which exist throughout the galaxy. Astronomers think L1448-IRS2E is in between the prestellar phase, when a particularly dense region of a molecular cloud first begins to clump together, and the protostar phase, when gravity has pulled enough material together to form a dense, hot core out of the surrounding envelope.

"It's very difficult to detect objects in this phase of star formation, because they are very short-lived and they emit very little light," said Xuepeng Chen, a postdoctoral associate at Yale and lead author of the paper. The team detected the faint light emitted by the dust surrounding the object.

Most protostars are between one to 10 times as luminous as the Sun, with large dust envelopes that glow at infrared wavelengths. Because L1448-IRS2E is less than one tenth as luminous as the Sun, the team believes the object is too dim to be considered a true protostar. Yet they also discovered that the object is ejecting streams of high-velocity gas from its center, confirming that some sort of preliminary mass has already formed and the object has developed beyond the prestellar phase. This kind of outflow is seen in protostars (as a result of the magnetic field surrounding the forming star), but has not been seen at such an early stage until now. The team hopes to use the new Herchel space telescope, launched last May, to look for more of these objects caught between the earliest stages of star formation so they can better understand how stars grow and evolve. "Stars are defined by their mass, but we still don't know at what stage of

the formation process a star acquires most of its mass," said Hor Arce, assistant professor of astronomy at Yale and an author of the paper. "This is one of the big questions driving our work."

Other authors of the paper include Qizhou Zhang and Tyler Bourke of the Harvard-Smithsonian Center for Astrophysics; and Ralf Launhardt, Markus Schmalzl and Thomas Henning of the Max Planck Institute for Astronomy. [Description of Source: Tehran Fars News Agency in English -- hardline pro-Ahmadinezhad news agency; headed as of December 2007 by Hamid Reza Moqaddamfar, who was formerly an IRGC cultural officer; www.fars.ir]

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Record - 3

DIALOG(R)

Yale University: Astronomers Witness a Star Being Born,
M2 PressWIRE,
Friday, June 18, 2010

TEXT:

RDATE:17062010

New Haven, Conn. -- Astronomers have glimpsed what could be the youngest known star at the very moment it is being born. Not yet fully developed into a true star, the object is in the earliest stages of star formation and has just begun pulling in matter from a surrounding envelope of gas and dust, according to a new study that appears in the current issue of the Astrophysical Journal.

The study's authors*who include astronomers from Yale University, the Harvard-Smithsonian Center for Astrophysics and the Max Planck Institute for Astronomy in Germany*found the object using the Submillimeter Array in Hawaii and the Spitzer Space Telescope. Known as L1448-IRS2E, it's located in the Perseus star-forming region, about 800 light years away within our Milky Way galaxy.

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CONTACT: Suzanne Taylor Muzzin, Yale University Tel: +1 203 432 8555

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Record - 4

DIALOG(R)

Astronomers witness birth of a star,

Hindustan Times,

Friday, June 18, 2010

TEXT:

Washington, June 18 -- Astronomers have witnessed the birth of a star, that could be youngest known to us.

Still far from a fully developed star, the object is in the earliest stages of star formation and has just begun pulling in matter from a surrounding envelope of gas and dust, says a new research published in the *Astrophysical Journal*.

The study's authors - who include astronomers from Yale University, the Harvard-Smithsonian Center for Astrophysics and the Max Planck Institute for Astronomy in Germany - found the object using the Submillimeter Array in Hawaii and the Spitzer Space Telescope.

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"This is one of the big questions driving our work." Published by HT Syndication with permission from Asian News International. For more information on news feed please contact Sarabjit Jagirdar at htsyndication@hindustantimes.com

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Record - 5

DIALOG(R)
PAN-STARRS 1 TELESCOPE BEGINS SCIENCE MISSION,
US Federal News,
Thursday, June 17, 2010

TEXT:
HONOLULU, June 16 -- The University of Hawaii issued the following news release:

The world became a slightly safer place on May 13, when the Pan-STARRS 1 (PS1) telescope in Hawaii started surveying the sky for killer asteroids.

This 1.8 meter (60-inch) diameter telescope on Haleakala is designed to automatically search the skies for objects that either move or change their brightness from night to night. It contains the world's largest digital camera, with 1,400 megapixels.

"Although modest in size, this telescope is on the cutting edge of technology," said Dr. Nick Kaiser, astronomer at UH Manoa's Institute for

Astronomy and head of the Pan-STARRS project. "It can image a patch of sky about 40 times the area of the full moon, much larger than any similar-sized telescope on Earth or in space."

Designed and built by astronomers and engineers of the Pan-STARRS project at the University of Hawaii at Manoa, PS1 has now been turned over to the PS1 Science Consortium, a group of ten institutions, including UH Manoa, in the United States, Germany, United Kingdom and Taiwan that are funding the PS1 Science Mission.

The giant digital camera will take over 500 exposures each night and send about four terabytes of data (equivalent to what 1,000 DVDs can hold) to the Maui High Performance Computing Center for analysis. Computers will rapidly compare each exposure with corresponding ones taken either a few minutes or a few days earlier to find objects that have moved or whose brightness has changed.

In the next three years, PS1 is expected to discover about 100,000 asteroids and to determine if any of them are on a collision course with Earth. It will catalog five billion stars and 500 million galaxies.

PS1 will also be used to compile the most comprehensive digital map of the 75 percent of the universe visible from Hawaii.

UH Manoa astronomers will use the data to search for killer asteroids, to find brown dwarfs and distant quasars, to watch supernova explosions in distant galaxies and to test their latest theories concerning dark matter and dark energy.

PS1 is the experimental prototype for the larger PS4 telescope, which will have four times the power of PS1 and is planned for Mauna Kea.

The PS1 surveys have been made possible through contributions of the PS1 Science Consortium: the University of Hawaii at Manoa Institute for Astronomy; the Pan-STARRS Project Office; the Max-Planck Society and its participating institutes, the Max Planck Institute for Astronomy, Heidelberg, Germany and the Max Planck Institute for Extraterrestrial Physics, Garching, Germany; the Johns Hopkins University; the University of Durham; the University of Edinburgh; the Queen's University Belfast; the Harvard-Smithsonian Center for Astrophysics; the Las Cumbres Observatory Global Telescope Network, Inc.; and the National Central University of Taiwan. Funding for Pan-STARRS (short for Panoramic Survey Telescope & Rapid Response System) has been provided by the U.S. Air Force.

For more information about UH Manoa's role in the PS1 Science Mission, visit: http://www.ifa.hawaii.edu/info/front_page_news/PS1_Science_at_IfA/.

For more information, visit: <http://pan-starrs.ifa.hawaii.edu/public/> For more information about USfednews please contact: Sarabjit Jagirdar, US Fed News, email:- htsyndication@hindustantimes.com

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Record - 6

DIALOG(R)

Is Human Activity a Substantial Cause of Global Climate Change? New ProCon.org Website Shows Latest Pro and Con Research in Climate Change Debate,

PR Newswire,

Tuesday, June 15, 2010

TEXT:

SANTA MONICA, Calif., June 15 /PRNewswire-USNewswire/ -- ProCon.org's 34th and newest website, , explores the debate over whether human actions or natural events are primarily responsible for global climate changes. The website helps to stimulate critical thinking on global climate change by presenting the best pros, cons, and facts so people can formulate their own informed perspectives on this complex and important issue.

Natural occurrences, such as changes in the sun's radiation and ocean current shifts, as well as human activities, including burning fossil fuels and deforestation, are reportedly contributing to climate change. Over the 20th century global temperatures have risen between 1 degree F and 1.4 degrees F. This rise has taken place concurrently with a rise in atmospheric levels of greenhouse gases, loss of sea ice, glacier retreat, sea level rise, more intense heat waves, stronger hurricanes, and more droughts.

Several human activities release greenhouse gases such as carbon dioxide (CO₂), methane (CH₄), and nitrous oxide (NO₂), into the atmosphere. As of Apr. 2010, CO₂ levels were 389 parts per million (ppm) - reportedly higher than at any time in the last 650,000 years when levels fluctuated between 180 and 300 ppm.

Although there was a period of cooling from 1940 to 1970, and uncertainty exists in computer climate models, many researchers think the earth will continue to warm by 3 - 10 degrees F over the 21st century.

Predictions about how climate changes will affect civilization range from

an Oct. 2003 Department of Defense report detailing catastrophic weather events and a "significant drop in the human carrying capacity of the Earth's environment," to a Fall 2007 Oregon Institute of Science and Health report detailing "an increasingly lush environment of plants and animals."

Those who believe humans are causing substantial climate change, including the US National Academies of Science, the National Aeronautics and Space Administration (NASA), and the National Oceanic and Atmospheric Administration (NOAA), state that greenhouse gas levels rise mainly from human activities. They argue these increases are amplified by natural feedback loops, leading to significant global warming and climate change that will detrimentally effect human civilization, causing flooding, water shortages, hotter summers and colder winters, and decreased crop harvests.

Those who believe humans are not substantially contributing to climate change, including the Heartland Institute, the Heritage Foundation, and the American Association of Petroleum Geologists, argue that the amount of human-generated greenhouse gas increases are too small to substantially change the climate. They state that the earth's forests and oceans are capable of absorbing these small increases, and that 20th century warming has been the result of natural processes including fluctuations in the sun's heat and ocean currents.

Did You Know?

* As of 2010, the US had 4.5% of world's population but was responsible for about 28% of all global greenhouse gas emissions.

* From 1998-2009, the US government appropriated \$99 billion for work related to climate change. \$35.7 billion (36%) of that total came in 2009 as part of the American Recovery and Reinvestment Act of 2009.

* A 2003 study by researchers at the Harvard-Smithsonian Center for Astrophysics showed temperatures from 1000-1100 AD (before fossil fuel use) that are comparable to those from 1900-1990.

For more information about Climate Change ProCon.org, visit

About Us

ProCon.org (online at) is a 501(c)3 nonprofit public charity whose mission is promoting critical thinking, education, and informed citizenship.

Information is presented on 34 different ProCon.org issue websites in subjects ranging from health care, medical marijuana, and alternative energy to the death penalty, illegal immigration, and euthanasia.

ProCon.org websites are free of charge and require no registration. The websites have been referenced by over 220 media entities, cited 26 times by the governments of seven countries (including eight US states and six US federal agencies), and used in over 1,260 schools in all 50 US states and 31 countries.

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Record - 7

DIALOG(R)

In the Hunt for Planets, Who Owns the Data?,

DENNIS OVERBYE,

New York Times (NY), Late Edition - Final ed, p1,

Tuesday, June 15, 2010

TEXT:

We are about to find out just how generous nature really is.

On Tuesday, astronomers operating NASA's Kepler spacecraft will release a list of about 350 stars newly suspected of harboring planets, including five systems with multiple candidate planets. That data could dramatically swell the inventory of alien worlds, which now stands at 461, none of them habitable by the likes of us.

Astronomers everywhere, who have been waiting since Kepler's launch in March 2009 to get their hands on this data, will be rushing to telescopes to examine these stars in the hopes of advancing the grand quest of finding Earthlike planets capable of harboring life out there.

But a lot of attention has been paid in astronomical circles over the past few months to what the Kepler team will not be saying. By agreement with NASA, the team is holding back data on its 400 brightest and best planet

candidates, which the astronomers intend to observe themselves over a busy summer.

NASA's policy requires astronomers to release their data from instruments like the Hubble Space Telescope in a year, but the Kepler astronomers say launch delays and other problems robbed them of the observing time they needed to check out their planet candidates, which are only visible from the ground from April until September. An extension of the deadline is needed, they say, to guard against a flood of bogus claims -- "false positives" -- by other astronomers misinterpreting their data.

"If I sent you 0's and 1's, it would be useless," said William Borucki, Kepler's leader, from the Ames Research Laboratory at Moffett Field in California. The public wants answers to the age-old question of whether the Earth is unique, he said.

"If we say, 'Yes, they are small planets,' " he went on, "you can be sure they are."

The decision to hold back some data, reported on Nature.com, has divided astronomers. Some say they do not begrudge the Kepler scientists -- who have in some cases devoted their careers to the project -- a few more months with their data.

Paul Kalas of the University of California, Berkeley, who used Hubble to take one of the first images of an exoplanet in 2008, said, "The stakes aren't that high compared to human subject experiments, where a six-month delay has real consequences when therapies might become available for diseases."

But the sequestering of the data, even temporarily, has irritated other astronomers, who believe that it is antithetical to the ideal of scientific openness.

"Kepler was constructed and launched with a comparatively large sum of money for a project that is run by a single team," said Ben Oppenheimer, an astronomer at the American Museum of Natural History in New York, in an e-mail message. "At this point, I have to say I do think they are being far too restrictive."

B. Scott Gaudi, an astronomer and planet hunter at Ohio State University, said there were more planet candidates than the Kepler team members could check by themselves. "They need help," he said. "If they were more open they would be able to get more science out."

But then he added: "Who am I to say this? I didn't put 10 years of my life into this."

Nobody denies that the stakes, both personal and institutional, are huge.

"The first astronomer who can prove they found an Earthlike planet around an Earthlike star will win many kudos and prizes," said John Huchra of the Harvard-Smithsonian Center for Astrophysics, who led a NASA advisory committee that approved the deal. "It's glory for NASA," he added. "NASA would like to have one of its missions find an Earthlike planet."

The fate of data -- who owns it and who gets to see it, and when -- has become one of the more contentious issues in science, scientists say.

In the past, scientific data consisted of carefully inked notations in research notebooks, bound, with numbered pages, accumulating on a bookshelf in the office or lab, or photographic plates in yellowing envelopes sitting in a filing cabinet. And it was proprietary, meaning it was yours forever to publish or mull endlessly as you desired.

Today, it often consists of billions or trillions of 1's and 0's reposing in vast digital archives, whose capacity is measured in terabytes or petabytes, buttressed by the giant computer programs that process it and the reams of ancillary information, dubbed metadata, that give it context. In the era of the Web, all this information can be sent around the globe at the click of a mouse, retrieved and manipulated by anyone who wants to use it to better understand the nature of dark matter, argue about the safety or desirability of nuclear power, or decide how much salt to put in her food.

"Science is more and more living in a glass house," said Robbert Dijkgraaf, a physicist at the University of Amsterdam and co-chairman of the InterAcademy Council, a multinational organization of science academies that is reviewing the work of the Intergovernmental Panel on Climate Change at the request of the United Nations.

Phillip Sharp, a biologist at the Massachusetts Institute of Technology, led a National Academy of Sciences study last year that said rules for sharing data should be built into projects. In an interview, he said: "The time has past when a bunch of elite true-meaning experts could go into the next room and make conclusions. They have to be transparent. That's a change in the culture."

The result has been a shift in the balance between the duty of a scientist to wring every last drop of truth and credibility out of the data he or she might have spent years gathering and the rights of the rest of us to know what our tax dollars have discovered.

"Proprietary" has become a four-letter word, said Michael Turner, a cosmologist at the University of Chicago who was part of the panel on research data. He said he worried that the pendulum had swung too far toward the Internet ideal of free information.

Secrets have been part of modern science since its beginning. Galileo reported his discovery of the rings of Saturn in an anagram that he wouldn't decode until he was sure that he wasn't seeing things. In the early 1960s, when radio astronomers discovered the powerful radio sources known now as quasars, they jealously guarded their coordinates, giving them to only a few trusted astronomers to investigate.

The members of a scientific collaboration typically agree not to talk about their results before they have been officially released in a paper or a news conference, for example, upon pain of being kicked out. The Kepler team took this a step farther by signing formal nondisclosure agreements.

But then, few areas of physical science have excited the public imagination in recent years as the search for planets around other stars, dubbed exoplanets. Most of them are giants like Jupiter in orbits broilingly close to their stars, but that is not surprising, since most of them were found by looking at stars that wobble under the influence of their planets; the wobble from big planets up close is much easier to detect than that of an Earth at a more temperate distance.

Kepler employs a different approach, which Mr. Borucki has championed ever since 1984. It stares at a patch of sky in the constellation Cygnus, constantly measuring the brightness of 156,000 different stars looking for the small blips that would signal a planet's passing in front of its star.

"In a sense, it's the most boring mission ever flown: doing the same thing every six seconds," Mr. Borucki said. The grand scientific goal of the project, a kind of cosmic census planned to go on until 2013, is to discover Earthlike planets in Earthlike places -- that is to say, in the not-too-cold, not-too-hot Goldilocks zones near a star where liquid water can exist.

Mr. Borucki said the Kepler team started out with 12,000 suspicious dips. They laboriously whittled down those to 956 planet candidates, then quickly dismissed 204 as false positives. That leaves about 750 real candidates, some with supposed orbits of less than a day. Only about half of them, he suspects, will turn out to be real planets. The rest will be double stars, triple stars, starspots and other impostors.

"We have dozens of ways of recognizing when it isn't a planet," said Mr. Borucki.

Realizing earlier this year that sorting them out would take more time than they had before the June 15 deadline, the Kepler team asked NASA for an extension. Jon Morse, director of astrophysics at NASA headquarters, referred the Kepler question to the astrophysics subcommittee of the NASA Advisory Council, a group of 13 astronomers who serve as a go-between between the space agency and professional astronomers.

On April 12, the Kepler team presented the committee with four options. The most radical, and Mr. Borucki's favorite, was to hold back the data on 500 candidates until the end of the mission or until the planets had been verified. At the other end of the spectrum was an option to release everything on June 15, as originally planned.

Dr. Huchra of Harvard, who led the discussion, said, "We all felt the sooner the data hit the streets the better," and in the end there were no votes for holding back candidate data until the end of the mission. "If we had done that everybody would have been hung out to dry," he said.

The group settled on a compromise in which Kepler will be able to protect 400 planet candidates until Feb. 1 -- an extra eight months -- and an additional 100 from a second set of candidates in another data release in 2011. The extra time will in effect give the Kepler astronomers back the summer observing season they lost last year. The compromise, Dr. Morse said, was "in the spirit of the regular release policy."

Meanwhile, the treasure hunt for the end to cosmic loneliness continues. "The public wants to know whether there is life on other planets," Mr. Borucki said, noting that it could take decades. The effort to get an answer, he said, reminds him of the building of the great cathedrals in Europe, in which each generation of workers had to tell themselves that "someday it will be built."

"In a sense, we, too, are doing these things," he said.

PHOTO: ONCE-OVER: Inspecting a mirror on the Kepler spacecraft. It has been searching the constellation Cygnus for signs of alien worlds since 2009. (PHOTOGRAPH BY BALL AEROSPACE) (D3)

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Record - 8

DIALOG(R)

Energy and What's Ahead,

Reed Miller,
Industrial Heating, v78, n6, p12,
Tuesday, June 1, 2010

TEXT:

By the time you read this, the plans for energy/emissions policies may be better understood. As I write, however, it is anyone's guess. We will shed some light on the subject by reflecting our thoughts and those of other industry experts. Please pay close attention to this issue in the coming months because decisions made in Washington may severely impact our ability to do business as usual.

Washington's involvement may come in the form of legislation, regulation or both. At the time of publication, the Senate bill is in jeopardy because of the pullout of Lindsay Graham and because of the impact of the oil spill in the Gulf. The bill is the Senate's way of responding to President Obama's post-Copenhagen pledge to cut greenhouse gases (GHG) "in the range of" 17% below 2005 levels by 2020 and 80% by 2050. If the Congress can't get this done, the EPA seems poised to impose immediate regulations, based on a faulty interpretation of the Clean Air Act of 1970.

It's stunning to me that this effort continues, seemingly unaffected by the "Climategate" facts that have been revealed in the past few months. For those of you who just awoke from a long winter's nap, Climategate involves the revelation that virtually all of the GW data generated over the past few decades is suspect due to fraud and falsification. Some of this has been deliberate, and some of it has been a willingness to suspend disbelief. Let me provide some examples:

* From the 1960s-1980s, the number of stations used to calculate global surface temperatures was approximately 6,000. By 1990, this dropped to 1,500. Most of the lost stations were in the colder regions, with Russia reporting that the East Anglia Climate Research Unit (CRU) was ignoring data being reported by the coldest regions.

* In spite of all of the hype, polar bears today outnumber the total from 1950.

* Reports such as the 2003 research by the Harvard-Smithsonian Center for Astrophysics are unreported or ignored. Among its many conclusions, it said, "The 20th century is probably not the warmest nor a uniquely extreme climatic period of the last millennia."

* The pre-Climategate report where 2,500 scientists agree that the GW problem is real is touted, while the petition signed last year by more than 31,000 scientists - 9,021 with Ph.D.s - rejecting the claims of

human-caused GW is ignored.

* At Copenhagen, Al Gore continued the lie when he claimed that a researcher said that there was a 75% chance that the polar ice caps would melt entirely (during the summers) in the next 5-7 years. The researcher denied ever making such a claim.

Why do they do this? I believe the root cause is influence, or power. Stanford professor and activist Stephen H. Schneider, a key person in the environmentalist movement, stated the following in 1989: "We have to make up scary scenarios, make simplified dramatic statements and make little mention of any doubts we may have." And former Colo. Senator Tim Wirth, now president of the U.N. Foundation, said, "We've got to ride the GW issue. Even if the theory of GW is wrong, we'll be doing the right thing, in terms of economic policy and environmental policy."

While so much more can be said about the abuse of the facts - and the media is certainly complicit - space won't allow us to continue. The key is what we can do to counter this blatant ignoring of the facts to pursue an agenda, at all costs. Several industry associations are leading the way. Here are just a few examples:

* On February 16, 2010, the National Association of Manufacturers (NAM) filed a petition in federal appeals court challenging the EPA's decision to regulate GHG emissions from stationary sources through the Clean Air Act.

* The American Iron and Steel Institute (AISI) has described the EPA plan as "tantamount to immediate regulation, in effect, shutting down plans for the very investment in plants and equipment needed to jumpstart America's fragile economic recovery." AISI is calling for Congress - not the EPA - to decide the fate of emissions standards in the U.S.

* The North American Die Casting Association (NADCA) has joined a group of 20 industry associations and chambers of commerce who, on March 18, 2010, filed a motion to intervene in support of NAM's position.

* The Industrial Heating Equipment Association (IHEA) met with the DOE in Washington on April 16 to raise awareness of IHEA and foster future collaboration on a wide range of issues affecting our industry.

Let's lend our support to organizations standing their ground against government intervention that flies in the face of reason and common sense.

SIDEBAR

To read some thoughts on carbon taxes, use this Tag to view the June 2009

editorial or enter www.industrialheating.com/ed610

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Wolbach Library: CfA in the News ~ Week ending 27 June 2010

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- 2. Findings from K.I.R. Oberg and co-authors broaden understanding of astronomy**, Science Letter, p461, Tuesday, June 29, 2010
- 3. Reports on astronomy findings from J.F. Wang and co-researchers provide new insights**, Science Letter, p1497, Tuesday, June 29, 2010
- 4. Recent findings in astronomy described by A. Deoliveiracosta and colleagues**, Science Letter, p1308, Tuesday, June 29, 2010
- 5. New astronomy study results reported from R.V. Shcherbakov et al**, Science Letter, p744, Tuesday, June 29, 2010
- 6. New astronomy research has been reported by V.A. Acciari et al**, Science Letter, p736, Tuesday, June 29, 2010
- 7. The Coolest Stars Come Out of the Dark**, National Aeronautics and Space Administration Documents, Thursday, June 24, 2010
- 8. WESTERN WASHINGTON UNIVERSITY NAMES 2009-10 OUTSTANDING GRADUATES**, US Federal News, Thursday, June 24, 2010
- 9. Sailing to Venus and beyond by the light of the sun**, SARAH WILD, Business Day (South Africa), Wednesday, June 23, 2010
- 10. Black hole found a little off-center: displacement could provide clue to history of galaxy M87**. Ron Cowen, Science News, v177, n13, p9(1), Saturday, June 19, 2010

Record - 1

DIALOG(R)

Findings in silicic acid reported from H.A. Smith and co-researchers,
Science Letter, p549,
Tuesday, June 29, 2010

TEXT:

"We report the detection and successful modeling of the unusual 9.7 μm Si-O stretching silicate emission feature in the type 1 (i.e., face-on) LINER nucleus of M81. Using the Infrared Spectrograph (IRS) instrument on Spitzer, we determine the feature in the central 230 pc of M81 to be in strong emission, with a peak at similar to 10.5 μm . This feature is strikingly different in character from the absorption feature of the galactic interstellar medium, and from the silicate absorption or weak emission features typical of galaxies with active star formation," scientists in the United States report (see also).

"We successfully model the high signal-to-noise ratio IRS spectra with porous silicate dust using laboratory-acquired mineral spectra. We find that the most probable fit uses micron-sized, porous grains of amorphous silicate and amorphous carbon. In addition to silicate dust, there is weak polycyclic aromatic hydrocarbon (PAH) emission present (particularly at 11.3 μm , arising from the C-H out-of-plane bending vibration of relatively large PAHs of similar to 500-1000 C atoms) whose character reflects the low-excitation active galactic nucleus environment, with some evidence that small PAHs of similar to 100-200 C atoms (responsible for the 7.7 μm C-C stretching band) in the immediate vicinity of the nucleus have been preferentially destroyed. Analysis of the infrared fine structure lines confirms the LINER character of the M81 nucleus. Four of the infrared H-2 rotational lines are detected and fit to an excitation temperature of T similar to 800 K. Spectral maps of the central 230 pc in the [Ne II] 12.8 μm line, the H-2 17 μm line, and the 11.3 μm PAH C-H bending feature reveal arc-or spiral-like structures extending from the core. We also report on epochal photometric and spectroscopic observations of M81, whose nuclear intensity varies in time across the spectrum due to what is thought to be inefficient, sub-Eddington accretion onto its central black hole," wrote H.A. Smith and colleagues.

The researchers concluded: "We find that, contrary to the implications of earlier photometry, the nucleus has not varied over a period of two years at these infrared wavelengths to a precision of about 1%."

Smith and colleagues published their study in *Astrophysical Journal* (Anomalous Silicate Dust Emission In The Type 1 Liner Nucleus Of M81. *Astrophysical Journal*, 2010;716(1):490-503).

For more information, contact H.A. Smith, Harvard Smithsonian Center for 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)

Findings from K.I.R. Oberg and co-authors broaden understanding of Astronomy,

Science Letter, p461,
Tuesday, June 29, 2010

TEXT:

According to recent research published in the Astrophysical Journal, "Gas-phase complex organic molecules have been detected toward a range of high-and low-mass star-forming regions at abundances which cannot be explained by any known gas-phase chemistry. Recent laboratory experiments show that UV irradiation of CH₃OH-rich ices may be an important mechanism for producing complex molecules and releasing them into the gas phase."

"To test this ice formation scenario, we mapped the B1-b dust core and nearby protostar in CH₃OH gas using the IRAM 30 m telescope to identify locations of efficient non-thermal ice desorption. We find three CH₃OH abundance peaks tracing two outflows and a quiescent region on the side of the core facing the protostar. The CH₃OH gas has a rotational temperature of similar to 10 K at all locations. The quiescent CH₃OH abundance peak and one outflow position were searched for complex molecules. Narrow, 0.6-0.8 km s⁻¹ wide, HCOOCH₃ and CH₃CHO lines originating in cold gas are clearly detected, CH₃OCH₃ is tentatively detected, and C₂H₅OH and HOCH₂CHO are undetected toward the quiescent core, while no complex molecular lines were found toward the outflow. The core abundances with respect to CH₃OH are similar to 2.3% and 1.1% for HCOOCH₃ and CH₃CHO, respectively, and the upper limits are 0.7%-1.1%, which is similar to most other low-mass sources. The observed complex molecule characteristics toward B1-b and the pre-dominance of HCO-bearing species suggests a cold ice (below 25 K, the sublimation temperature of CO) formation pathway followed by non-thermal desorption through, e. g., UV photons traveling through outflow cavities," wrote K.I.R. Oberg and colleagues (see also).

The researchers concluded: "The observed complex gas composition together with the lack of any evidence of warm gas-phase chemistry provides clear evidence of efficient complex molecule formation in cold interstellar ices."

Oberg and colleagues published their study in Astrophysical Journal (A COLD COMPLEX CHEMISTRY TOWARD THE LOW-MASS PROTOSTAR B1-b: EVIDENCE FOR COMPLEX

MOLECULE PRODUCTION IN ICES. *Astrophysical Journal*, 2010;716(1):825-834).

For additional information, contact K.I.R. Oberg, Harvard Smithsonian Center for Astrophysics, MS 42, 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 - 3

DIALOG(R) File 989:

Reports on astronomy findings from J.F. Wang and co-researchers provide new Insights,

Science Letter, p1497,
Tuesday, June 29, 2010

TEXT:

"We present high spatial resolution Chandra X-ray images of the NGC 2237 young stellar cluster on the periphery of the Rosette Nebula. We detect 168 X-ray sources, 80% of which have stellar counterparts in USNO, Two Micron All Sky Survey, and deep FLAMINGOS images," scientists in the United States report (see also).

"These constitute the first census of the cluster members with 0.2 less than or similar to M less than or similar to 2 M-circle dot. Star locations in near-infrared color-magnitude diagrams indicate a cluster age around 2 Myr with a visual extinction of 1 less than or similar to A(V) less than or similar to 3 at 1.4 kpc, the distance of the Rosette Nebula's main cluster NGC 2244. We derive the K-band luminosity function and the X-ray luminosity function of the cluster, which indicate a population similar to 400-600 stars. The X-ray-selected sample shows a K-excess disk frequency of 13%. The young Class II counterparts are aligned in an arc similar to 3 pc long suggestive of a triggered formation process induced by the O stars in NGC 2244. The diskless Class III sources are more dispersed. Several X-ray emitting stars are located inside the molecular cloud and around gaseous pillars projecting from the cloud. These stars, together with a previously unreported optical outflow originating inside the cloud, indicate that star formation is continuing at a low level and the cluster is still growing. This X-ray view of young stars on the western side of the Rosette Nebula complements our earlier studies of the central cluster NGC 2244 and the embedded clusters on the eastern side of the Nebula. The large-scale distribution of the clusters and molecular material is consistent with a

scenario in which the rich central NGC 2244 cluster formed first, and its expanding H II region triggered the formation of the now-unobscured satellite clusters Rosette Molecular Cloud (RMC) XA and NGC 2237. A large swept-up shell material around the H II region is now in a second phase of collect-and-collapse fragmentation, leading to the recent formation of subclusters," wrote J.F. Wang and colleagues.

The researchers concluded: "Other clusters deeper in the molecular cloud appear unaffected by the Rosette Nebula expansion."

Wang and colleagues published their study in *Astrophysical Journal* (A Chandra Study Of The Rosette Star-forming Complex. Iii. The Ngc 2237 Cluster And The Region's Star Formation History. *Astrophysical Journal*, 2010;716(1):474-489).

For more information, contact J.F. Wang, Harvard Smithsonian Center for 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 - 4

DIALOG(R)

Recent findings in astronomy described by A. Deoliveiracosta and colleagues,
Science Letter, p1308,
Tuesday, June 29, 2010

TEXT:

"In order to construct accurate point sources simulations at the frequencies relevant to 21-cm experiments, the angular correlation of radio sources must be taken into account. Using the 74 MHz VLA Low-Frequency Sky Survey, we measured the angular two-point correlation function, $w(\theta)$," scientists in the United States report (see also).

"We obtain the first measurement of clustering at the low frequencies relevant to 21-cm tomography. We find that a single power law with shape $w(\theta) = A \theta^{(-\gamma)}$ fits well the data. For a 10 degrees galactic cut, with all data at declinations $\delta < -10$ degrees also discarded, and a flux limit of $S = 770$ mJy, we obtain a slope of $\gamma = (-1.21 \pm 0.35)$. This value of γ is consistent with that measured from other radio catalogues at the metre wavelengths," wrote A. Deoliveiracosta and

colleagues.

The researchers concluded: "The amplitude of clustering has a length of 0 degrees.2-0 degrees.6, and it is independent of the flux-density threshold."

Deoliveiracosta and colleagues published their study in Monthly Notices of the Royal Astronomical Society (Clustering at 74 MHz. Monthly Notices of the Royal Astronomical Society, 2010;404(4):1962-1965).

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

The publisher's 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)

New astronomy study results reported from R.V. Shcherbakov et al,
Science Letter, p744,
Tuesday, June 29, 2010

TEXT:

According to a study from the United States, "We propose a two-temperature radial inflow-outflow model near Sgr A* with self-consistent feeding and conduction. Stellar winds from individual stars are considered to find the rates of mass injection and energy injection."

"These source terms help to partially eliminate the boundary conditions on the inflow. Electron thermal conduction is crucial for inhibiting the accretion. Energy diffuses out from several gravitational radii, unbinding more gas at several arcseconds and limiting the accretion rate to <1% of Bondi rate. We successfully fit the X-ray surface brightness profile found from the extensive Chandra observations and reveal the X-ray point source in the center. The super-resolution technique allows us to infer the presence and estimate the unabsorbed luminosity L approximate to 4×10^{32} erg s⁽⁻¹⁾ of the point source. The employed relativistic heat capacity and

direct heating of electrons naturally lead to low electron temperature T_e approximate to 4×10^{10} K near the black hole," wrote R.V. Shcherbakov and colleagues (see also).

The researchers concluded: "Within the same model, we fit 86 GHz optically thick emission and obtain the order of magnitude agreement of Faraday rotation measure, thus achieving a single accretion model suitable at all radii."

Shcherbakov and colleagues published their study in Astrophysical Journal (INFLOW-OUTFLOW MODEL WITH CONDUCTION AND SELF-CONSISTENT FEEDING FOR Sgr A*. Astrophysical Journal, 2010;716(1):504-509).

For more information, contact R.V. Shcherbakov, Harvard Smithsonian Center for 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)

New astronomy research has been reported by V.A. Acciari et al,
Science Letter, p736,
Tuesday, June 29, 2010

TEXT:

"M 87 is a nearby radio galaxy that is detected at energies ranging from radio to very high energy (VHE) gamma rays. Its proximity and its jet, misaligned from our line of sight, enable detailed morphological studies and extensive modeling at radio, optical, and X-ray energies," researchers in the United States report (see also).

"Flaring activity was observed at all energies, and multi-wavelength correlations would help clarify the origin of the VHE emission. In this paper, we describe a detailed temporal and spectral analysis of the VERITAS VHE gamma-ray observations of M 87 in 2008 and 2009. In the 2008 observing season, VERITAS detected an excess with a statistical significance of 7.2 standard deviations (σ) from M 87 during a joint multi-wavelength monitoring campaign conducted by three major VHE experiments along with the Chandra X-ray Observatory. In 2008 February, VERITAS observed a VHE flare from M 87 occurring over a 4 day timespan. The peak nightly flux above 250

GeV was $(1.14 \pm 0.26) \times 10^{-11} \text{ cm}^{-2} \text{ s}^{-1}$, which corresponded to 7.7% of the Crab Nebula flux. M 87 was marginally detected before this 4 day flare period, and was not detected afterward. Spectral analysis of the VERITAS observations showed no significant change in the photon index between the flare and pre-flare states. Shortly after the VHE flare seen by VERITAS, the Chandra X-ray Observatory detected the flux from the core of M 87 at a historical maximum, while the flux from the nearby knot HST-1 remained quiescent. Acciari et al. presented the 2008 contemporaneous VHE gamma-ray, Chandra X-ray, and Very Long Baseline Array radio observations which suggest the core as the most likely source of VHE emission, in contrast to the 2005 VHE flare that was simultaneous with an X-ray flare in the HST-1 knot. In 2009, VERITAS continued its monitoring of M 87 and marginally detected a 4.2 sigma excess corresponding to a flux of similar to 1% of the Crab Nebula," wrote V.A. Acciari and colleagues.

The researchers concluded: "No VHE flaring activity was observed in 2009."

Acciari and colleagues published their study in *Astrophysical Journal* (Veritas 2008-2009 Monitoring Of The Variable Gamma-ray Source M 87. *Astrophysical Journal*, 2010;716(1):819-824).

For additional information, contact V.A. Acciari, Harvard Smithsonian Center for Astrophysics, Fred Lawrence Whipple Observ, Amado, AZ 85645, 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 - 7

DIALOG(R)

The Coolest Stars Come Out of the Dark,
National Aeronautics and Space Administration Documents,
Thursday, June 24, 2010

TEXT:

The Coolest Stars Come Out of the Dark

Astronomers have uncovered what appear to be 14 of the coldest stars known in our universe. These failed stars, called brown dwarfs, are so cold and faint that they'd be impossible to see with current visible-light telescopes. Spitzer's infrared vision was able to pick out their feeble glow, much as a firefighter uses infrared goggles to find hot spots buried

underneath a dark forest floor.

The brown dwarfs join only a handful of similar objects previously discovered. The new objects are between the temperatures of about 450 Kelvin to 600 Kelvin (350 to 620 degrees Fahrenheit). As far as stars go, this is bitter cold -- as cold, in some cases, as planets around other stars.

These cool orbs have remained elusive for years, but will soon start coming out of the dark in droves. NASA's Wide-field Infrared Survey Explorer (WISE) mission, which is up scanning the entire sky now in infrared wavelengths, is expected to find hundreds of objects of a similarly chilly disposition, if not even colder. WISE is searching a volume of space 40 times larger than that sampled in the recent Spitzer study, which concentrated on a region in the constellation Bootes. The Spitzer mission is designed to look at targeted patches of sky in detail, while WISE is combing the whole sky.

"WISE is looking everywhere, so the coolest brown dwarfs are going to pop up all around us," said Peter Eisenhardt, the WISE project scientist at NASA's Jet Propulsion Laboratory, Pasadena, Calif., and lead author of a recent paper in the *Astronomical Journal* on the Spitzer discoveries. "We might even find a cool brown dwarf that is closer to us than Proxima Centauri, the closest known star."

Brown dwarfs form like stars out of collapsing balls of gas and dust, but they are puny in comparison, never collecting enough mass to ignite nuclear fusion and shine with starlight. The smallest known brown dwarfs are about 5 to 10 times the mass of our planet Jupiter -- that's as massive as some known gas-giant planets around other stars. Brown dwarfs start out with a bit of internal heat left over from their formation, but with age, they cool down. The first confirmed brown dwarf was announced in 1995.

"Brown dwarfs are like planets in some ways, but they are in isolation," said astronomer Daniel Stern, co-author of the Spitzer paper at JPL. "This makes them exciting for astronomers -- they are the perfect laboratories to study bodies with planetary masses."

Most of the new brown dwarfs found by Spitzer are thought to belong to the coolest known class of brown dwarfs, called T dwarfs, which are defined as being less than about 1,500 Kelvin (2,240 degrees Fahrenheit). One of the objects appears to be so cold that it may even be a long-sought Y dwarf -- a proposed class of even colder stars. The T and Y classes are part of a larger system categorizing all stars; for example, the hottest, most massive stars are O stars; our sun is a G star.

"Models indicate there may be an entirely new class of stars out there, the Y dwarfs, that we haven't found yet," said co-author Davy Kirkpatrick, a

co-author of the study and a member of the WISE science team at the California Institute of Technology, Pasadena, Calif. "If these elusive objects do exist, WISE will find them." Kirkpatrick is a world expert in brown dwarfs -- he came up with L, T and Y classifications for the cooler stars.

Kirkpatrick says that it's possible that WISE could find an icy, Neptune-sized or bigger object in the far reaches of our solar system -- thousands of times farther from the sun than Earth. There is some speculation amongst scientists that such a cool body, if it exists, could be a brown dwarf companion to our sun. This hypothetical object has been nicknamed "Nemesis."

"We are now calling the hypothetical brown dwarf Tyche instead, after the benevolent counterpart to Nemesis," said Kirkpatrick. "Although there is only limited evidence to suggest a large body in a wide, stable orbit around the sun, WISE should be able to find it, or rule it out altogether."

The 14 objects found by Spitzer are hundreds of light-years away -- too far away and faint for ground-based telescopes to see and confirm with a method called spectroscopy. But their presence implies that there are a hundred or more within only 25 light-years of our sun. Because WISE is looking everywhere, it will find these missing orbs, which will be close enough to confirm with spectroscopy. It's possible that WISE will even find more brown dwarfs within 25-light years of the sun than the number of stars known to exist in this space.

"WISE is going to transform our view of the solar neighborhood," said Eisenhardt. We'll be studying these new neighbors in minute detail -- they may contain the nearest planetary system to our own."

Other authors of the Spitzer paper are Roger Griffith and Amy Mainzer of JPL; Ned Wright, A.M. Ghez and Quinn Konopacky of UCLA; Matthew Ashby and Mark Brodwin of the Harvard-Smithsonian Center for Astrophysics, Cambridge; Mass., Michael Brown of Monash University, Australia; R.S. Bussmann of the University of Arizona, Tucson; Arjun Dey of National Optical Astronomy Observatory, Tucson, Ariz.; Eilat Glikman of Caltech; Anthony Gonzalez and David Vollbach of the University of Florida, Gainesville; and Shelley Wright of the University of California, Berkeley.

NASA's Jet Propulsion Laboratory, Pasadena, Calif., manages the Spitzer Space Telescope mission for NASA's Science Mission Directorate, Washington. Science operations are conducted at the Spitzer Science Center at the California Institute of Technology in Pasadena. Caltech manages JPL for NASA.

JPL manages the Wide-field Infrared Survey Explorer for NASA's Science Mission Directorate, Washington. The principal investigator, Edward Wright, is at UCLA. The mission was competitively selected under NASA's Explorers Program managed by the Goddard Space Flight Center, Greenbelt, Md. The science instrument was built by the Space Dynamics Laboratory, Logan, Utah, and 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 - 8

DIALOG(R)

WESTERN WASHINGTON UNIVERSITY NAMES 2009-10 OUTSTANDING GRADUATES,

US Federal News,
Thursday, June 24, 2010

TEXT:

BELLINGHAM, Wash., June 23 -- Western Washington University issued the following news release:

Western Washington University honored its Outstanding Graduates for the 2009-2010 academic year at spring Commencement June 12.

Faculty Members from each academic department select one graduate to honor as the Outstanding Graduate of the year. Selection is a high honor based on grades, research and writing, service to the campus and community and promise for the future.

This year's Outstanding Graduates include:

ANACORTES

* Graphic Design Outstanding Graduate Emma James earned a Bachelor of Arts degree in Design and a minor in Psychology. James has worked as a student coordinator of reservations and Web development for New Student Services and Family Outreach, and was nominated as Student Employee of the Year for the 2009-10 academic year. She was also a recipient of the President's Scholarship from 2005 to 2007. After graduating, James plans to move to Seattle to pursue a career in Web design and development. James is a graduate of Anacortes High School and the daughter of Peter and Deborah James of Bellingham.

BAINBRIDGE ISLAND

* Environmental Studies Outstanding Graduate Emily Lewis earned a Bachelor of Arts degree in Environmental Policy. Lewis served as a student advisor and secretary general for the International Affairs Association student club from 2009 to 2010, where she advised club officers on conference planning and organized a statewide Model United Nations conference for high school students. In June 2009, she represented Washington state at the Henry Clay Center for Statesmanship Student Congress in Lexington, Ky. There, she attended lectures on diplomacy, learned negotiation and diplomacy techniques, and compiled and published the 2009 Global Threats Index, which outlined the five most significant global threats facing the next generation. Lewis plans to move to Amman, Jordan to intern with the United Nations Educational, Scientific and Cultural Organization before applying to graduate school for International Development Studies. Lewis is a graduate of Bainbridge High School, the sister of Kael Lewis and the daughter of Christine Lewis and the late David Lewis, all of Bainbridge Island.

BATTLE GROUND

* Canadian-American Studies Outstanding Graduate Kathleen Mintz earned a Bachelor of Arts degree in both Canadian-American Studies and French, as well as a minor in TESOL. Mintz was active in a number of student clubs including Club Canada, where she was co-prime minister, and the Scottish Country Dancing Club where she was secretary and dancer. She was also team captain for Cancer Knows No Borders during WWU's Relay for Life event. Mintz received a number of scholarships during her time at Western, including the Herb and Beth Hersey Scholarship, which is for student employees of the WWU library, and the Krejci Inukshuk Scholarship for Canadian-American Studies students. She also studied abroad in Canada at the University of Alberta, Edmonton, on a full scholarship, and in Quebec. This summer, Mintz will intern as a data analyst for the Whatcom Council of Governments in Bellingham before serving as a language-teaching assistant in France during the 2010-11 academic year. In the future, she hopes to continue teaching English overseas and attend graduate school. Mintz is a graduate of CAM High School in Battle Ground and is the daughter of Alex Mintz and Judy Zeider of Battle Ground.

BELLINGHAM

* Communication Sciences and Disorders Outstanding Graduate Jessica Dalgas earned a Bachelor of Arts degree in Communication Sciences and Disorders and a minor in Psychology. In addition to serving as a faculty liaison for the National Student Speech Language Hearing Association, Dalgas helped plan the annual benefit auction for the Speech and Hearing clinic at WWU.

This fall, she will begin her studies at the Speech Language Pathology graduate program at Western. Dalgas is a graduate of Memorial High School in Eau Claire, Wis., and Whatcom Community College and is the daughter of Lee and Cheryl Kultz of Woodland Park, Colo. Her spouse is Nate Dalgas of Bellingham.

* Communications Outstanding Graduate Catherine Shornick earned a Bachelor of Arts degree in Communications and a minor in Creative Writing. Shornick graduated Magna Cum Laude and was a Presidential Scholar for the 2009-10 academic year. A majority of her scholarly work centered on the effects of war on women and children. A WWU staff member since 2002, Shornick attended one or two classes at a time to complete her degree. Beginning this fall, she will serve as assistant to the dean at WWU's College of Humanities and Social Sciences. She also hopes to spend more time with her family: Shornick has four adult children and eight grandchildren and is the daughter of Winston Shornick and the late Mary Shornick.

* Economics Outstanding Graduate Elizabeth Buren earned a Bachelor of Arts degree in Financial Economics and a minor in Mathematics. Buren received several scholarships and maintained a 3.99 grade point average at Western. Having recently passed two actuarial exams, Buren plans to pursue a career as an actuary and is currently applying for jobs. Buren graduated valedictorian of Meridian High School and is the daughter of Mike and Lori Buren of Whatcom County.

BOTHELL

* Theatre Arts Outstanding Graduate Lauren Robbins earned a Bachelor of Arts degree in Theatre Arts. Having spent nearly all of her time working in the Theatre Arts Department, Robbins has worked on eight different productions in a variety of positions, including electrics, set construction, prop design, and stage management. She was also recently inducted to the Phi Kappa Phi honors society. Robbins will serve as a stage manager intern this summer for the WWU Theatre Arts production of "Private Lives," which will be directed by Jon Kretzu from the Artist's Repertory Theatre in Portland, Ore. She will also look for future internships, apprenticeships, or a full-time job in theatre. Robbins is a former homeschooler, graduate of Cascadia Community College and the daughter of Michael and Suzanne Robbins of Bothell.

BURIEN

* Human Services Outstanding Graduate Kathleen Christiansen earned a Bachelor of Arts degree in Human Services and Rehabilitation Counseling. During her time at Western, she interned for Rebound of Whatcom County, where she worked as an administrative and planning assistant and volunteered for its Flying Colors after-school program. Christiansen also interned with the Bellingham Cooperative School, where she planned

fundraisers and coordinated events. This summer, she will work as the director of the City of Burien's summer day camp. In the future, she plans to move to Kitsap County to apply for jobs in the human services field. Christiansen is a graduate of Highline High School and the daughter of Jeff and Mary Christiansen of Burien.

CAMANO ISLAND

* Geology Outstanding Graduate Marin Trautman earned a Bachelor of Science degree in Geology and a minor in French. Trautman, a graduate of WWU's Honors Program, was included the President's Honor Roll list nine times. Her field work in geology landed her a summer 2010 internship with the U.S. Geological Survey at the University of Washington. She also attended an advanced, six-week field course in New Zealand on structural geology. Her senior thesis explored fracture origin on Puget Lowland coastal bluffs. Trautman served as a study skills tutor for four years at WWU's Tutoring Center and was recommended for WWU Student Employee of the Year in 2010. She also was a member of WWU's Concert Choir for three years, touring with the group to Argentina and Uruguay in summer 2009. She performed and worked backstage during WWU Summerstock in 2007 and volunteered with Kidstage! Youth Theatre Camps in 2006. After her internship this summer, Trautman will attend University of Texas to begin a master's degree in Structural Geology. She is a graduate of Stanwood High School and the daughter of Phil and Candy Trautman of Camano Island.

CLINTON

* Management Outstanding Graduate Frederick Alexander Helpenstell earned a Bachelor of Arts degree in International Business and minors in Spanish and Economics. Now an intern doing market research for Darigold, Helpenstell is an Eagle Scout and a member of the Beta Gamma Sigma and Sigma Iota Epsilon honor societies and was a member of WWU's International Business Club. After graduation, he will travel to South America as a Peace Corps volunteer. The son of Mark Helpenstell and Kim Allen of South Whidbey, he is a graduate of South Whidbey High School.

EVERETT

* Mathematics Outstanding Graduate Adam Welly earned a Bachelor of Science degree in Mathematics and a minor in Physics. Welly won numerous scholarships, including the Mathematics Memorial scholarship and Richard Greene Scholarship. He served as a tutor in WWU's Math Center from fall 2008 to winter 2010 and wrote a research paper titled, "Differential Equations and Symmetry Groups." A graduate of Everett High School and the son of Jerry and Maureen Welly of Everett, he will attend graduate school at the University of Oregon in the fall.

EVERSON

* Special Education Outstanding Graduate Kimberly Assink earned a Bachelor of Arts degree in Special Education. During her time at Western, Assink was involved in many extracurricular activities, including the Phi Kappa Phi honor society and the Council for Exceptional Children (CEC). In 2009, she attended the CEC National Conference in Seattle and was the newsletter editor for the WWU CEC chapter. Assink also volunteered in the Special Olympics bowling program. In the future, she plans to teach elementary school in Whatcom County. Assink is a graduate of Whatcom Community College and the daughter of Kenneth and Maxine Loomer of Bellingham. Her husband is Phil Assink of Everson and her children are Daniel Assink of Lynden and Melinda Assink of Everson, who is also a teacher and a 2006 WWU graduate.

FEDERAL WAY

* Computer Science Outstanding Graduate Amanda Font earned a Bachelor of Science degree in Computer Science and a minor in Spanish. Font was a teaching assistant in WWU's Computer Science Department in winter 2008 and treasurer of the Association of Women in Computing from 2007 to 2009. She held summer internships with Vitech Business Group in Bellingham and with Microsoft in Redmond. She also played on WWU's women's soccer team from 2004 to 2007 and was captain for two of those years. Font, who graduated in December 2009, now works as a program manager in Windows Live at Microsoft. She is a graduate of Decatur High School and the daughter of Peter and Susanne Font of Federal Way.

ISSAQUAH

* Biology Outstanding Graduate Gail Butler earned a Bachelor of Science degree in Biochemistry and Cellular and Molecular Biology as well as a minor in Chemistry. Active in research in both the Biology and Chemistry departments, Butler participated in summer research internships funded by the National Science Foundation at both Cornell University and the University of Oregon and is preparing to publish a scientific paper based on her work at the University of Oregon. She was also a member of both the National Society for Collegiate Scholars and the WWU chapter of the Association for Women in Science. An accomplished athlete, Butler participated in varsity track and field as a long jumper and sprinter during all four years at Western and was named to the GNAC All-Academic Track and Field Team. Outside of Western, Butler interned with the Meals on Wheels program in Whatcom County in 2007. She plans to attend graduate school at the University of Michigan to pursue a doctorate in Cellular and Molecular Biology. A graduate of Issaquah High School, Butler is the daughter of Thomas and Joan Butler of Issaquah.

LUMMI INDIAN RESERVATION

* Elementary Education Outstanding Graduate Mary Donna Ballew earned a Bachelor of Arts degree in Elementary Education Studies and a minor in Elementary Education. Ballew has served as an intern at Blaine Primary School teaching first-graders and has other practicum experiences in Bellingham, Burlington, and the Lummi community. Ballew first became interested in teaching after volunteering in her son's Head Start classroom. A 1981 graduate of Oakland High School in California who had worked in office professions, she decided to shift her focus to education and earned an early childhood education certificate from Northwest Indian College. After serving as a Lummi Head Start teacher for four years, she decided that in order to be an exceptional teacher, she needed a teaching degree. Ballew graduated with high honors with an associate's degree from NWIC in 2005 before transferring to WWU. She plans to teach in Whatcom County. Ballew is married to Cas Ballew and has two children, her niece Tonya and son Jonah.

MERCER ISLAND

* Finance and Marketing Outstanding Graduate Jonathan Dunning earned a Bachelor of Arts degree in Finance with minors in Accounting and Psychology. While at Western, Dunning earned a 3.96 GPA, was president of WWU's Finance Club and a member of the team that won a financial accounting case study competition sponsored by KPMG. After graduation, Dunning will work as a business analyst at the Boeing Co., working on the 787 program. The son of Steve Dunning of Seattle and Duangporn Tengtrirat of Melbourne, Australia, he is a graduate of Mercer Island High School.

OAK HARBOR

* Accounting Outstanding Graduate Libbe Bear earned a Bachelor of Arts degree in Accounting with a minor in Business Administration. She was president of WWU's chapter of Beta Alpha Psi in winter 2010 and currently serves as the executive vice president. She earned second place at the Beta Alpha Psi Regional Conference in 2010 for her presentation, "Best Practices Competition for Ethics and Integrity." Bear also volunteered as a coach for Girls on the Run, which uses running to teach character-building skills to third- through fifth-grade girls. After graduation, Bear plans to work at Moss Adams as an intern before returning to Western in the fall to complete her master's degree in Accounting. Bear is a graduate of Oak Harbor High School and the daughter of Chris Bear of Montana and Maggie Bear of Oak Harbor.

OLYMPIA

* Music Outstanding Graduate Gentry Hill earned a Bachelor of Arts degree in Viola Performance. Hill was a recipient of the Don C. Walter Memorial Scholarship and a member of the WWU Scholarship Quartet. She also served as Principal Chair for WWU's symphony for two years. Hill will continue to play the viola at the University of California, Santa Barbara, where she will pursue a master's degree in music. She is a graduate of Black Hills High School and the daughter of Ron and Grace Hill of Olympia.

PUYALLUP

* Kinesiology Outstanding Graduate Kathryn Lorraine Johnson earned both a Bachelor of Arts degree in Mixed Media Art and a Bachelor of Science degree in Health and Fitness. In addition to membership in WWU's National Society of Collegiate Scholars from 2005 to 2010, Johnson became an American College of Sports Medicine Certified Health Fitness Specialist in 2009. She has served as a personal trainer, yoga instructor and weight room attendant at WWU's Wade King Student Recreation Center. Her volunteer activities include being a yoga instructor for the INN University Ministries, a soccer coach for Whatcom County's YMCA Rookie League, and a designer for WWU's Adult Fitness Program logo and t-shirts. She also participated in fundraisers for the American Red Cross and Haitian earthquake recovery and volunteers with Salt on the Street delivering food to homeless people. After graduating, Johnson is working in Alaska before applying to graduate schools. Johnson is a graduate of Rogers High School and the daughter of Bruce and Susan Johnson of Puyallup.

* English Outstanding Graduate Jessica Dana Crockett earned a Bachelor of Arts degree in English with an emphasis on Creative Writing. Crockett has been on the President's List consistently throughout her time at Western, missing only one quarter, and currently serves as a member of Phi Kappa Phi. She won the Centrum Forum Scholarship award for poetry to attend a workshop in Port Townsend this summer. Her piece "Yahtzee Cheats and Charcoal Peas," was included in WWU's spring edition of Jeopardy Magazine. Off campus, she volunteers at PAWS, a no-kill animal shelter in Lynwood. Crockett plans to move back home for a few months, reconnect with family, find an internship and prepare to apply for graduate school at Western. A graduate of Emerald Ridge High School who also attended Pierce College, Crockett is the daughter of Kathryn Guerrero of Puyallup and is engaged to Jason Flores of Renton.

* Physics & Astronomy Outstanding Graduate Daniel Gifford earned a Bachelor of Science degree in Physics with a minor in Astronomy. A student speaker at Commencement, Gifford was also one of seven Presidential Scholars honored for exceptional scholarship and community service. Gifford has conducted research on galaxy clusters alongside WWU Assistant Professor Kenneth Rines for two years. During summer 2009, he participated in a

Research Experience for Undergraduates program at the Harvard Smithsonian Center for Astrophysics, where he studied galaxies at the edge of our visible universe. Gifford has also been on the President's List every quarter during his four years at Western. A recipient of the 2010 National Science Foundation Graduate Research Fellowships, he plans to attend graduate school at the University of Michigan, where he will pursue a doctorate in Astrophysics. Gifford is a graduate of Rogers High School and the son of David and Susan Gifford of Puyallup.

REDMOND

* Physical Education, Health & Recreation Outstanding Graduate Melissa Mead earned a Bachelor of Science degree in Community Health and minors in both Spanish and Psychology. Mead volunteered as a small-group leader with Campus Christian Fellowship, where she mentored several people, and volunteered with Bellingham's Salt on the Street Ministries. She also traveled to Guatemala and Haiti to help build houses and assist in orphanages by teaching English and distributing clothing and shoes. During her freshman year, Mead was named one of 30 Woodring Future Scholars for her high school achievement and her interest in teaching. She won the WWU President's Scholarship in 2006 and 2007 and the Nellie Martin Carman scholarship all four years. A graduate of Redmond High School and the daughter of Wally and Cheryl Mead of Redmond, she'll spend the summer interning at SeaMar Community Health Center in Bellingham, working in a clinic serving low-income families. This fall, she'll become a campus missionary through Campus Christian Fellowship for a year, then eventually travel abroad to work in the health field as an overseas missionary.

RIDGEFIELD

* Chemistry Outstanding Graduate Cameron M. Moore earned a Bachelor of Science degree in Chemistry. Moore worked on a research group with Assistant Chemistry Professor Timothy Clark studying organometallic chemistry, specifically the use of copper catalysts to incorporate boron into organic molecules. Moore earned a fellowship from the American Chemical Society's Division of Organic Chemistry to work on his research over the summer, and presented his work at the world headquarters of Pfizer Inc. in Connecticut. He is now pursuing a doctorate in Chemistry at the University of Michigan. A Ridgefield High School graduate who also attended Clark Community College, Moore is the son of Mike Moore of Vancouver, Wash., and Corie Moore of Cascade Locks, Ore.

SAMMAMISH

* Liberal Studies Outstanding Graduate Wesleigh Richardson earned a Bachelor of Arts degree in Liberal Studies and a minor in Art History.

Richardson has been on WWU's President's List since 2006 and was the recipient of the Humanities Department Scholarship fall quarter 2009. A volunteer for the Bellingham-based Slum Doctor Programme, she taught middle school and high school students about HIV and AIDS. Richardson has conducted research in Italian Renaissance and Islam, leading to her senior thesis, "Painting the East: the Christian-Muslim encounter from Giotto to Bellini." After graduating, she plans to volunteer at an orphanage in Mexico before continuing her education. Richardson is a graduate of Skyline High School and the daughter of Michael and Polly Richardson of Sammamish.

SEATTLE

* Decision Sciences Outstanding Graduate Anna Kathryn Park earned a Bachelor of Arts degree in Business Administration - Management Information Systems and a minor in French. She also earned a 3.9 grade point average and inclusion on the President's List spring 2008 and winter 2009. Park served on the Beta Gamma Sigma Honor Society and as a volunteer leader with Campus Christian Fellowship from 2008 to 2009. In the future, Park hopes to work for a small database consulting company in the Seattle region. Park attended Sky Valley Education Center in Monroe and Everett Community College and is the daughter of Jim and Sarah Park.

SEQUIM

* American Cultural Studies Outstanding Graduate Anna Boenish earned a Bachelor of Arts degree in American Cultural Studies. Boenish served as a peer mentor in WWU's Fairhaven College of Interdisciplinary Studies and taught a workshop about the narrative evaluation process in a required class for all new Fairhaven College students. She later worked as a coordinator of WWU's Social Issues Resource Center during her junior and senior years. During this time, Boenish worked with other students and community members to plan conferences, performances and other events highlighting social issues. She plans to move to the Seattle region to be an AmeriCorps volunteer for a few years before going back to graduate school to become a high school history and social studies teacher. Boenish is a graduate of Sequim High School and the daughter of Bonnie Bless-Boenish and Hans Boenish of Sequim.

SNOHOMISH

* Philosophy Outstanding Graduate Christopher Bryant earned a Bachelor of Arts degree in Philosophy. Bryant served as the president of WWU's Philosophy Club from 2009 to 2010 and was a commentator or organizer at the seventh and eighth annual Northwest Student Philosophy Conferences. He was also a recipient of the Paul J. and Rebecca Ann Olscamp Philosophy Scholarship. Bryant plans to take one year off from school while working

full time before pursuing a doctorate in Philosophy. Bryant is a graduate of Snohomish High School and the son of Sheryl Bryant of Greenbank.

* University Honors Program Outstanding Graduate Jennifer Mankin earned a Bachelor of Arts degree in Linguistics and minors in both Japanese and German. While earning a certificate in TESOL, Mankin taught English grammar to exchange students in WWU's Intensive English Program. She served as a substitute teacher and English language tutor for the program; volunteered for WWU's Asia University America Program from 2006 to 2009, leading group discussions and demonstrating native speaker articulation; was a teaching assistant in a Linguistics class; and tutored students in German in WWU's language lab. This summer, she will travel to Europe before teaching English in Germany for a year as a Fulbright English Teaching Assistant. In the future, Mankin hopes to study Psycho- or Sociolinguistics in graduate school in the United Kingdom. A graduate of Sky Valley Education Center in Monroe who attended Everett Community College through Running Start, Mankin is the daughter of Paula McClory and Chris Mankin of Snohomish.

* History Outstanding Graduate Shaun Nichols earned a Bachelor of Arts degree in American History minors in Philosophy and Spanish. Nichols received several scholarships at Western and was president of the WWU chapter of Phi Alpha Theta, the History honors society, for the 2008-2009 academic year. He presented two papers at regional Phi Alpha Theta conferences: one about American philosopher John Dewey and the other about relations between labor unions and the state of Washington from 1900 to 1940. Nichols was a student manager at WWU's Ridgeway Commons dining hall and now has an internship with the Port of Bellingham, where he is helping put together a history section for their website. A graduate of Snohomish High School and the son of Steven and Nalia Nichols of Snohomish, he will attend Harvard University this fall to begin his pursuit of a doctorate in History.

SPOKANE

* Humanities and Social Sciences Outstanding Graduate Zachary Snover earned a Bachelor of Arts degree with a double major in History and East Asian Studies, with minors in Political Science and TESOL. He was a DJ with KUGS, WWU's student-run radio station, and head of the Chinese Conversation Club. After graduation, he'll travel to China to work and study Chinese, then attend graduate school at the University of British Columbia. The son of Mark Snover of Spokane, he is a graduate of Mead High School and graduated from Spokane Falls Community College through Running Start.

VANCOUVER, Wash.

* Classical Language Outstanding Graduate Marten van Schijndel earned a

Bachelor of Arts degree in Linguistics and minors in Mathematics, Computer Science, and Spanish. Van Schijndel served as a WWU representative to regional Model UN conferences in 2008 and 2009 and was also president of WWU's Linguistics Club from 2007 to 2009. He designed and carried out the first worldwide census of Latin scholars in 2009. A member of the Phi Eta Sigma National Honor Society, van Schijndel was on WWU's President's List Honor Roll from 2006 to 2009. After graduating, van Schijndel plans to attend graduate school to pursue a degree in computational linguistics, artificial intelligence or machine learning. A graduate of Vancouver School of Arts and Academics and Clark Community College, van Schijndel is the son of Terri Parks and Art van Schijndel of Vancouver.

* Sociology Outstanding Graduate Allison McGrath earned a Bachelor of Arts degree in Sociology. During her time at Western, McGrath volunteered at several Bellingham-based organizations and served as a research assistant for Associate Professor of Sociology Glenn Tsunokai. She co-authored several papers with Tsunokai, including "The Web of Hate in the 21st Century" and "Baby Boomers and Beyond: Crossing Boundaries in Search for Love." She graduated magna cum laude and plans to continue her research with Tsunokai before applying to graduate schools. McGrath hopes to earn a doctorate in sociology with a focus on gender and race studies. McGrath is a graduate of Skyview High School and the daughter of Patti McGrath of Vancouver.

WINTHROP

* Environmental Science Outstanding Graduate Jaime Welfelt earned a Bachelor of Science degree in Environmental Science. Outside of Western, Welfelt worked with students from Blaine, Bellingham and Sedro-Woolley teaching environmental education and volunteered for the Washington State Department of Fish and Wildlife, U.S. Forest Service and local salmon recovery groups. Welfelt did conservation work for the Bureau of Reclamation and held a paid position monitoring a great blue heron colony at Post Point in Bellingham. This summer, she'll work on a WWU study examining the genetics of regional mountain goat populations. In the future, she hopes to work as a wildlife ecologist. Welfelt is a graduate of Liberty Bell High School and the daughter of Jay and Sandy Welfelt of Winthrop.

BUFFALO, Wyo.

* Political Science Outstanding Graduate Aubrey Black earned a Bachelor of Arts degree in Political Science and a minor in Economics. Black's study of participatory budgeting practices in Brazil won the department's prize for best paper in 2009. Black was also the recipient of the Ken Hoover Memorial Scholarship. He was a member of the northwest chapter board of the

international group Witness for Peace, bringing speakers to Bellingham and the WWU campus and also worked with the Associated Students of WWU to bring more organic, locally produced and sustainably grown food to campus. This fall, he'll begin graduate studies at the Henry M. Jackson School of International Studies at the University of Washington where he'll focus on Southeast Asia. He's also considering pursuing a degree in Marine Studies in order to become an international marine policy analyst. A graduate of North Idaho College, Black is the son of Mitch and Suzi Black of Buffalo, Wyo., and the father of Kendra, 5, who will start kindergarten in Seattle this fall as her father begins graduate school.
LOS GATOS, Calif.

* Anthropology Outstanding Graduate Parsan Saffaie earned both a Bachelor of Arts degree in Anthropology and a Bachelor of Science degree in Biological Anthropology. Saffaie was a teaching assistant in many introductory Biology and Biological Anthropology classes, and participated in a number of research projects. She plans to study Paleoanthropology or Paleohominid Biology and earn a doctorate. A graduate of Saratoga High School in Saratoga, Calif., Saffaie is the daughter of Barry and Teresa Saffaie of Seattle. For more information about USfednews please contact: Sarabjit Jagirdar, US Fed News, email:- htsyndication@hindustantimes.com

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Record - 9

DIALOG(R)

Sailing to Venus and beyond by the light of the sun,
SARAH WILD,
Business Day (South Africa),
Wednesday, June 23, 2010

TEXT:

Sailing to Venus and beyond by the light of the sun CONSIDERING the amount of money that goes into science research and development globally, it's entirely understandable that So what use is it? is the cornerstone of scientific advances. But lying tangential to that is the fact that we like to be awed. With science, we have the opportunity to sit back and feel our linguistic abilities contract into one, prolonged Wow. In 1964, Arthur C Clarke wrote a short story called Sunjammer in which his protagonist builds and designs a solar yacht to race around the moon and back. Now in 2010, more than 40 years later, a real, functioning, self-propelled interplanetary solar sail is racing through space. The Interplanetary Kite-craft Accelerated by Radiation of the Sun (named Ikaros for short) was

launched last month and looks like a large kite, or for the more whimsical, a large, square butterfly. Its 14m by 14m sail is thinner than a human hair, and propelled through space by the pressure of photons from the sun hitting the surface of the sail. The photons from sunlight even exert pressure here on Earth the pressure you feel on the surface of your skin standing in the sun on a hot day. We're unlikely to be moved by the pressure of photons, but if you're a 0,0075mm-thick kite with a large surface area, the force of sunlight will propel you through space. And if the Japanese scientists have their way, these photons will propel Ikaros all the way to Venus.

The bottom line of the solar sail is likely to be more clearly defined by the Japan Aerospace Exploration Agency's second mission, which will involve a solar power sail it's a solar sail that incorporates thin-film solar cells, which will provide the sail with electrical energy to propel it forward in addition to the photon pressure. Why does this matter? Because the main impediment to space travel is carrying fuel on board it won't last a trip to Jupiter and back, which is where the second mission is heading. If a space craft can create its own fuel, well then, racing yachts around the sun isn't as far-fetched as we thought it was.

EYES WIDE SHUT WORRYING, but true according to a study conducted by the Ohio State University Comprehensive Cancer Centre, awake sedation in brain surgery shortened patients' hospital stay. The study examined patients treated for glioma tumours. With conscious sedation, the patient is initially anaesthetised, but roused during surgery on the brain itself. Yes, you'll get out of hospital sooner; yes, it will save you money, but are you sure that it isn't worth it to be unconscious while someone fiddles in your brain?

STAR LIGHT, STAR BRIGHT ASTRONOMERS from Yale University, the Harvard-Smithsonian Centre for Astrophysics and the Max Planck Institute for Astronomy have discovered that 800 light years away, within the Perseus region of the Milky Way galaxy, at this very moment, a star is being born. The researchers believe the whimsically named L1448-IRS2E is a protostar, which is surrounded by dust clouds and is one to 10 times more luminous than the sun. This is the earliest stage at which a protostar has been seen.

BACK TO THE PAST WHILE science can help us navigate the road to the future, it seems it's just as good at shining a light on the past: a team of Austrians has used radar imaging to uncover a 3500-year-old city in Egypt, the home of Egypt's foreign occupiers, the Hyksos, from 1664-1569BCE. The archaeologists used noninvasive radar imagining to map the extent of the ancient city. The images show the outlines of streets, dwellings and temples underneath the modern town of Tel al-Dabaa.

SCIENCE & TECHNOLOGY

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Record - 10

DIALOG(R)

Black hole found a little off-center: displacement could provide clue to history of galaxy M87.

Ron Cowen,
Science News, v177, n13, p9(1),
Saturday, June 19, 2010

TEXT:

Supermassive black holes are shiftier beasts than astronomers suspected. A new study finds that the giant black hole at the core of galaxy M87 somehow got displaced from the galaxy's center.

Off-kilter black holes "could represent a significant change in our understanding of supermassive black holes, galaxies and the ways in which they may interact with each other," said Daniel Batcheldor of the Florida Institute of Technology in Melbourne.

Sorting through old Hubble Space Telescope observations of M87's core, Batcheldor and colleagues found that its giant black hole, weighing the equivalent of about 6 billion suns, doesn't lie smack-dab at the galaxy's center. Rather it is displaced by about 22 light-years, possibly as the result of a merger with another as-yet-unknown supermassive black hole in the galaxy. Or the black hole might have been pushed aside by one of the twin central jets of gas and dust that emanate from the core of M87, Batcheldor reported May 25.

The finding, to be described in an upcoming *Astrophysical Journal Letters*, has also been posted online at arXiv.org.

The result is plausible, says Karl Gebhardt of the University of Texas at Austin. But finding M87's true center is difficult because the light associated with the black hole isn't entirely symmetrical and could be confused with the blobs of material ejected by the galaxy's jets.

Theorist Avi Loeb of the Harvard-Smithsonian Center for Astrophysics in Cambridge, Mass., notes that there are several ways the jets could have

confounded efforts to determine the galaxy's center. Jets plowing into surrounding gas can generate excess light or even create new stars by shocking the gas.

Astronomers hadn't realized earlier that the giant black hole was off-center because there was little reason to search for such an offset, Batcheldor said. Most searches for off-center black holes have focused on objects traveling thousands of kilometers per hour. A fast-moving black hole is relatively easy to spot because its velocity has either carried it farther from its galaxy's core or has modified its light spectrum so it stands out from other sources, or both.

Supermassive black holes ejected from a galactic center with velocities of only a few hundred kilometers per second--like the one in M87--are harder to detect but maybe more common.

The most likely explanation for the offset is that the collision of two supermassive black holes at some time in the past 10 billion years kicked the newly merged black hole out of the galaxy's center, Batcheldor and his team suggested.

Once kicked, a supermassive black hole can spend millions to billions of years oscillating about the galactic center before coming to rest. The displacement of the hole can therefore reveal the merger history of the galaxy, says team member David Merritt of the Rochester Institute of Technology in New York.

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Wolbach Library: CfA in the News ~ Week ending 4 July 2010

1. Prix prestigieux pour le Jurassien Michel Ory, Serge Jubin, Le Temps, Tuesday, June 29, 2010

Record - 1

DIALOG(R)

Prix prestigieux pour le Jurassien Michel Ory,

Serge Jubin,

Le Temps,

Tuesday, June 29, 2010

TEXT:

C'est une première pour un astronome suisse. Pour avoir découvert une comète qui porte son nom, le Jurassien Michel Ory est l'un des trois lauréats du prestigieux Edgar Wilson Award 2009, décerné par le Smithsonian Astrophysical Observatory de l'Université Harvard. Le prix récompense tout astronome amateur qui découvre une comète avec des moyens non professionnels.

Le 27 août 2008, avec le télescope de 61 centimètres d'ouverture de l'Observatoire jurassien de Vicques, à l'est de Delemont, le professeur de physique du lycée de Porrentruy a vu, le premier, rien de moins qu'une nouvelle planète du système solaire interne.

<<L'objet ressemblait à une tache à peine allongée et floue, s'enthousiasme-t-il. J'ai été surpris par sa brillance.>> Michel Ory croit avoir accroché un géocroiseur. La nuit suivante, il confirme l'observation. C'est une comète. Neuf comètes sur dix ne sont observées qu'une fois. La comète P/2008 Q2 Ory, grosse comme la Terre, est périodique: elle repassera à 100 millions de kilomètres de la Terre en 2014. Entre août 2008 et janvier 2009, avant qu'elle ne s'éloigne, elle a été observée plus de mille fois partout dans le monde. Le Jurassien se rejouit de la retrouver dans quatre ans, <<avec un numéro, dit-il. Seules 230 comètes périodiques ont un numéro. Ma comète pourrait être plus brillante qu'en 2008 et, de ce fait, susciter davantage d'intérêt encore.>>

Michel Ory s'est fait un nom dans le petit monde des astronomes. Il a donné des conférences à Paris et Shanghai, et <<l'observatoire de Vicques a gagné en crédit>>. Il n'est pas le premier Helvète à découvrir une comète, le

Bernois Paul Wild en compte sept, entre 1957 et 1990. Mais a l'epoque, le Prix Edgar Wilson n'existait pas.

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Wolbach Library: CfA in the News ~ Week ending 18 July 2010

- 1. New findings in astronomy described by S. Ballard and co-researchers, Science Letter, p1073, Tuesday, July 20, 2010**
- 2. New astronomy research from E. Keto and co-researchers described, Science Letter, p828, Tuesday, July 20, 2010**
- 3. Research from J. Forbrich and co-researchers in the area of astronomy described, Science Letter, p2115, Tuesday, July 20, 2010**
- 4. Research from A. Frebel and co-researchers in the area of astronomy described, Science Letter, p2015, Tuesday, July 20, 2010**
- 5. SMITHSONIAN NAMES DIRECTORS OF CONSORTIA FOR FOUR GRAND CHALLENGES OF STRATEGIC PLAN, US Federal News, Saturday, July 17, 2010**
- 6. Origin of key cosmic explosions still shrouded in mystery, Hindustan Times, Tuesday, July 13, 2010**
- 7. Designing a giant among molecules: Rydberg atom could form new kind of bond, scientists propose. Laura Sanders, Science News, v178, n1, p8(1), Saturday, July 3, 2010**

Record - 1

DIALOG(R)

**New findings in astronomy described by S. Ballard and co-researchers, Science Letter, p1073
Tuesday, July 20, 2010**

TEXT:

"We present time series photometry of the M dwarf transiting exoplanet system GJ 436 obtained with the Extrasolar Planet Observation and Characterization (EPOCh) component of the NASA EPOXI mission. We conduct a search of the high-precision time series for additional planets around GJ 436, which could be revealed either directly through their photometric transits or indirectly through the variations these second planets induce on the transits of the previously known planet," scientists in the United States report (see also).

"In the case of GJ 436, the presence of a second planet is perhaps

indicated by the residual orbital eccentricity of the known hot Neptune companion. We find no candidate transits with significance higher than our detection limit. From Monte Carlo tests of the time series, we rule out transiting planets larger than $1.5R_{\text{star}}$ interior to GJ 436b with 95% confidence and larger than $1.25R_{\text{star}}$ with 80% confidence. Assuming coplanarity of additional planets with the orbit of GJ 436b, we cannot expect that putative planets with orbital periods longer than about 3.4 days will transit. However, if such a planet were to transit, we would rule out planets larger than $2.0R_{\text{star}}$ with orbital periods less than 8.5 days with 95% confidence. We also place dynamical constraints on additional bodies in the GJ 436 system, independent of radial velocity measurements. Our analysis should serve as a useful guide for similar analyses of transiting exoplanets for which radial velocity measurements are not available, such as those discovered by the Kepler mission. From the lack of observed secular perturbations, we set upper limits on the mass of a second planet as small as $10M_{\text{Earth}}$ in coplanar orbits and $1M_{\text{Earth}}$ in non-coplanar orbits close to GJ 436b. We present refined estimates of the system parameters for GJ 436. We find $P = 2.64389579 \pm 0.00000080$ d, $R_{\text{star}} = 0.437 \pm 0.016 R_{\text{sun}}$, and $R_{\text{p}} = 3.880 \pm 0.147 R_{\text{Earth}}$. We also report a sinusoidal modulation in the GJ 436 light curve that we attribute to star spots," wrote S. Ballard and colleagues.

The researchers concluded: "This signal is best fit by a period of 9.01 days, although the duration of the EPOCH observations may not have been long enough to resolve the full rotation period of the star."

Ballard and colleagues published their study in *Astrophysical Journal* (A Search For Additional Planets In The Nasa Epoxi Observations Of The Exoplanet System GJ 436. *Astrophysical Journal*, 2010;716(2):1047-1059).

For additional information, contact S. Ballard, 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 - 2

DIALOG(R)

New astronomy research from E. Keto and co-researchers described,
Science Letter, p828,
Tuesday, July 20, 2010

TEXT:

"In this paper, we discuss two approximate methods previously suggested for modeling hyperfine spectral line emission for molecules whose collisional transition rates between hyperfine levels are unknown. Hyperfine structure is seen in the rotational spectra of many commonly observed molecules such as HCN, HNC, NH₃, N₂H⁺, and (CO)-O-17," researchers in the United States report (see also).

"The intensities of these spectral lines can be modeled by numerical techniques such as Lambda-iteration that alternately solve the equations of statistical equilibrium and the equation of radiative transfer. However, these calculations require knowledge of both the radiative and collisional rates for all transitions. For most commonly observed radio frequency spectral lines, only the net collisional rates between rotational levels are known. For such cases, two approximate methods have been suggested. The first method, hyperfine statistical equilibrium, distributes the hyperfine level populations according to their statistical weight, but allows the population of the rotational states to depart from local thermal equilibrium (LTE). The second method, the proportional method, approximates the collision rates between the hyperfine levels as fractions of the net rotational rates apportioned according to the statistical degeneracy of the final hyperfine levels. The second method is able to model non-LTE hyperfine emission," wrote E. Keto and colleagues.

The researchers concluded: "We compare simulations of N₂H⁺ hyperfine lines made with approximate and more exact rates and find that satisfactory results are obtained."

Keto and colleagues published their study in *Astrophysical Journal* (Modeling Molecular Hyperfine Line Emission. *Astrophysical Journal*, 2010;716(2):1315-1322).

For additional information, contact E. Keto, 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. Copyright (c) 2010 Science Letter via NewsRx.com

Record - 3

DIALOG(R)

Research from J. Forbrich and co-researchers in the area of astronomy

described,

Science Letter, p2115,
Tuesday, July 20, 2010

TEXT:

According to a study from the United States, "When studying the evolutionary stages of protostars that form in clusters, the role of any intracluster medium cannot be neglected. High foreground extinction can lead to situations where young stellar objects (YSOs) appear to be in earlier evolutionary stages than they actually are, particularly when using simple criteria like spectral indices."

"To address this issue, we have assembled detailed spectral energy distribution characterizations of a sample of 56 Spitzer-identified candidate YSOs in the clusters NGC 2264 and IC 348. For these, we use spectra obtained with the Infrared Spectrograph (IRS) on board the Spitzer Space Telescope and ancillary multi-wavelength photometry. The primary aim is twofold: (1) to discuss the role of spectral features, particularly those due to ices and silicates, in determining a YSO's evolutionary stage, and (2) to perform comprehensive modeling of SEDs enhanced by the IRS data. The SEDs consist of ancillary optical-to-submillimeter multi-wavelength data as well as an accurate description of the 9.7 μm silicate feature and of the mid-infrared continuum derived from line-free parts of the IRS spectra. We find that using this approach, we can distinguish genuine protostars in the cluster from T Tauri stars masquerading as protostars due to external foreground extinction. Our results underline the importance of photometric data in the far-infrared/submillimeter wavelength range, at sufficiently high angular resolution to more accurately classify cluster members," wrote J. Forbrich and colleagues (see also).

The researchers concluded: "Such observations are becoming possible now with the advent of the Herschel Space Observatory."

Forbrich and colleagues published the results of their research in *Astrophysical Journal* (Disentangling Protostellar Evolutionary Stages In Clustered Environments Using Spitzer-irs Spectra And Comprehensive Spectral Energy Distribution Modeling. *Astrophysical Journal*, 2010;716(2):1453-1477).

For additional information, contact J. Forbrich, 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)

Research from A. Frebel and co-researchers in the area of astronomy described,

Science Letter, p2015,
Tuesday, July 20, 2010

TEXT:

"The abundance patterns of the most metal-poor stars in the Galactic halo and small dwarf galaxies provide us with a wealth of information about the early Universe. In particular, these old survivors allow us to study the nature of the first stars and supernovae, the relevant nucleosynthesis processes responsible for the formation and evolution of the elements, early star- and galaxy formation processes, as well as the assembly process of the stellar halo from dwarf galaxies a long time ago," researchers in the United States report (see also).

"This review presents the current state of the field of "stellar archaeology" - the diverse use of metal-poor stars to explore the high-redshift Universe and its constituents. In particular, the conditions for early star formation are discussed, how these ultimately led to a chemical evolution, and what the role of the most iron-poor stars is for learning about Population III supernovae yields. Rapid neutron-capture signatures found in metal-poor stars can be used to obtain stellar ages, but also to constrain this complex nucleosynthesis process with observational measurements. Moreover, chemical abundances of extremely metal-poor stars in different types of dwarf galaxies can be used to infer details on the formation scenario of the halo and the role of dwarf galaxies as Galactic building blocks. I conclude with an outlook as to where this field may be heading within the next decade," wrote A. Frebel and colleagues.

The researchers concluded: "A table of similar to 1000 metal-poor stars and their abundances as collected from the literature is provided in electronic format."

Frebel and colleagues published their study in *Astronomische Nachrichten* (Stellar archaeology: Exploring the Universe with metal-poor stars Ludwig Biermann Award Lecture 2009. *Astronomische Nachrichten*, 2010;331(5):474-488).

For additional information, contact A. Frebel, Harvard Smithsonian Center Astrophysics, 60 Garden St., MS 20, Cambridge, MA 02138, USA.

Publisher contact information for the journal *Astronomische Nachrichten* is:
Wiley-V C H Verlag GmbH, PO Box 10 11 61, D-69451 Weinheim, Germany.

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Record - 5

DIALOG(R)

SMITHSONIAN NAMES DIRECTORS OF CONSORTIA FOR FOUR GRAND CHALLENGES OF STRATEGIC PLAN,

US Federal News,
Saturday, July 17, 2010

TEXT:

WASHINGTON, July 16 -- The Smithsonian Institution issued the following press release:

Following a yearlong strategic planning process, the Smithsonian identified four Grand Challenges that would be the focus of its efforts in the coming decade. Secretary Wayne Clough has named four Smithsonian scholars to serve as directors of the consortia described in the Institution's strategic plan, "Inspiring Generations through Knowledge and Discovery." The plan outlines the broad areas of concentration for the Smithsonian: mysteries of the universe, biodiversity, the American experience and world cultures.

The directors of the consortia all currently hold positions at the Smithsonian:

- * Unlocking the Mysteries of the Universe-Christine Jones Forman, senior astrophysicist, Smithsonian Astrophysical Observatory
- * Understanding and Sustaining a Biodiverse Planet-John Kress, curator and botanist, National Museum of Natural History
- * Understanding the American Experience-Michelle Delaney, curator, National Museum of American History
- * Valuing World Cultures-Robert Leopold, director, National Anthropological Archives at the National Museum of Natural History

"In the 19th century, the Smithsonian was defined by the growth of its national collections, and the 20th century saw a growth of museums and science centers, each excellent in their own field," said Clough. "For this century, we must integrate all our parts-science, history, art and culture-and look holistically at the four broad themes as areas in which

the Smithsonian can make the greatest contribution." At the center of this effort, Clough added, is the creation of these four consortia, each headed by a prominent scholar who will work collaboratively across the Institution and with outside partners and funders. The result will be a "cultural transformation of the Smithsonian poised to address critical issues facing the world today."

The Grand Challenges are the overarching priorities that will guide the Smithsonian's work over the next decade, and the consortia are the vehicles that will draw from all fields of the Institution to develop interdisciplinary programs, exhibitions and research and to attract foundations and other donors to support the Institution's initiatives.

Forman and Kress will report to Under Secretary for Science Eva Pell (mysteries of the universe and biodiversity) while Delaney and Leopold will report to Under Secretary for History, Art and Culture Richard Kurin (American experience and world cultures). Consortia directors Delaney and Leopold will also serve as senior program officers in the Under Secretary's office. They will leave their current museum positions. Forman and Kress will divide their time between the science consortia and their home organizations, Natural History and the Smithsonian Astrophysical Observatory. The consortia offices will be located in the Smithsonian Castle. For more information about USfednews please contact: Sarabjit Jagirdar, US Fed News, email:- htsyndication@hindustantimes.com

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Record - 6

DIALOG(R)

Origin of key cosmic explosions still shrouded in mystery,

Hindustan Times,

Tuesday, July 13, 2010

TEXT:

Washington, July 13 -- Type Ia supernova brightens and dims so predictably that astronomers use the variety to measure the universe's expansion. The resulting discovery of dark energy and the accelerating universe rewrote our understanding of the cosmos. However, the origin of these supernovae still remains unknown.

"The question of what causes a Type Ia supernova is one of the great unsolved mysteries in astronomy," said Rosanne Di Stefano of the Harvard-Smithsonian Center for Astrophysics (CfA).

Astronomers have very strong evidence that Type Ia supernovae come from exploding stellar remnants called white dwarfs. To detonate, the white dwarf must gain mass until it reaches a tipping point and can no longer support itself.

There are two leading scenarios for the intermediate step from stable white dwarf to supernova, both of which require a companion star. In the first possibility, a white dwarf swallows gas blowing from a neighbouring giant star. In the second possibility, two white dwarfs collide and merge. To establish which option is correct (or at least more common), astronomers look for evidence of these binary systems.

Given the average rate of supernovae, scientists can estimate how many pre-supernova white dwarfs should exist in a galaxy. But the search for these progenitors has turned up mostly empty-handed.

To hunt for accreting white dwarfs, astronomers looked for X-rays of a particular energy, produced when gas hitting the star's surface undergoes nuclear fusion. A typical galaxy should contain hundreds of such "super-soft" X-ray sources. Instead we see only a handful. As a result, a recent paper suggested that the alternative, merger scenario was the source of Type Ia supernovae, at least in many galaxies.

That conclusion relies on the assumption that accreting white dwarfs will appear as super-soft X-ray sources when the incoming matter experiences nuclear fusion. Di Stefano and her colleagues have argued that the data do not support this hypothesis.

In a new paper, Di Stefano takes the work a step further. She points out that a merger-induced supernova would also be preceded by an epoch during which a white dwarf accretes matter that should undergo nuclear fusion. White dwarfs are produced when stars age, and different stars age at different rates. Any close double white-dwarf system will pass through a phase in which the first-formed white dwarf gains and burns matter from its slower-aging companion. If these white dwarfs produce X-rays, then we should find roughly a hundred times as many super-soft X-ray sources as we do.

Since both scenarios - an accretion-driven explosion and a merger-driven explosion - involve accretion and fusion at some point, the lack of super-soft X-ray sources would seem to rule out both types of progenitor. The alternative proposed by Di Stefano is that the white dwarfs are not luminous at X-ray wavelengths for long stretches of time. Perhaps material surrounding a white dwarf can absorb X-rays, or accreting white dwarfs might emit most of their energy at other wavelengths.

If this is the correct explanation, says Di Stefano, "we must devise new

methods to search for the elusive progenitors of Type Ia supernovae."

Di Stefano's paper, available online, has been accepted for publication in The Astrophysical Journal. Published by HT Syndication with permission from Asian News International. For more information on news feed please contact Sarabjit Jagirdar at htsyndication@hindustantimes.com
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Record - 7

DIALOG(R)

Designing a giant among molecules: Rydberg atom could form new kind of bond, scientists propose.

Laura Sanders,
Science News, v178, n1, p8(1)
Saturday, July 3, 2010

TEXT:

Physicists have predicted the existence of a new kind of gargantuan molecule, large enough to dwarf a virus, with the potential to be in two configurations at once. Such a molecule might prove useful in storing and transmitting quantum information, the researchers report online June 15 in Physical Review Letters.

An atom in an excited state can have an electron that roams very far from its nucleus. These giant "Rydberg atoms" can form molecules more than a thousand times larger than everyday molecules. The newly predicted molecule would be so large that a small virus--itself made of many molecules--could fit inside, says study coauthor Seth Rittenhouse.

In the new study, Rittenhouse and his colleague Hossein Sadeghpour, both of the Harvard-Smithsonian Center for Astrophysics in Cambridge, Mass., predicted what would happen to a giant rubidium atom in the Rydberg state if it were brought near a small molecule, composed of potassium and rubidium, with a dipole moment--a positive electrical charge at one end and a negative charge at the other. This charge separation wouldn't be strong enough to rip the wandering electron away from the giant atom. But the electron would find the dipole irresistible, calculations show. "That extra bit of charge is enough to get the electron to stick near it," Rittenhouse says.

In this way, the small molecule and giant atom would form a gigantic Rydberg molecule with a totally new type of chemical bond. "When you talk about chemistry, you talk about bonds," says Rittenhouse. "This type of bond is new."

[ILLUSTRATION OMITTED]

In 2000, atomic physicist Chris Greene of JILA and the University of Colorado at Boulder and colleagues predicted the existence of a Rydberg molecule made up of an excited atom and a neutral atom. The researchers calculated that the roaming electron of the excited atom would hover around the neutral atom and form an electron cloud that resembled, of all things, an ancient trilobite.

"I think it came as a surprise to a lot of people when we made our original prediction, because diatomic molecules, with just two atoms, were believed by chemists to be completely understood," Greene says. Adding a molecule with a charge takes his prediction a step further: "I view this as a really interesting extension," he says.

The new giant molecule would exhibit a property called superposition. The potassium-rubidium molecule can point in two directions at once, the models predict, with the potassium atom on top and on the bottom of the rubidium atom at the same time. Rittenhouse says that this superposition state might serve as a qubit, a bit of quantum information that could store or transmit a message.

Such a use is "certainly an interesting aspect I hadn't thought of before," Greene says. But he says the life span of the molecules, about 100 microseconds, might be too short for them to be useful.

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Wolbach Library: CfA in the News ~ Week ending 25 July 2010

1. **Studies from D. Castro and colleagues provide new data on astronomy**, Science Letter, p3738, Tuesday, July 27, 2010
2. **New research on astronomy from F. Civano and co-authors summarized**, Science Letter, p1585, Tuesday, July 27, 2010
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Record - 1

DIALOG(R)

Studies from D. Castro and colleagues provide new data on astronomy, Science Letter, p3738, Tuesday, July 27, 2010

TEXT:

According to a study from the United States, "We report the detection of gamma-ray emission coincident with four supernova remnants (SNRs) using data from the Large Area Telescope on board the Fermi Gamma-ray Space Telescope."

"G349.7+0.2, CTB 37A, 3C 391, and G8.7-0.1 are SNRs known to be interacting with molecular clouds, as evidenced by observations of hydroxyl (OH) maser emission at 1720 MHz in their directions. SNR shocks are expected to be sites of cosmic-ray acceleration, and clouds of dense material can provide effective targets for production of gamma-rays from pi(0) decay," wrote D. Castro and colleagues (see also).

The researchers concluded: "The observations reveal unresolved sources in the direction of G349.7+0.2, CTB 37A, and 3C 391, and a possibly extended source coincident with G8.7-0.1, all with significance levels greater than 10 sigma."

Castro and colleagues published their study in *Astrophysical Journal* (Fermi Large Area Telescope Observations Of Supernova Remnants Interacting With Molecular Clouds. *Astrophysical Journal*, 2010;717(1):372-378).

For more information, contact D. Castro, 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 research on astronomy from F. Civano and co-authors summarized,
Science Letter, p1585,
Tuesday, July 27, 2010

TEXT:

"We present a detailed study of a peculiar source detected in the COSMOS survey at $z = 0.359$. CXOC J100043.1+020637, also known as CID-42, has two compact optical sources embedded in the same galaxy," researchers in the United States report (see also).

"The distance between the two, measured in the HST/ACS image, is 0 ".495

+/- 0 ".005 that, at the redshift of the source, corresponds to a projected separation of 2.46 +/- 0.02 kpc. A large (similar to 1200 km s(-1)) velocity offset between the narrow and broad components of H beta has been measured in three different optical spectra from the VLT/VIMOS and Magellan/IMACS instruments. CID-42 is also the only X-ray source in COSMOS, having in its X-ray spectra a strong redshifted broad absorption iron line and an iron emission line, drawing an inverted P-Cygni profile. The Chandra and XMM-Newton data show that the absorption line is variable in energy by Delta E = 500 eV over four years and that the absorber has to be highly ionized in order not to leave a signature in the soft X-ray spectrum. That these features-the morphology, the velocity offset, and the inverted P-Cygni profile-occur in the same source is unlikely to be a coincidence. We envisage two possible explanations, both exceptional, for this system: (1) a gravitational wave (GW) recoiling black hole (BH), caught 1-10 Myr after merging; or (2) a Type 1/Type 2 system in the same galaxy where the Type 1 is recoiling due to the slingshot effect produced by a triple BH system. The first possibility gives us a candidate GW recoiling BH with both spectroscopic and imaging signatures," wrote F. Civano and colleagues.

The researchers concluded: "In the second case, the X-ray absorption line can be explained as a BAL-like outflow from the foreground nucleus (a Type 2 AGN) at the rearer one (a Type 1 AGN), which illuminates the otherwise undetectable wind, giving us the first opportunity to show that fast winds are present in obscured active galactic nuclei (AGNs), and possibly universal in AGNs."

Civano and colleagues published their study in *Astrophysical Journal* (A Runaway Black Hole In Cosmos: Gravitational Wave Or Slingshot Recoil? *Astrophysical Journal*, 2010;717(1):209-222).

For additional information, contact F. Civano, 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)

New astronomy study findings have been reported by C. Espaillat and co-researchers,
Science Letter, p942,

Tuesday, July 27, 2010

TEXT:

"In the past few years, several disks with inner holes that are relatively empty of small dust grains have been detected and are known as transitional disks. Recently, Spitzer has identified a new class of "pre-transitional disks" with gaps based on near-infrared photometry and mid-infrared spectra; these objects have an optically thick inner disk separated from an optically thick outer disk by an optically thin disk gap," scientists writing in the *Astrophysical Journal* report (see also).

"A near-infrared spectrum provided the first confirmation of a gap in the pre-transitional disk of LkCa 15 by verifying that the near-infrared excess emission in this object was due to an optically thick inner disk. Here, we investigate the difference between the nature of the inner regions of transitional and pre-transitional disks using the same veiling-based technique to extract the near-infrared excess emission above the stellar photosphere. However, in this work we use detailed disk models to fit the excess continua as opposed to the simple blackbody fits previously used. We show that the near-infrared excess emission of the previously identified pre-transitional disks of LkCa 15 and UX Tau A in the Taurus cloud as well as the newly identified pre-transitional disk of ROX 44 in Ophiuchus can be fit with an inner disk wall located at the dust destruction radius. We also present detailed modeling of the broadband spectral energy distributions of these objects, taking into account the effect of shadowing by the inner disk on the outer disk, but considering the finite size of the star, unlike other recent treatments. The near-infrared excess continua of these three pre-transitional disks, which can be explained by optically thick inner disks, are significantly different from that of the transitional disks of GM Aur, whose near-infrared excess continuum can be reproduced by emission from sub-micron-sized optically thin dust, and DM Tau, whose near-infrared spectrum is consistent with a disk hole that is relatively free of small dust," wrote C. Espaillat and colleagues.

The researchers concluded: "The structure of pre-transitional disks may be a sign of young planets forming in these disks and future studies of pre-transitional disks will provide constraints to aid in theoretical modeling of planet formation."

Espaillat and colleagues published their study in *Astrophysical Journal* (Unveiling The Structure Of Pre-transitional Disks. *Astrophysical Journal*, 2010;717(1):441-457).

Additional information can be obtained by contacting C. Espaillat, Harvard Smithsonian Center Astrophysics, 60 Garden St., MS 78, 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)

New astronomy research reported from L. Zappacosta and co-authors,
Science Letter, p939,
Tuesday, July 27, 2010

TEXT:

"We make use of a 500 ks Chandra HRC-S/LETG spectrum of the blazar H 2356-309, combined with a lower signal-to-noise ratio (S/N; 100 ks) pilot LETG spectrum of the same target, to search for the presence of warm-hot absorbing gas associated with two large-scale structures (LSSs) crossed by this sight line and to constrain its physical state and geometry. Strong ($\log N\text{-O VII} \geq 10(16) \text{ cm}^{-2}$) O VII K alpha absorption associated with a third LSS crossed by this line of sight (the Sculptor Wall (SW)), at $z = 0.03$, has already been detected in a previous work," scientists writing in the Astrophysical Journal report (see also).

"Here, we focus on two additional prominent filamentary LSSs along the same line of sight, one at $z = 0.062$ (the Pisces-Cetus Supercluster (PCS)) and another at $z = 0.128$ (the "Farther Sculptor Wall" (FSW)). The combined LETG spectrum has an S/N of similar to 11.6-12.6 per resolution element in the 20-25 angstrom and an average 3 sigma sensitivity to intervening O VII K alpha absorption line equivalent widths (EWs) of EWO VII greater than or similar to 14 m angstrom in the available redshift range ($z < 0.165$). No statistically significant (i.e., ≥ 3 sigma) individual absorption is detected from any of the strong He-or H-like transitions of C, O, and Ne (the most abundant metals in gas with solar-like composition) at the redshifts of the PCS and FSW structures and down to the EW thresholds mentioned above. However, we are still able to constrain the physical and geometrical parameters of the putative absorbing gas associated with these structures, by performing a joint spectral fit of various marginal detections and upper limits of the strongest expected lines with our self-consistent hybrid-ionization WHIM spectral model. At the redshift of the PCS, we identify a warm phase with $\log T = 5.35(-0.13)(+0.07)$ K and $\log N\text{-H} = (19.1 \pm 0.2) \text{ cm}^{-2}$ possibly co-existing with a much hotter and statistically less significant phase with $\log T = 6.9(-0.8)(+0.1)$ K and $\log N\text{-H} = 20.1(-1.7)(+0.3) \text{ cm}^{-2}$ (1 sigma errors). These two separate physical phases are identified through, and mainly constrained by, C V K alpha (warm

phase) and O VIII K alpha (hot phase) absorption, with single line significances of 1.5 sigma each. For the second LSS, at z similar or equal to 0.128, only one hot component is hinted in the data, through O VIII K alpha (1.6 sigma) and Ne IX K alpha (1.2 sigma). For this system, we estimate $\log T = 6.6(-0.2)(+0.1)$ K and $\log N-H = 19.8(-0.8)(+0.4)$ cm⁻². Our column density and temperature constraints on the warm-hot gaseous content of these two LSSs, combined with the measurements obtained for the hot gas permeating the SW, allow us to estimate the cumulative number density per unit redshifts of O VII WHIM absorbers at three different EW thresholds of 0.4 m angstrom, 7 m angstrom, and 25.8 m angstrom. This is consistent with expectations only at the very low end of EW thresholds, but exceeds predictions at 7 m angstrom and 25.8 m angstrom (by more than 2 sigma)," wrote L. Zappacosta and colleagues.

The researchers concluded: "We also estimate the cosmological mass density of the WHIM based on the four absorbers we tentatively."

Zappacosta and colleagues published their study in *Astrophysical Journal* (Studying The Whim Content Of Large-scale Structures Along The Line Of Sight To H 2356-309. *Astrophysical Journal*, 2010;717(1):74-84).

Additional information can be obtained by contacting L. Zappacosta, 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 - 5

DIALOG(R)

SUBCOMMITTEE EXAMINES SMITHSONIAN INSTITUTION'S UNIQUE OPPORTUNITY TO STRENGTHEN AMERICA'S ROLE IN SCIENCE,

US Federal News,
Saturday, July 24, 2010

TEXT:

WASHINGTON, July 23 – The House Science and Technology Committee issued the following news release:

The House Committee on Science and Technology's Subcommittee on Research and Science Education held a hearing Wednesday to examine the Smithsonian Institution's research and education activities, scientific collections,

and its ability to collaborate with federal agencies. While renowned for the world's largest museum complex, the Smithsonian Institution is also a prominent leader in scientific research. For instance, scientists at Smithsonian research centers are using their collections to understand the Gulf of Mexico's ecosystem before the oil spill and how climate change is impacting the planet.

"While many Americans know about the Smithsonian's famous museums and the castle along the National Mall, most people do not know that the Smithsonian Institution receives nearly \$800 million a year in federal appropriations, or that over \$200 million of that goes toward basic scientific research," Subcommittee Chairman Daniel Lipinski (D-IL) said. "It is appropriate and necessary for Congress to take a more active role in the oversight of the Institution's activities and long-term plans."

To fund their research beyond these direct appropriations, which largely go toward salaries and infrastructure costs, institution scientists depend on gifts and regularly compete for grants and contracts from government agencies such as NASA, the Department of Energy (DOE), the Department of Defense (DOD), and NIH. The Smithsonian Institution employs hundreds of scientists at nine centers, including the Tropical Research Institute in Panama and the Harvard-Smithsonian Center for Astrophysics. In addition to these research activities, the hearing examined the Institution's strategic plan and how hiring Ms. Claudine Brown as their first ever Director of Education could improve informal science education, public outreach, and access programs. Witnesses also explained how digitizing the Institution's collection, which includes well over 100 million specimens, could improve both research and education.

"The Smithsonian has one of the largest collections in the world, including over 137 million individual specimens and artifacts," Lipinski said. "Although federal coordination is a bit more complicated because the Smithsonian is not a part of the Executive Branch, working with other science and education agencies is extremely important if we want to maximize the impact of federal spending."

Witnesses also discussed the need for better management of federal scientific collections, and supported the recommendations of the 2009 Interagency Working Group on Scientific Collections. The America COMPETES Reauthorization Act of 2010, which the House passed in late May, addressed many of these recommendations through the Office of Science and Technology Policy (OSTP), directing that office to develop interagency policies for the management, use, and disposal of federal scientific collections and to create an online clearinghouse for these collections.

Witnesses at the hearing stressed how the Smithsonian Institution's unique collections and ability to conduct long-term studies, such as the tropical

ecosystems research it has been conducting in Panama since 1923, set it apart from both academia and federal research agencies. When combined with its ability to educate the public through its museums and zoo, the Smithsonian Institution continues to carry out founder James Smithson's final wish: that the Institution be an "establishment for the increase and diffusion of Knowledge among men."

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Record – 6

DIALOG®

Riesenstern schießt aus der Milchstrasse,

Stuttgarter Zeitung, p20,

Saturday, July 24, 2010

TEXT:

Ein rasender Riesenstern verlässt mit einer Geschwindigkeit von rund 2,5 Millionen Kilometern pro Stunde unsere Milchstrasse. Das haben US-Astronomen mit dem Weltraumteleskop Hubble beobachtet. Der Fluchtling - eine Sonne mit der Nummer HE 0437-5439 - befindet sich nun am Rand unserer Galaxie, 200 000 Lichtjahre vom Zentrum entfernt, wie die US-Weltraumbehörde Nasa berichtete. "Der Stern reist mit einer absurd hohen Geschwindigkeit, ungefähr doppelt so schnell wie nötig, um der Schwerkraft unserer Galaxie zu entkommen", erläuterte Warren Brown vom Harvard-Smithsonian Zentrum für Astrophysik. dpa

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Record - 7

DIALOG(R)

Black hole 'evicted' star from Milky Way,

UPI Science News,

Friday, July 23, 2010

TEXT:

A "hypervelocity" star speeding out of our galaxy was sent on its way by a

violent encounter with a black hole at the heart of the Milky Way, scientists say.

The hypervelocity star is one of the fastest ever detected, heading out of our galaxy at a speed of 1.6 million mph, a Space Telescope Science Institute release said Thursday.

The star was the lone survivor of a trio of stars that wandered too close to the black hole, which captured one and threw the other two out of the Milky Way with such violence they coalesced into a single super-hot blue star, scientists say.

About 16 hypervelocity stars have been discovered since 2005 and most are thought to be exiles from the heart of our galaxy. But scientists used the Hubble space telescope for the first direct observation linking a fast-flying star to a galactic center origin, the release said.

"Using Hubble, we can for the first time trace back to where the star comes from by measuring the star's direction of motion on the sky. Its motion points directly from the Milky Way center," astronomer Warren Brown of the Harvard-Smithsonian Center for Astrophysics in Cambridge, Mass., says.

"These exiled stars are rare in the Milky Way's population of 100 billion stars," Brown said. "For every 100 million stars in the galaxy lurks one hypervelocity star."

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Record - 8

DIALOG(R)

NASA'S HUBBLE SHOWS HYPERFAST STAR WAS BOOTED FROM MILKY WAY,

US Federal News,
Friday, July 23, 2010

TEXT:

WASHINGTON, July 22 -- NASA issued the following press release:

NASA's Hubble Space Telescope has detected a hypervelocity star, a rare phenomenon moving three times faster than our sun.

The star may have been created in a cosmic misstep. A hundred million years ago, a triple-star system was traveling through the bustling center of our Milky Way galaxy when it wandered too close to the galaxy's giant black

hole. The black hole captured one of the stars and hurled the other two out of the Milky Way. The two outbound stars merged to form a super-hot blue star traveling at incredible speeds.

This story may seem like science fiction, but Hubble astronomers say it is the most likely scenario for the creation of a so-called hypervelocity star, known as HE 0437-5439. It is one of the fastest ever detected with a speed of 1.6 million mph. Hubble observations confirm that the stellar speedster hails from the Milky Way's core, settling some confusion about the star's original home.

Most of the roughly 16 known hypervelocity stars, all discovered since 2005, are thought to be exiles from the heart of our galaxy. But this Hubble result is the first direct observation linking such a star to an origin in the center of the galaxy.

"Using Hubble, we can for the first time trace back to where the star came from by measuring the star's direction of motion on the sky," said astronomer Warren Brown of the Harvard-Smithsonian Center for Astrophysics in Cambridge, Mass. "Our measurements point directly to the Milky Way center."

Brown, a member of the Hubble team that observed the star, is the lead author on a paper about the finding published online July 20 in the *Astrophysical Journal Letters*.

Brown said, "These exiled stars are rare in the Milky Way's population of 100 billion stars. For every 100 million stars in the galaxy, there lurks one hypervelocity star."

The stellar outcast already is cruising in the Milky Way's distant outskirts about 200,000 light-years from the galaxy's center. Using Hubble to measure the runaway star's direction and determine the Milky Way's core as its starting point, Brown and Gnedin's team calculated how fast the star had to have been ejected to reach its current location.

"Studying these stars could provide more clues about the nature of some of the universe's unseen mass, and it could help astronomers better understand how galaxies form," said team leader Oleg Gnedin of the University of Michigan in Ann Arbor.

The star's age is another mystery. Based on the speed and position of HE 0437-5439, the star would have to be 100 million years old to have journeyed from the Milky Way's core. Yet its mass -- nine times that of our sun-- and blue color mean that it should have burned out after only 20 million years -- far shorter than the transit time it took to get to its current location.

Astronomers have proposed two possibilities to solve the age problem. The star either dipped into the Fountain of Youth by becoming a blue straggler, or it was flung out of the Large Magellanic Cloud, a neighboring galaxy.

In 2008 a team of astronomers thought they had solved the mystery. They found a match between the exiled star's chemical makeup and the characteristics of stars in the Large Magellanic Cloud. The rogue star's position also is close to the neighboring galaxy, only 65,000 light-years away. The new Hubble result, however, settles the debate over the star's birthplace and places it in the Milky Way.

The most likely explanation for the star's blue color and extreme speed is that it was part of a triple-star system that was involved in a gravitational billiards game with the galaxy's monster black hole. This concept for imparting an escape velocity on stars was first proposed in 1988. The theory predicted the Milky Way's black hole should eject a star about once every 100,000 years.

The triple-star system contained a pair of closely orbiting stars and a third outer member also gravitationally tied to the group. The black hole pulled the outer star away from the tight binary system. The doomed star's momentum was transferred to the stellar twosome, boosting the duo to escape velocity from the galaxy. As the pair rocketed away, they went on with normal stellar evolution.

The more massive companion evolved more quickly, puffing up to become a red giant. It enveloped its partner, and the two stars spiraled together, merging into one superstar, the blue straggler that Hubble observed. A blue straggler is a relatively young, massive star produced by the merger of two lighter-weight stars.

Astronomers used the sharp vision of Hubble's Advanced Camera for Surveys to make two separate observations of the wayward star 3.5 years apart. Team member Jay Anderson of the Space Telescope Science Institute in Baltimore developed a technique to measure the star's position relative to each of 11 distant background galaxies. These background galaxies form a reference frame in which Anderson compared the star's position in 2006 and 2009 to calculate how far it had moved.

"Hubble excels with this type of measurement," Anderson said. "This observation would be challenging to do from the ground."

The team is trying to determine the homes of four other unbound stars, all located on the fringes of the Milky Way.

"We are targeting massive "B" stars, like HE 0437-5439," said Brown, who

has discovered 14 of the 16 known hypervelocity stars. "These stars shouldn't live long enough to live in the distant outskirts of the Milky Way, so we shouldn't expect to find them there. But the quantity of stars in the outer region is much less than in the core, so we have a better chance of finding these unusual objects."

For graphics and more information about HE 0437-5439, visit:

<http://www.nasa.gov/hubble>
and

<http://hubblesite.org/news/2010/19>. 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®

Hubble discovers hyperfast star hailing from Milky Way's core,
Hindustan Times,
Friday, July 23, 2010

TEXT:

Washington, July 23 -- NASA's Hubble Space Telescope has come across a hypervelocity star - which is moving three times faster than our sun - hailing from the Milky Way's core.

The star may have been created in a cosmic misstep. A hundred million years ago, a triple-star system was travelling through the bustling centre of our Milky Way galaxy when it wandered too close to the galaxy's giant black hole. The black hole captured one of the stars and hurled the other two out of the Milky Way. The two outbound stars merged to form a super-hot blue star travelling at incredible speeds.

This story may seem like science fiction, but Hubble astronomers say it is the most likely scenario for the creation of a so-called hypervelocity star, known as HE 0437-5439. It is one of the fastest ever detected with a speed of 1.6 million mph. Hubble observations confirm that the stellar speedster hails from the Milky Way's core, settling some confusion about the star's original home.

Most of the roughly 16 known hypervelocity stars, all discovered since

2005, are thought to be exiles from the heart of our galaxy. But this Hubble result is the first direct observation linking such a star to an origin in the center of the galaxy.

"Using Hubble, we can for the first time trace back to where the star came from by measuring the star's direction of motion on the sky. Our measurements point directly to the Milky Way centre," said astronomer Warren Brown of the Harvard-Smithsonian Center for Astrophysics in Cambridge, Mass.

Brown, a member of the Hubble team that observed the star, is the lead author on a paper about the finding published online in the *Astrophysical Journal Letters*.

Brown said, "These exiled stars are rare in the Milky Way's population of 100 billion stars. For every 100 million stars in the galaxy, there lurks one hypervelocity star."

"Studying these stars could provide more clues about the nature of some of the universe's unseen mass, and it could help astronomers better understand how galaxies form," added team leader Oleg Gnedin of the University of Michigan in Ann Arbor.

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The most likely explanation for the star's blue colour and extreme speed is that it was part of a triple-star system that was involved in a gravitational billiards game with the galaxy's monster black hole. 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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DIALOG(R)

R136a1: Monster star too big to be true?

Pete Spotts Staff writer,
Christian Science Monitor (USA), ALL ed,
Wednesday, July 21, 2010

TEXT:

Astronomers say they have uncovered the most monstrous star yet seen a(euro)" far more massive than some had thought possible a(euro)" deep in the Tarantula Nebula, a brightly glowing region of hydrogen gas in a small companion galaxy to the Milky Way.

The team of astronomers estimates that at its birth the behemoth, called R136a1, could have been 320 times more massive than the sun. Up to this point, it looked as though the upper mass limit for stars in today's universe was around 150 solar masses, based on observations of other researchers.

If the object turns out to be an individual star a(euro)" rather than a several stars bunched closely together a(euro)" such monsters on the Milky Way's doorstep could help researchers to tackle fundamental questions about about how such bulked up but short-lived stars form and what happens to them when they run out of gas.

They also may shed light on the universe's first stars a(euro)" objects whose masses are estimated to have ranged from 300 to 1,000 times the mass of the sun. The earliest stars are thought to have formed 100 million years after the Big Bang a(euro)" the enormous release of energy that researchers say gave rise to the universe some 13.6 billion years ago.

The object is one of a cluster of stellar giants roughly 1 million to 2 million years old. Their nebula-nursery sits in the Large Magellanic Cloud, a small companion galaxy to the Milky Way. Visible in the southern hemisphere, the mini galaxy is some 165,000 light-years from Earth.

The results represent "a real leap" toward getting a better grasp on how massive stars in the Tarantula Nebula can become, says Scott Kenyon, a specialist in stellar and solar system evolution at the Harvard-Smithsonian Center for Astrophysics in Cambridge, Mass.

Mysteries of the Tarantula Nebula:

In the early 1980s, he explains, astronomers thought that the entire star cluster, of which the new object is a part, was one star. If so, it tipped the cosmic scale at 2,500 solar

masses. But improved observations showed it to be a bright cluster of massive young stars, rather than one object.

It's ironic that R136a1, the most massive object the team found in the R136a group, "is a record-holder again a(euro)" hopefully more permanent than in the 1980s," says Paul Crowther, a Sheffield University astrophysicist who led the team reporting the results in a recent issue of the Monthly Notices of the Royal astronomical Society in Britain.

The object's discovery emerged from a study the team was conducting of two regions of intense star formation, R136a and NGC 3603. NCG 3606 lies inside the Milky Way roughly 22,000 light-years from Earth. There, the team detected stars whose initial masses are estimated at 150 solar masses and more.

Those findings helped them understand what they thought they might be seeing in R136a.

Using data from the Hubble Space Telescope, as well as observations take at the European Southern Observatory's Very Large Telescope in Paranal, Chile, the team noted that several of R136a's stars were burning ferociously, posting temperatures some seven time hotter than the sun's. The team put those up against computer models of stellar evolution and concluded that the stars started burning with masses significantly higher than the purported 150-solar-mass limit. Indeed, radiation from the four largest stars the team says it has identified in cluster R136a account for more than half of the radiation emitted by the cluster's full complement of 100,000 stars.

Doubts about R136a1 Yet the history of observations of R136a call for caution in interpreting the new results, notes the Harvard-Smithsonian's Dr. Kenyon.

The team has used a range of meticulous observations and marshaled a variety of arguments to support the notion that the objects they see are individual stars. But the observing technology the team used can't resolve closely spaced individual stars 165,000 light-years away, he says. It's still possible that an object the team interprets as a single star could instead be close binary stars with orientations that make them look as though they are a single object.

Others have suggested that the team has detected very tightly packed clusters with stars too close to resolve individually.

Whatever the result, the presence of stars with mass topping 100 solar masses poses some problems for theories of stellar evolution, Kenyon adds.

If they form from a single cloud of gas, it's hard to explain how they could gravitationally accumulate so much mass in the relatively short 100,000-year period in which stars are thought to form. If they form from a collision between several closely spaced, lower-mass stars, the physics behind such mergers remains murky, leaving it as an unsatisfying solution, he adds.

With R136a1 having tipped the scales at 320 solar masses and shining with 10 million times the sun's brightness, "owing to the rarity of these monsters, I think it is unlikely that this new record will be broken any time soon," Dr. Crowther says.

Related:

Astronomers observe formation of humongous star

Herschel telescope finds 'impossible' star so massive it would dwarf our sun

Massive runaway star near Tarantula Nebula races thru universe at 250,000 mph

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Record - 11

DIALOG(R)
Science And Education At The Smithsonian,
Congressional Testimony via FDCH,
Wednesday, July 21, 2010

TEXT:
xfdt SCIENCE-AND-EDUCATION sked

TESTIMONY

July 21, 2010

DANIEL LIPINSKI

CHAIRMAN

U.S. SUBCOMMITTEE ON RESEARCH AND SCIENCE EDUCATION

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copyright or other notice from copies of the content. Opening Statement of Daniel Lipinski Chairman U.S. Subcommittee on Research and Science Education

Committee on House Science and Technology Subcommittee on Research and Science Education

July 21, 2010

Good afternoon and welcome to today`s Research and Science Education Subcommittee hearing on Science and Education at the Smithsonian Institution.

When most Americans think of the Smithsonian, they think about the famous museums and the castle along the National Mall. Some that know a little

more might also think of the National Zoo. But most people do not know that the Smithsonian Institution receives nearly \$800 million a year in federal appropriations, or that over \$200 million of that goes toward basic scientific research and dedicated Smithsonian research facilities.

In spite of receiving almost a billion dollars a year in taxpayer funds, the Smithsonian is not actually part of any branch of government. Although it began with a bequest from British scientist James Smithson, it is technically a "federal trust instrumentality," established by an Act of Congress in 1846. As such, it is appropriate and necessary for the Congress to take a more active role in oversight of the Institution's activities and long-term plans.

This hearing will focus on the Smithsonian's contributions to scientific research and education, on its vast scientific collections, and how the Institution collaborates with Federal agencies. I'm looking forward to learning what goes on behind the scenes at their 19 museums and nine research centers, and how they share expertise with the 168 affiliated museums from around the country.

I'm particularly interested in hearing from the Smithsonian's first-ever Director of Education, and about her plans for improving education, outreach, and access programs. Informal science education has been a passion of mine on this subcommittee, probably because I know how my own early experiences at the Museum of Science and Industry and the Field Museum in Chicago influenced my interest in science and engineering. I hope both Director Brown and Secretary Clough will explain how the new position fits into the Smithsonian's strategic plan and what its role is, and should be, in federal STEM education programs.

The Smithsonian Institution's research centers stretch from the Tropical Research Institute in Panama to the Harvard-Smithsonian Center for Astrophysics. These facilities, which are home to some of the world's foremost scientific experts, are almost unknown to the general public. The Center for Astrophysics, for example, has 300 scientists and 12 telescopes on land and in the sky, but most of us have never heard of the Center or its work. The Smithsonian is especially active in the life sciences, including ecology, with four of the research centers and the National Zoo focusing in these areas. As one of the Co-chairs of the Congressional Zoo and Aquarium Caucus, I am particularly interested in learning about the Zoo's efforts to repopulate endangered species.

Finally, I would like to hear how the Smithsonian works with other federal agencies, including through coordinating bodies like the Office of Science and Technology Policy and the National Science and Technology Council. Although federal coordination is a bit more complicated because the

Smithsonian is not a part of the Executive Branch, working with other science and education agencies is extremely important if we want to maximize the impact of federal spending.

One area where it is especially important to coordinate between agencies is in managing and sharing scientific collections. The Smithsonian has one of the largest collections in the world, including over 137 million individual specimens and artifacts used for scientific research and museum displays. In 2005, the Smithsonian and the Department of Agriculture co-chaired an interagency working group that released a report highlighting the importance of improving collections management. I'm looking forward to learning more about the Smithsonian's plans for implementing the recommendations in this report.

I would like to thank all of our witnesses for joining us and look forward to their testimony.

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SCIENCE AND EDUCATION AT THE SMITHSONIAN - Part 1,
Congressional Testimony via FDCH,
Wednesday, July 21, 2010

TEXT:

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TESTIMONY

July 21, 2010

DR. ELDREDGE BERMINGHAM

DIRECTOR

SMITHSONIAN INSTITUTION

HOUSE Science and Technology
Research and Science Education

SCIENCE AND EDUCATION AT THE SMITHSONIAN - Part 1

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Roll Call, Inc. You may not alter or remove any trademark, copyright or other notice from copies of the content. Statement of Dr. Eldredge Bermingham Director, Smithsonian Tropical Research Institute Smithsonian Institution

Committee on House Science and Technology Subcommittee on Research and Science Education

July 21, 2010

Introduction

Thank you, Chairman Lipinski and distinguished members of the Subcommittee for the opportunity to provide testimony today. My name is Eldredge Bermingham. I am the Director of the Smithsonian Tropical Research Institute, or STRI, located on the banks of the Panama Canal in the Republic of Panama, the only bureau of the Smithsonian Institution located outside the United States. I hold a PhD degree in Genetics. I have spent 20 years guiding molecular genetics research programs at STRI and have published more than 140 scientific articles. For the past 7 years I have served as Deputy Director and now Director of STRI, where I oversee about 40 PhD scientists and 350 technical staff. I participate on the

Smithsonian's steering committee for its Marine Science Network, and on Secretary Clough's strategic planning teams responsible for the 2010-2015 Strategic Vision for the Smithsonian. I have played the lead role over the past 5 years transforming the Center for Tropical Forest Science that began in Panama more than thirty years ago into the pan institutional Smithsonian Institution Global Earth Observatories (SIGEO). SIGEO is a global network of 40 large-scale forest dynamics plots in 21 countries. The network is a U.S.-led resource that investigates forest dynamics and the response of forests and the ecosystem services they provide - carbon storage, water provision and biodiversity conservation -- to climate change. National and international science education, training and capacity building are core missions of STRI and SIGEO.

My purpose today is to use my experience at STRI to summarize the main themes and importance of post-secondary STEM education at the Smithsonian. At STRI we host more than 1000 visiting undergraduate, graduate and postdoctoral researchers. Our approach is to partner outstanding scientists with outstanding young scholars. At STRI, we apply state-of-the-science technologies to understand the nature and origins of biodiversity, the causes and consequences of climate change, the interconnectedness of global ecosystems, and the cultural heritage of Native American peoples. We mix the necessary, more traditional long-term measurement and observations about the natural world with innovative, new analytic techniques and approaches. At each of the science research units at the Smithsonian the contribution to training the next generation of scientists is impressive and the Institution is recognized at the national and international level for producing scientific leaders. Outstanding examples include education in tropical biology (STRI), astronomy and astrophysics (Smithsonian Astrophysical Observatory), species survival biology (National Zoological Park), biodiversity (National Museum of Natural History) and invasive species biology and coastal zone processes (Smithsonian Environmental Research Center). And the Smithsonian partners with the National Academy of Sciences to develop award- winning science curricula through the National Science Resources Center. We are a remarkable U.S. resource responsible for training the next generation of scientists.

Background:

What has made STRI such an important resource for educating the next generation of scientists? The answer is long-term federal investment in world-class resident scientists supported by superb research facilities located adjacent to tropical forests and coral reefs. This year, 2010, the Smithsonian marks a century of research in Panama, tracing back to the 1910-1912 Smithsonian Expeditions to Panama authorized by President William H. Taft. From the humble beginning of a single research station on Barro Colorado Island (BCI) located in the middle of the Panama Canal, STRI has

developed dramatically. STRI is an international focal point for scientists and students interested in the ecological and evolutionary processes that underlie the extraordinary biological diversity of rain forest and coral reef ecosystems. These processes are palpable on an isthmus that formed three million years ago and transformed our planet by joining the continents of South and North America, and separating the Caribbean Sea from the Eastern Pacific Ocean. Long-term environmental research is a STRI trademark, more than eighty years in the case of the forests on Barro Colorado Nature Monument (BCNM), protected under the terms of the Convention on Nature Protection and Wildlife Preservation in the Western Hemisphere, ratified by the U.S. Senate in 1941. The BCNM is the only mainland tropical forest reserve in the world under U.S. stewardship.

The long-term research conducted by STRI scientists, collaborators and students is a critical contribution to the Smithsonian Institution's 2010-2015 strategic plan "A Smithsonian for the Twenty-First Century" set forth in 2009, particularly through its contributions to the Grand Challenge, Understanding and Sustaining a Biodiverse Planet, but STRI also contributes through its Paleontology program to Unlocking the Mysteries of the Universe, and through its Anthropology and Archeology programs to Valuing World Cultures. As noted in the Smithsonian's strategic vision, the importance of long-term assessment and analysis of forests and ecosystem function in a world marked by significant biodiversity loss and climate change led to the establishment of the BCI 50 hectare forest plot in 1980, a model that has now been replicated at 40 sites around the world including six in the United States providing an innovation platform for new observation technologies.

With laboratories on both coasts of Panama, STRI is the only institute in the Americas providing direct research access to both the Pacific and Atlantic oceans. The two-ocean stage provided by STRI marine facilities permits scientists and their students to move between experiments in the eastern Pacific and Caribbean in a few hours, and represents a principal component of the Smithsonian Marine Science Network extending from the Chesapeake to Florida, Belize and Panama. The recurring two-ocean theme in marine science at STRI has resulted in landmark studies of the evolution and ecology of tropical marine species and communities, as well as research funded by the National Science Foundation (NSF) and the National Institutes of Health (NIH) for ecologically guided discovery of novel pharmaceutical compounds, and research funded by the U.S. Department of Agriculture (USDA) for discovery of novel agrochemicals from nature. Marine facilities with easy access to two oceans take on increased importance as an experimental platform for studying the impact of climate change and ocean acidification on near shore coral reefs, sea grasses, and mangroves.

In addition, BCI and STRI represent important facility resources for other

federal agencies, and serve as the base for tsunami monitoring equipment installed by the U.S. Geological Survey; and as sites to monitor mosquitoes and their role as disease vectors by the Environmental Protection Agency, or survey wildlife that could be carriers of avian influenza and other animal-borne diseases in projects funded by NIH. Thus extraordinary science facilities, the unique geography of Panama and the country's long-term and strongly positive association with the United States, and a world-class group of 40 resident scientists has led STRI to play a key role in the education of tropical biologists. It is fair to say that nearly all tropical biologists pass through STRI at some point in their careers -- many in the formative stages of their development.

Science/Technology/Engineering/Math Education at STRI - General:

STRI's research excellence is a function of our ability to attract and nurture the best and brightest young researchers. Indeed, supporting and training promising young scholars is a cornerstone of STRI science and builds our capacity to understand a biologically diverse planet and solve Earth's most challenging environmental problems. STRI actively participates in science, technology, engineering and math (STEM) training: directly by supporting interns, PhD students and postdoctoral scholars, and indirectly by partnering with universities concerned with tropical research and education. Both education avenues foster transformational science by connecting researchers and students with diverse backgrounds, experiences and skills. STRI also partners with institutions in Panama to develop STEM training for Panamanian students at our facilities.

Education at STRI is strongly assisted by mentors of exceptional ability. The relevance, quality, and performance of STRI scientists as mentors of the next generation of tropical biologists is top tier, as evaluated by a Visiting Committee of outside experts. In a recent review, the Visiting Committee used National Research Council criteria to measure the productivity and impact of STRI science compared to 142 of the best university research departments in the United States; STRI scientists ranked first in all measures of scientific relevance (e.g., publication citations), quality (e.g., scientific honors), and productivity (e.g., publication numbers). Furthermore, the number of young scientists who choose STRI as the base for their graduate and postgraduate research training provides an annual measure of the relevance and quality of STRI science to the future of tropical biology and policy. 2009 marked the fifth year in a row that the number of visiting scientists and students choosing to base their research at STRI has increased, from the previous year, to the point that STRI now participates in the training of more than 1000 scientists annually. The extraordinary hallmark of STEM education at STRI is the mentor-directed research training provided at the undergraduate level to research interns, and at the graduate level to Master's and PhD

candidates, and to postdoctoral researchers carrying out independent or collaborative research. Over the past 5 years NSF grants have directly supported 81 undergraduate students, 97 graduate students and a remarkable 71 postdoctoral scholars at STRI facilities. For the same period 57 university faculty spent time at STRI on NSF-supported research.

The numbers that I have provided for NSF-associated scholars are exceeded by the numbers in each category of young investigators supported by Smithsonian funds, non-NSF grants and contracts and donations. For example, we received a \$1.5 million dollar donation from a private citizen to fund three 5-year postdoctoral positions in tropical neurobiology. The idea behind the donation is to use the remarkable biological diversity found in the tropics to inform new approaches to nanotechnology by understanding how insects carry out complex behaviors as brains decrease over evolutionary time to very small sizes. In 2007, we received an \$8 million dollar grant from the Hong Kong Shanghai Bank (HSBC) to establish a regional training center at SERC in Maryland in collaboration with the environmental organization Earthwatch Institute in order to promote science education and citizen involvement in climate change science. The HSBC grant funds citizen scientists, undergraduate research interns, graduate students and postdoctoral researchers to study how climate change impacts carbon fluxes across SIGEO forest dynamic sites in Maryland and Virginia as well as across companion training centers located in Brazil, United Kingdom, China and India.

To provide a sense of the resonance associated with the educating of scientists at STRI, it is useful to highlight the experience of Dr. Phyllis Coley, a PhD student at STRI in the 1980s. Dr. Coley went on to a career as professor of biology at the University of Utah, and then supported by NSF continued her groundbreaking studies of herbivory and plant defenses in the field in Panama. In the late 1990's Dr. Coley's insights into chemically mediated plant defenses led her to develop a Panama International Cooperative Biodiversity Group (ICBG) grant. The ICBG program is a unique effort that addresses the interdependent issues of biological exploration and discovery, socioeconomic benefits, and biodiversity conservation. Dr. Coley was successful with her application and the Panama ICBG is now in its third round of funding by NIH, NSF, and now includes funding from USDA as well. Twelve years later the program has trained 21 students - - including 10 PhDs and 2 MD's -- representing 19 U.S. universities. The program has also educated 135 Panamanian students and 15 young investigators from other nations in the study of ecology and natural products chemistry. But the true resonance comes from the fact that four recent Panama ICBG PhDs and postdoctoral researchers are continuing with their Panama- based research as beginning faculty in departments of Chemistry or Pharmaceutical Sciences at the University of California, Santa Cruz, University of Connecticut, York College of Pennsylvania and Oregon State University.

STRI also maintains robust partnerships with a number of universities that offer degree-granting, semester-abroad, capstone or collaborative research programs. These partnerships provide students, teachers, and policy makers with an up-close and personal experience with biological diversity at our field stations across Panama, and an increased understanding of global threats to tropical ecosystems. To provide some numbers, in the past 5 years alone STRI has hosted 43 U.S. universities offering 65 different courses in tropical biology and anthropology. These courses have utilized STRI facilities, STRI staff scientists and the knowledge of the tropics gleaned across a century of study to educate 825 undergraduate students. Princeton University has run a semester abroad at STRI every year since 1998. Courses range from forest ecology, marine ecology, tropical evolution, tropical conservation, tropical landscape ecology, tropical paleontology, Mesoamerica anthropology and archeology, conservation genetics and tropical environmental policy. Courses are typically run from STRI facilities at our Gamboa campus and BCI in the midst of tropical lowland forest, and our Bocas del Toro marine laboratory adjacent to mangrove, sea grass and coral reef ecosystems, in addition to a tropical cloud forest field site at La Fortuna and archeological excavations at Cerro Juan Diaz and El Cano.

STEM Education at STRI - The SIGEO model:

A major goal of the 2010-2015 strategic plan for the Smithsonian is headlined ``Crossing Boundaries,`` which refers to the implementation of interdisciplinary consortia aimed at sparking innovative research and education programs, and brokering partnerships. These consortia are being established in recognition of the fact that solving the grand challenge of Understanding and Sustaining a Biodiverse Planet requires integrating information across different biological scales (i.e. from cells to individuals to ecosystems) and different fields of scientific inquiry. Key to these challenges is training scientists to: 1) work comfortably across research disciplines and biological scales, 2) interact synergistically, 3) incorporate new and innovative technologies, and 4) participate in larger national and international collaborations.

Presently, SIGEO is the best example of an interdisciplinary center and boundary-crossing training opportunities at SI. Global climate systems and life on the planet are in flux. Policy-makers and scientists need long-term data on the fluctuations in primary productivity of forests around the globe, as well as changes in the abundance and distribution of biological diversity, to distinguish the components of global change that can be ascribed to planetary processes from those that may be caused by human activity. The Smithsonian Institution is building on its unique research and science education infrastructure to provide the required data by

expanding its global network of long-term tropical forest dynamic plots into the temperate zone and by collecting additional data on vertebrates, insects and soil microorganisms, in addition to the trees that we have monitored for three decades. It is the students being educated by the Smithsonian that will answer the following questions: Does climate change significantly alter forest biomass, and does the rate of carbon sequestration by forests vary with latitude, hydrological condition and soil fertility? How are the diversity and the relative abundance of forest organisms changing over time and space? What components of observed changes are due to human activities? How can we modify our behavior and economies?

SIGEO promotes large-scale environmental monitoring and maintains enormous banks of data and metadata, which help galvanize advanced data networks and sophisticated analyses, extending from single forest plots to the remote sensing of forests at landscape scales monitored from space-based observatories. The result -- big data sets, global comparisons and research and policy opportunities to investigate the impact of climate change on forest function -- attract top-caliber students and provide extraordinary opportunities in science education. Thus it is little wonder that students attracted to the long-term data of SIGEO go on to big things. Dr. Helene Muller-Landau, for example, went on from her Princeton University PhD dissertation research on seed dispersal and community dynamics of the BCI SIGEO forest plot to a position as an Assistant Professor at the University of Minnesota. In quick turn, Dr. Muller-Landau was honored with an \$875K Packard Fellowship for Science and Engineering -- one of 16 new faculty members selected out of 100 national nominees by university presidents across the U.S.. Dr. Muller-Landau is now the lead scientist for the SIGEO Global Forest Carbon Research Initiative.

The Global Forest Carbon Initiative provides in situ measures of above- and below-ground carbon and its change over time in response to rising levels of carbon dioxide. Two recent and high profile publications by young scholars associated with the SIGEO network provide direct evidence of the quality of science education based from the network. In the first study a PhD student using 25 years worth of data from two forest plots (BCI, Panama and Pasoh, Malaysia) has shown that, despite increased atmospheric carbon fertilization, the growth rates of trees have decreased in at least some tropical forests, perhaps in response to global warming. On the other hand, research led by a SIGEO postdoctoral investigator using 30 years of data on long-term changes in species survival and growth in mapped plots of tens of thousands of trees at SERC on the Rhode River in Maryland, has demonstrated that the rate of carbon sequestration is increasing in the Maryland sample of temperate forests. These two studies demonstrate the need for objective long-term data, and the utility of the global network of forest plots to provide opportunities for educating scientists and for the critical empirical data needed for modeling carbon dynamics and directly

measuring the response of global forests to environmental change. Young scholars play a direct role in the network's overall aim to forecast the consequences of global climate change on forest function and biodiversity in tropical and temperate forests, and to provide objective and rigorous scientific data quickly via the World Wide Web to scientists, policy makers, and people around the world.

It is worth emphasizing that students and scientists like Dr. Mueller-Landau play a major role for STRI and SIGEO in directly supporting U.S. government goals in the environmental sciences. Such activities send an international message regarding the U.S. commitment to the provision of objective, long-term data needed for understanding the consequences of climate change. As one of the premier U.S.-led international partnerships, SIGEO integrates the SI network of forest dynamics plots with the U.S. Group on Earth Observations (USGEO), and promotes an international Global Earth Observation System of Systems (GEOSS) to further advance the progress of science and science education across borders. In the context of Global Earth Observatories, the Smithsonian collaborates with the Environmental Protection Agency (EPA), United States Geological Survey (USGS), U.S. Department of Agriculture (USDA) Forest Service, the National Oceanic and Atmospheric Administration (NOAA), the National Aeronautics and Space Administration (NASA), and NSF's National Ecological Observation Network (NEON). NEON and SIGEO sites are co-located in Virginia/Maryland (Smithsonian Conservation Biology Institute/SERC), the Harvard Forest, MA, and the Wind River Experimental Forest, WA, providing a tremendous opportunity for cross-fertilization and synergy between the two earth observation networks.

Moreover, SIGEO extends globally beyond the Smithsonian and direct partners. As an educational resource, the SIGEO network leverages huge intellectual horsepower, much of that from PhD students and postdoctoral fellows. The network is extremely well used by independent, university-associated faculty, students and network partners. More than 200 scientists have published research from the SIGEO data sets, many of them students, attesting to the broad usability and science education benefits of the network. One measure of this effective leveraging is the large number of NSF-funded research projects based within the network. As one example, Dr. Stephen Hubbell, currently a UCLA professor of biology and originator of the first 50 hectare forest plot on BCI 30 years ago, has directed approximately \$7 million dollars in NSF support to his studies of forest dynamics. In the process Dr. Hubbell has chaired the PhD committees of 19 students currently found on the faculties of Stanford University, University of Minnesota, Ohio State University, Louisiana State University, Taiwan University and others, and as science leaders on the staff of SAS Institute, Wisconsin Department of Natural Resources, National Park Service of Portugal and The Nature Conservancy. Dr. Hubbell has also trained 9

postdoctoral researchers on the faculties of the University of Illinois, University of Pittsburgh, STRI and others, who carry on the tradition of STRI-based science education. The tradition of science education is so profound across the SIGEO network, that Harvard and Yale universities have provided \$9 million over five years to support the network and its science education and policy initiatives.

STEM education at STRI- looking forward:

The long-term, cross-disciplinary, multicultural and collaborative nature of STRI science provides unique STEM training opportunities for the leaders of tomorrow. As we look to the future, landscape transformation and remediation in the developing world will take on increasing prominence as we consider food and water security and human migration associated with sea level rise and desertification. Science education in this light is critical, a need that the Smithsonian is addressing with the Panama Canal Watershed Experiment, a collaboration between the Panama Canal Authority, Panama National Environmental Authority, the HSBC Climate Partnership and universities around the world. The experiment is large-scale and aims to quantify the diverse set of ecological, social, and economic services provided by tropical forests and alternative land use in the Panama Canal Watershed. The project is a remarkable science education tool that takes advantage of the Panama Canal's central role in world commerce to focus global attention on ecosystem services provided by tropical forests.

The Panama Canal Watershed Experiment is also an extraordinary research and education opportunity. The experiment provides scaling opportunities across the 300,000-hectare Panama Canal watershed using remote sensing technologies. These studies are carried out in conjunction with students and postdoctoral researchers at the Carnegie Global Ecology Institute at Stanford University. It is also important to note that climate variation in the Panama Canal Watershed, particularly El Nino and La Nina events, provide experimental results that can be used to build models permitting the forecasting of ecosystem services under different climate change scenarios. In addition to studying services delivered locally, the experiment takes specific aim on ecosystem services that affect people at some distance. For example, the Panama Canal shortens shipping routes and reduces carbon emissions associated with transportation, thus extending the benefits of water management in the Panama Canal watershed from local to global. The list of ecosystem services that the Panama Canal watershed provides and different opportunities for science and engineering education is impressive: 1) regulation of water supply to the canal - ensuring sufficient water to run the locks and reduction of the risk of floods; 2) regulation of drinking water quality for more than 50% of the population of Panama; 3) hydropower; 4) regulation of soil erosion and siltation in the Panama Canal; 5) avoided deforestation, reforestation and carbon

sequestration, which couple to represent a low-risk opportunity for the United Nations Framework Convention on Climate Change Reduced Emissions from Deforestation and Degradation approaches; 6) timber and food production; 7) provision of ecosystem processes and habitat for endangered species; 8) regulation of disease vectors; and 9) ecotourism.

We also continue to build on our record of research and training excellence through increased partnerships with U.S. universities. Recently, the Smithsonian has established research and training partnerships with the University of Maryland, George Mason University and Arizona State University (ASU). The ASU partnership, in particular, seeks to connect undergraduate and graduate students interested in global environmental change to the tropical ecosystems where environmental transformation is the most pronounced. Student researchers are also using information about past tropical environments to inform our interpretation of earth's response to climate change. The University of Florida and STRI, led by paleontologist Carlos Jaramillo, have recently been awarded \$3.8 million dollar NSF International Partnership in Research and Education (PIRE) grant to study new fossils and geology exposed by the excavations of the multi-billion dollar expansion of the Panama Canal. This massive excavation provides PIRE undergraduate and graduate students with an unparalleled opportunity to strengthen our understanding of the role the Isthmus of Panama has played with regard to climate and biodiversity change through time, and a unique perspective on how increasing CO₂ levels may shape the forests of the future.

Lastly, STRI is in the process of developing new relationships aimed at utilizing STRI's scientific legacy and position in the tropics to increase STEM education for an increasingly diverse student community. As a concrete step in this direction, STRI established the new position of Academic Dean in late 2009 -- a first for the Institution. The role of the Dean is to further align STRI science with education and training opportunities, and immediate results are new relationships with: 1) NSF Tree of Life, Encyclopedia of Life and taxonomy workshops focused on the marine biology of Bocas del Toro; 2) Louisiana State University to create a NSF/Louis Stokes Alliance for Minority Participation Center for International Research (funding pending); 3) University of Texas at Austin to establish a NSF Research Experiences for Undergraduates collaboration (application in development); and 4) University of Illinois Urbana-Champaign to develop a NSF Integrative Graduate Education and Research Traineeship (IGERT) program (application for full proposal to NSF approved June 2010). Reviewers of the IGERT pre-proposal favorably recognized the strengths that STRI brings to the collaboration, and to a science education model that aligns emerging genomic technologies with intimate knowledge of the organisms themselves.

Wolbach Library: CfA in the News ~ Week ending 1 August 2010

1. **Research from J.W. Wu et al broadens understanding of astronomy**, Science Letter, p3148, Tuesday, August 3, 2010
2. **Research from J.S. Nichols and colleagues has provided new data on astronomy**, Science Letter, p3147, Tuesday, August 3, 2010
3. **New research on solar research from A. Moullet and co-authors summarized**, Science Letter, p2066, Tuesday, August 3, 2010
4. **Senate Environment and Public Works Subcommittee on Water and Wildlife Hearing**, Congressional Documents, Tuesday, July 27, 2010

Record - 1

DIALOG(R)

Research from J.W. Wu et al broadens understanding of astronomy,
Science Letter, p3148,
Tuesday, August 3, 2010

TEXT:

According to recent research from the United States, "We have mapped over 50 massive, dense clumps with four dense gas tracers: HCN J = 1-0 and 3-2; and CS J = 2-1 and 7-6 transitions. Spectral lines of optically thin (HCN)-C-13 3-2 and (CS)-S-34 5-4 were also obtained toward the map centers."

"These maps usually demonstrate single well-peaked distributions at our resolution, even with higher J transitions. The size, virial mass, surface density, and mean volume density within a well-defined angular size (FWHM) were calculated from the contour maps for each transition. We found that transitions with higher effective density usually trace the more compact, inner part of the clumps but have larger linewidths, leading to an inverse linewidth-size relation using different tracers. The mean surface densities are 0.29, 0.33, 0.78, 1.09 g cm⁻² within FWHM contours of CS 2-1, HCN 1-0, HCN 3-2, and CS 7-6, respectively. We find no correlation of L-IR with surface density and a possible inverse correlation with mean volume density, contrary to some theoretical expectations. Molecular line luminosities L'(mol) were derived for each transition. We see no evidence in the data for the relation between L'(mol) and mean density posited by modelers. The correlation between L'(mol) and the virial mass is roughly

linear for each dense gas tracer. No obvious correlation was found between the line luminosity ratio and infrared luminosity, bolometric temperature, or the L-IR/M-Vir ratio. A nearly linear correlation was found between the infrared luminosity and the line luminosity of all dense gas tracers for these massive, dense clumps, with a lower cutoff in luminosity at $L\text{-IR} = 10(4.5) L\text{-circle dot}$. The L-IR-L'(HCN1-0) correlation agrees well with the one found in galaxies. These correlations indicate a constant star formation rate per unit mass from the scale of dense clumps to that of distant galaxies when the mass is measured for dense gas," wrote J.W. Wu and colleagues (see also).

The researchers concluded: "These results support the suggestion that starburst galaxies may be understood as having a large fraction of gas in dense clumps."

Wu and colleagues published their study in *Astrophysical Journal Supplement Series (The Properties Of Massive, Dense Clumps: Mapping Surveys Of Hcn And Cs. Astrophysical Journal Supplement Series, 2010;188(2):313-357)*.

For additional information, contact J.W. Wu, Harvard Smithsonian Center Astrophysics, 60 Garden St., MS78, Cambridge, MA 02138, USA.

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

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Record - 2

DIALOG(R)

Research from J.S. Nichols and colleagues has provided new data on Astronomy,
Science Letter, p3147,
Tuesday, August 3, 2010

TEXT:

"Variable stars have been identified among the optical-wavelength light curves of guide stars used for pointing control of the Chandra X-ray Observatory. We present a catalog of these variable stars along with their light curves and ancillary data," investigators in the United States report (see also).

"Variability was detected to a lower limit of 0.02 mag amplitude in the

4000-10000 angstrom range using the photometrically stable Aspect Camera on board the Chandra spacecraft. The Chandra Variable Guide Star Catalog (VGUIDE) contains 827 stars, of which 586 are classified as definitely variable and 241 are identified as possibly variable. Of the 586 definite variable stars, we believe 319 are new variable star identifications. Types of variables in the catalog include eclipsing binaries, pulsating stars, and rotating stars. The variability was detected during the course of normal verification of each Chandra pointing and results from analysis of over 75,000 guide star light curves from the Chandra mission. The VGUIDE catalog represents data from only about 9 years of the Chandra mission. Future releases of VGUIDE will include newly identified variable guide stars as the mission proceeds. An important advantage of the use of space data to identify and analyze variable stars is the relatively long observations that are available. The Chandra orbit allows for observations up to 2 days in length. Also, guide stars were often used multiple times for Chandra observations, so many of the stars in the VGUIDE catalog have multiple light curves available from various times in the mission. The catalog is presented as both online data associated with this paper and as a public Web interface. Light curves with data at the instrumental time resolution of about 2 s, overplotted with the data binned at 1 ks, can be viewed on the public Web interface and downloaded for further analysis. VGUIDE is a unique project using data collected during the mission that would otherwise be ignored. The stars available for use as Chandra guide stars are generally 6-11 mag and are commonly spectral types A and later. Due to the selection of guide stars entirely for positional convenience, this catalog avoids the possible bias of searching for variability in objects where it is to be expected. Statistics of variability compared to spectral type indicate the expected dominance of A-F stars as pulsators," wrote J.S. Nichols and colleagues.

The researchers concluded: "Eclipsing binaries are consistently 20%-30% of the detected variables across all spectral types."

Nichols and colleagues published their study in *Astrophysical Journal Supplement Series* (The Chandra Variable Guide Star Catalog. *Astrophysical Journal Supplement Series*, 2010;188(2):473-487).

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

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

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Record - 3

DIALOG(R)

New research on solar research from A. Moullet and co-authors summarized,
Science Letter, p2066,
Tuesday, August 3, 2010

TEXT:

"Many of the key properties of Io's atmosphere, such as its spatial distribution, temperature, column density and composition, are still not fully assessed despite decades of extensive observations. The contribution of the possible gas sources to the atmospheric replenishment are then still unclear," scientists in the United States report (see also).

"This paper presents disk-resolved observations performed with the Submillimeter Array (SMA) at 345 GHz of atmospheric rotational lines of the main atmospheric species SO₂, and, for the first time, of the minor species SO and NaCl. All these species appear concentrated on the anti-jovian hemisphere, but do not share the same spatial distribution. The obtained maps and line-averaged fluxes are compared to realistic models simulating gas sources including volcanic plume outgassing, SO₂ frost sublimation and photolysis. Arguments in favor of each source are examined and compared to observations, putting constraints on their relative roles for each species. While sublimation clearly appears as the favored major source for SO₂, SO₂ photolysis may account for most of the production of SO. Using constraints on the volcanic plumes distribution from Galileo results, we find that direct volcanic input can only contribute for a minor fraction of atmospheric SO₂, but represent a more significant source for SO atmosphere, and is likely to be the only source for NaCl," wrote A. Moullet and colleagues.

The researchers concluded: "Temperature and column densities findings are also presented for SO₂, and compare well to previously published observations and atmospheric models."

Moullet and colleagues published their study in *Icarus* (Simultaneous mapping of SO₂, SO, NaCl in Io's atmosphere with the Submillimeter Array. *Icarus*, 2010;208(1):353-365).

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

The publisher's contact information for the journal *Icarus* is: Academic Press Inc. Elsevier Science, 525 B St., Ste. 1900, San Diego, CA 92101-4495, USA.

Record - 4

DIALOG(R)

Senate Environment and Public Works Subcommittee on Water and Wildlife Hearing,

Congressional Documents,
Tuesday, July 27, 2010

TEXT:

Thank you Chairman Cardin and distinguished members of the Subcommittee for the opportunity to provide testimony today on the role that the Smithsonian Institution might play in assisting in the aftermath of the oil spill in Gulf of Mexico. My name is Eva Pell. I joined the Smithsonian Institution in January of this year after a long career at Penn State University where I served as a faculty member studying the effects of air pollutants on vegetation; and then as the Senior Vice President for Research and Dean of the Graduate School. I now have the privilege of serving as the Undersecretary for Science at the Smithsonian where I oversee 500 research scientists and the operations of the National Museum of Natural History; the National Air and Space Museum; the National Zoo and its Conservation Biology Institute in Front Royal, Va.; the Smithsonian Astrophysical Observatory in Cambridge, Mass.; the Smithsonian Environmental Research Center in Edgewater, Md.; the Smithsonian's Museum Conservation Institute in Suitland, Md.; and the Smithsonian Tropical Research Institute in Panama. Collectively we care for an estimated 137 million specimens. About one third of our collections and staff focus on the marine realm.

Regarding the Deepwater Horizon oil spill, knowing what the conditions were like before the event is essential to understanding its impact. The Smithsonian is committed to long-term studies of ecosystems and biodiversity, and the data and collections that have resulted can play a crucial role in situations such as that posed by the gulf oil spill. For example, in 1986 more than 50,000 barrels of oil impacted the coast of Panama, including the habitats adjacent to the Galeta Marine Laboratory of the Smithsonian Tropical Research Institute. Because the Smithsonian had already studied this site for many years, the Department of Interior's Bureau of Ocean Energy Management, Regulation and Enforcement (BOEMRE) (formerly known as the Minerals Management Service) chose the Smithsonian to assess the impact of the spill. This study was one of the first to clearly document the long term effects of oil on soft bottom marine habitats such as are found along the U.S. Gulf Coast. Collections documenting this study (see below) are archived at Smithsonian's National

Museum of Natural History (NMNH). Throughout history, scientific collections have helped to resolve the issues of the day.

My testimony today focuses on the assistance the collections at the NMNH can provide to a coordinated national response to the Deepwater Horizon oil spill. This spill already has been described by many experts as the worst man-made ecological disaster in U.S. history. The extent of the ecological impact, its geographic extent, and possibilities for remediation at this point are only estimates, not known facts. Given the likely economic impacts of the spill and future costs, the accuracy of before and after comparisons are important. Assembling an accurate and detailed description of the Gulf of Mexico marine ecosystem as it existed prior to the spill is the chief topic I will address today.

Before describing the NMNH collections, I call your attention to research conducted by the Smithsonian Environmental Research Center (SERC) that has distinct relevance to the issue at hand. For the last 11 years SERC has conducted quantitative field surveys of the nearshore invertebrates that comprise the fouling community of North America. The fouling community is a robust environmental indicator of the broader ecosystem structure and function, and these surveys provide an extensive baseline data set of both native and non-native species. SERC surveys (2002) covered a broad geographic extent, including extensive sampling of four major bays in the Gulf of Mexico (Tampa Bay & Pensacola, FL, Galveston Bay & Corpus Christi Bay, TX). This unique data set contains taxonomic information as well as data on the relative abundance and diversity of native and non-native species. The design of our fouling survey offers a very powerful tool to test for possible impacts of the Deep Horizon oil on the ecology of both native and non-native fouling organisms. It is thought that differential invasion success may be related to the degree of habitat disturbance: highly disturbed habitats have open niche space that non-native species exploit, while pristine or less disturbed habitats have less open niche space and greater native biological resistance to invasion.

SERC also has two other important baseline surveys from the Gulf of Mexico. SERC is home to the National Ballast Information Clearinghouse which has been collecting information on ship arrivals and ballast water discharges as vectors of invasive species since 1999. The ballast water data base provides a means to assess the risk of shipping serving to spread toxic oily water from Gulf ports to distant ports in other regions of the U.S. and foreign countries. SERC biogeochemists have baseline samples and analyses from salt marshes and mangrove ecosystems in both Port of Fouchon, Louisiana, and the southern end of Florida, which would allow assessment of oil impacts on these ecological systems.

Thinking also of the service arm of the Smithsonian Institution I am

pleased to report that veterinarians from the Smithsonian National Zoological Park (NZIP) are working on a rotating basis assisting veterinarians from other federal agencies. They are working out of an incident command center in Houma, LA, overseeing the logistics and release of recovering wildlife - primarily birds - from the affected region. At the present time, only veterinarians have been requested by the US Fish and Wildlife Service, but other NZIP animal care staff, as well as migratory bird researchers, stand ready to assist as needed.

National Museum of Natural History and the role of collections:

The National Museum of Natural History (NMNH, previously the US National Museum, in part) has, since its beginning, been linked to the collection activities of the U. S. Government. The 1846 legislation that created the Smithsonian Institution identified the U.S. National Museum as the repository for natural history specimens belonging to the United States, .All collections of rocks, minerals, soils, fossils, and objects of natural history, archaeology, and ethnology, made by the National Ocean Survey, the United States Geological Survey, or by any other parties for the Government of the United States, when no longer needed for investigations in progress shall be deposited in the National Museum. (20 U.S.C. [Sec.] 59). In fact, it was research in the marine environment, the 1838-1842 U.S. Exploring Expedition that made clear the national need for such a repository. The role of the Smithsonian as the primary repository for federally funded collections has been repeatedly affirmed by Congress by legislation in 1879, 1965, 1970, and 1991.

Scientific collections are an essential and irreplaceable component of the national scientific infrastructure, as documented in the 2009 report of the Interagency Working Group on Scientific Collections (OSTP, 2009). Speaking just for the Smithsonian, we collaborate with the Federal Aviation Administration, the U.S. Air Force, and the U.S. Navy to identify birds involved in over 5,000 collisions with airplanes annually. Last summer, a number of Canada geese famously forced US Airways Flight 1549 to land in the Hudson River, luckily with no loss of life. Knowing the species of bird in each collision allows humans, as far as possible, to design systems to minimize collisions. We collaborate with the United States Department of Agriculture (USDA) by hosting 40 USDA entomology staff at NMNH because the collections are critical to their mission of protecting U.S. Agriculture. When the citrus leaf miner invaded the U.S. in 1993, the NMNH collections contained the only identified material in the country. Our scientists rapidly identified the pest, which enabled targeted control programs throughout citrus agriculture regions. Smithsonian collections also played a crucial role in the identification and control of many other invasive species, for example, the veined rapa whelk that damages Chesapeake oyster populations, or the Asian longhorned beetle, on track to cause billions of

dollars of damage to urban trees. Our unique database on volcanic eruptions is the international standard for basic science in this area, supporting plans to mitigate threats to human life near volcanoes, as well as threats to aviation. We also support our armed forces by hosting the Walter Reed Biosystematics Unit, a component of the Walter Reed Army Institute of Research. Mosquitoes, in particular, spread some of the most deadly and debilitating diseases, and NMNH therefore supports the largest and most comprehensive mosquito collection in the world. Another recent example is Hyalomma ticks, which are particularly common and diverse in Iraq. They transmit viral hemorrhagic fevers. Luckily, we have the world's best reference collection of Hyalomma ticks. Wherever our soldiers are, the ability to rapidly identify disease vectors in their environment is crucial to mitigating risk. Our collections have been used repeatedly to answer basic and historical questions regarding many diseases: Lyme disease, influenza, and hemorrhagic fevers, to name a few.

In the near future our collections may play crucial roles in two areas: climate change and ocean acidification. Since 1963 we have archived the results of environmental monitoring in the Antarctic, a partnership with the U.S. Antarctic Program (USAP). Climate models predict that the climate change may be particularly evident at the North and South Poles. The density and scope of our historical collections can provide the .before. to climate change's .after.. Ocean acidification, itself caused by climate change, threatens keystone species--reef builders--of many marine ecosystems. Clams and corals, for example, record growth rates in their skeletons. Those growth rates depend on the availability of calcium carbonate, and that depends on ocean acidification. Growth rates as reflected in the skeletons of marine organisms are an important record of environmental change.

NMNH Collections, BOEMRE, and the Gulf of Mexico:

Since 1979, NMNH has collaborated with the BOEMRE to archive the collections generated by their Environmental Studies Program. The BOEMRE has been conducting intensive environmental studies on the Outer Continental Shelf (OCS) for more than 30 years to support information needs for managing oil and gas development on the continental shelf and slope. Through its initial design, and during the first four years of program activity, the BOEMRE Environmental Studies Program established baseline environmental conditions based on a large number of biological, chemical, and physical parameters. With these baseline conditions, future monitoring studies during and after development would, presumably, have allowed an assessment of the long-term effects of development. After a review and recommendations from the National Academy of Sciences, this program design was revised in 1978. Subsequently, a new program of directed studies has provided data to inform critical decisions before they are required. These baseline surveys took place from 1974 to 1978, and the Smithsonian has all

or most of the specimens they generated in our collections. Specimens from numerous additional BOEMRE-directed studies are also in our collections. Data from these studies, including site and collecting event specific physico-chemical, oceanographic, sedimentary and biodiversity data are available in the various technical reports prepared by program contractors. These reports, available on-line at <https://www.gomr.mms.gov/homepg/espis/espisfront.asp>, provide information that document not only the biodiversity of these sites, but the population characteristics and environmental conditions at the time the samples were collected. For the Gulf of Mexico alone, from 1974-2010, this site provides 109 "baseline" reports, 252 "biology" reports, 86 "fate & effects" reports, and 340 "technical summaries." The availability of this extensive supporting data in conjunction with the specimens themselves makes these collections an irreplaceable research resource for comparative studies on the invertebrate biodiversity (animals without backbones) of the Gulf of Mexico.

These specimens represent one of the most extensive collections of marine organisms from U.S. continental shelves and slopes, in terms of geographic coverage, sampling density (spatial and temporal), number of phyla represented, and associated data collected concomitantly (other organisms, chemical, hydrographic, geologic). The BOEMRE therefore established a system for the archiving of, and access to, these specimens. Through a series of contracts, BOEMRE has partnered with the Smithsonian's NMNH-Department of Invertebrate Zoology (in its role as the repository for federally-funded collections) to ensure the long term maintenance of and access to invertebrates collected during these studies. The BOEMRE Environmental Studies Program deserves praise for the foresight and initiative shown in conducting and preserving the results, especially the collections, from these surveys.

Details of BOEMRE surveys as represented in NMNH Collections:
NMNH to date has received material from 21 continental shelf, slope and canyon surveys as well as two special oil spill surveys. These are: the Atlantic Slope and Rise Program (ASLAR); George's Bank Benthic Infauna Monitoring Program (BIMP); Central Atlantic Benchmark Program (CABP); California Monitoring Program (CAMP); Central and Northern California Reconnaissance Program (CARP); the Canyon and Slope Process Study (CASPS); Central Gulf Platform Study (CGPS); Gulf of Mexico Chemosynthetic Communities (CHEMO); Deep Gulf Shipwrecks of World War II (Deep Wrecks); Northern Gulf of Mexico Continental Shelf

Habitats and Benthic Ecology (DGoMB); the special Ixtoc oil spill survey in the Gulf of Mexico (IXTOC); the South Atlantic Outer Continental Shelf Area Living Marine Resources Study (LMRS); Gulf Of Mexico Hard Bottom Communities (Lophelia); Mississippi, Alabama, Florida Benchmark Program

(MAFLA); Mississippi-Alabama Marine Ecosystem Program (MAMES); Mississippi/Alabama Pinnacle Trend Ecosystem Monitoring Program (MAPTEM); the New England Environmental Benchmark Program (NEEB); the Northern Gulf of Mexico Continental Slope Study (NGOMCS); the special Panama Oil Spill Study (POSP); the South Atlantic Benchmark Program (SABP); the Southern California Baseline Study (SOCAL); the Southwest Florida Shelf Ecosystems Study (SOFLA); and the South Texas Outer Continental Shelf Program (STOCS). In addition to the biological material, more than 200 color slides of animals in situ were received from the MAPTEM program.

During the 30+-year tenure of the contracts between BOEMRE and the Smithsonian, more than 337,012 lots of sorted and identified material and 20,000 lots of unprocessed samples or mixed taxa have been received. .Lot. means a single jar or vial of specimens that have identical collecting data. One lot may comprise one or dozens or thousands of specimens. Therefore lot statistics always underestimate the actual number of specimens involved. Of this number more than 93,000 lots originated from studies in the U.S. Gulf of Mexico and more than 18,000 lots originated from the studies following the oil spill in Panama. In that case, Smithsonian marine scientists also led a scientific study (funded by BOEMRE, see above) of the ecological consequences of the oil. It remains a benchmark study in the field.

In the aggregate these collections document at least 4,000 species of marine invertebrates from 602 families from 22 phyla. Recent scientific publications document that the Gulf as a whole contains roughly 15,000 species, with perhaps another 3,000 species still undiscovered. These represent everything from ecological keystone species to economically important species to potentially threatened or endangered species. .Keystone. species are those on which most of the rest of the ecosystem depends. The North Atlantic cold water coral (*Lophelia pertusa* (Linnaeus, 1758) is a keystone species because it is one of the most important deep water reef-builders, and thus fundamental to deep marine ecosystems. It occurs within 20 or so miles of the Deepwater Horizon well-head, as documented by trawl samples from 1984 and direct observation from submersibles during BOEMRE -funded studies between 2004 and as recently as September of last year. Economically important species are the focus of the National Oceanic and Atmospheric Agency's National Marine Fisheries Service. Examples are the three commercially important Gulf shrimp species (pink and brown shrimps, *Farfantepenaeus duorarum* and *F. aztecus*, and the white shrimp, *Litopenaeus setiferus*), all of which are well-represented in NMNH collections. Endangered or .at risk. species include several populations of genetically distinct bottlenose dolphins, and the Florida manatee, which is particularly vulnerable to oil fouling of the plants on which they feed. Finally, many of the species collected through these surveys were entirely new: between 300 and 400 new species were described based on these collections and many more await description.

Distinct Roles of Smithsonian and BOEMRE:

The Smithsonian role in this partnership has been the archiving of the collections that support these technical studies, the improvement of the scientific quality of the collections as resources permitted, and making them publicly available in digital form through our website. BOEMRE conducted the surveys, received reports from the scientists and contractors involved, and is therefore the final authority on data and analyses extracted from the collections. The Smithsonian enhances the value of the collections by meticulously creating digital records for each sample of specimens, including precise georeferenced locality data and other important ecological aspects. Few other museums have the resources to create so many records of such high quality. The quality and quantity of digitally available data will make these collections in particular extremely valuable to scientists seeking information on the pre-spill ecosystem.

Importance of Collections:

To give the committee some idea of the importance of these collections, the staff recently estimated that fully 58% of publicly available specimen-based records from the Gulf of Mexico represent Smithsonian collections. I would like to emphasize that many marine research institutions around the Gulf and elsewhere will play key roles in assessing damage and measuring remediation and recovery in the years ahead. The Smithsonian is ready to collaborate and support that work in any way it can. It is also likely that many scientists and institutions have data or collections that are not publically available (i.e. accessible via on-line databases) that are highly relevant to the Deepwater Horizon oil spill. However, the massive size and quality of the BOEMRE survey collections at the Smithsonian will surely continue to be an important resource.

These collections, therefore, represent a unique and now irreplaceable resource to describe quantitatively the pre-spill Gulf of Mexico ecosystem. The depth range of these collections is enormous, ranging from five to nearly 3,000 meters (nearly two miles). From the label data we calculated that specimens were accessed at 459 distinct depths. The deep collections are especially valuable because survey work at such depths is extremely expensive and limited. Given the depth of the Deepwater Horizon well-head, data on abyssal communities are especially important. A Gulf-wide BOEMRE-funded deepwater study listed above as DGoMB was recently published and includes a number of these deep stations very near the spill site in its database. The total number of distinct geographic points sampled is roughly 1,000. In short, by the standards of biological sampling in general, and especially considering the rarity of deep-water samples, these collections

are truly impressive.

Ideally, the scientists that will carry out inventories and surveys of the post-spill environment will want exactly comparable pre-spill surveys, using the same methods, and designed for the same analytical protocols. There is one ongoing BOEMRE and NOAA-funded study of deep corals in the vicinity that is ideally suited to this task. We cannot say at this time to what extent the 1974-1978 baseline surveys, and most surveys since then, fulfill these stringent requirements. Even if the background raw data are not available, it is possible that such data could be regenerated directly from NMNH collections. In conclusion, it is already obvious that NMNH collections have had, and will have, an important role to play in describing the pre-spill ecosystem.

Thank you for the opportunity to testify today and I look forward to answering any questions you may have.

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Wolbach Library: CfA in the News ~ Week ending 15 August 2010

1. **Findings from L.S. Rothman et al in spectroscopy reported**, Science Letter, p713, Tuesday, August 17, 2010
2. **Studies from L.S. Rothman and co-researchers yield new data on reactive oxygen species**, Science Letter, p4314, Tuesday, August 17, 2010
3. **Astronomers in Uzbekistan Discover New Minor Planet**, Times of Central Asia, (Kyrgyzstan), Tuesday, August 10, 2010
4. **Masters of disaster: asteroid hunters are determined to protect human beings from outer space invaders**. Irion, Robert, Smithsonian, v41, n4, p90(3), Thursday, July 1, 2010

Record – 1

DIALOG(R)

Findings from L.S. Rothman et al in spectroscopy reported,
Science Letter, p713,
Tuesday, August 17, 2010

TEXT:

"This note provides a brief review of the history and impact of the molecular spectroscopic database known as HITRAN (High Resolution Transmission)," investigators in the United States report (see also).

"We reprint one of the articles describing this database (JQSRT 1998; 60: 665-710), although the series of these papers is among the most cited in the geosciences. HITRAN was established over three decades ago in response to the needs of simulating transmission in the terrestrial atmosphere, and it was enabled by new technology," wrote L.S. Rothman and colleagues.

The researchers concluded: "However the applications of HITRAN, and the requirements on the database, have greatly expanded over the intervening years."

Rothman and colleagues published their study in the Journal of Quantitative Spectroscopy & Radiative Transfer (The evolution and impact of the HITRAN molecular spectroscopic database. Journal of Quantitative Spectroscopy & Radiative Transfer, 2010;111(11 Sp. Iss):1565-1567).

For additional information, contact L.S. Rothman, Harvard Smithsonian

Center Astrophysics, Atom & Molecular Physics Division, 60 Garden St.,
Cambridge, MA 02138, USA.

The publisher of the Journal of Quantitative Spectroscopy & Radiative
Transfer can be contacted at: Pergamon-Elsevier Science Ltd., the
Boulevard, Langford Lane, Kidlington, Oxford OX5 1GB, England.

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Record - 2

DIALOG(R)

**Studies from L.S. Rothman and co-researchers yield new data on reactive
oxygen species,**

Science Letter, p4314,

Tuesday, August 17, 2010

TEXT:

According to a study from the United States, "The publication by G.H. Dieke
and H.M."

"Crosswhite (JQSRT 1962;2:97-199) is a classic paper detailing the
spectroscopy of the A(2)Sigma(+) <- X-2 Pi bands of the hydroxyl radical
(OH) in the ultraviolet region," wrote L.S. Rothman and colleagues (see
also).

The researchers concluded: "It soon became the basis of astrophysical
modeling, most subsequent theoretical and laboratory studies of the OH
individual line parameters, and a host of other applications."

Rothman and colleagues published their study in the Journal of Quantitative
Spectroscopy & Radiative Transfer (A note on a pioneering work in
quantitative spectroscopy: UV bands of the hydroxyl radical. Journal of
Quantitative Spectroscopy & Radiative Transfer, 2010;111(11 Sp.
Iss):1514-1515).

For more information, contact L.S. Rothman, Harvard Smithsonian Center
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Publisher contact information for the Journal of Quantitative Spectroscopy
& Radiative Transfer is: Pergamon-Elsevier Science Ltd., the Boulevard,
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Record - 3

DIALOG(R)

Astronomers in Uzbekistan Discover New Minor Planet,

Times of Central Asia, (Kyrgyzstan)

Tuesday, August 10, 2010

TEXT:

TASHKENT, Aug. 9 (Turkishweekly.net) - On a spectacularly clear night in October 2007, two astronomers pored over celestial images during the course of their usual work at Maidanak Observatory, high in the hills near the town of Kitob, in southern Uzbekistan.

As they examined the images, they noticed a star-like object moving along an apparent orbital path, and decided to track the object and provide the preliminary data to the International Astronomical Union (IAU) Minor Planet Center (MPC), run by the Smithsonian Astrophysical Observatory and Harvard College Observatory in Cambridge, Massachusetts.

To the delight of Alexey Sergeyev, a visiting Ukrainian astronomer, and Bahodir Hafizov, the resident Uzbek astronomer at Maidanak, the MPC confirmed that the object had not been previously documented in their catalogue. The Center assigned the object a provisional designation, and the real work began.

Over the course of almost two years, Hafizov daily plotted the trajectory and defined the precise coordinates of the object until the Center was satisfied that it was indeed a new minor planet, or small solar system body (SSSB), with a known orbit.

After being given an official designation as 210271 in the MPC catalogue, the planet was named Samarkand, after the city that fostered some of the earliest innovations in astronomy.

The Director of Tashkent's Ulugbek Astronomical Institute (UBAI), Shuhrat Ehgamberdiev, is a long-time member of the IAU and runs Maidanak Observatory, which has ongoing cooperation with US and other international institutions. It is this cooperation that has resulted in the technological capability to make such observations.

"This discovery," he says, "was the result of many years of scrupulous observation with the help of the most modern and highly-sensitive equipment." Specifically, the new SSSB was found using a 200,000 dollar

camera-the best in the region-manufactured in the United States and given to UBAI by the Association of Korean Universities.

This kind of international cooperation in the field of astronomy was not possible before independence, notes Ehgamberdiev, because Maidanak was a military satellite ranging station during the Soviet period, and was inaccessible to foreigners.

Today, he remarks, "astronomy is one of the most important priorities in our scientific development," and UBAI has cooperated with numerous international scientists and organizations on a wide variety of projects.

One of the most significant projects on which the Institute is working is the observation of young stars outside our solar system. Since 2001, Maidanak has participated in a young star observational team sponsored by Wesleyan University in Connecticut.

This group of astronomers from around the world has studied and observed the unique composition and activities of KH15D, a star of planet-forming age. It was the first time astronomers observed the first phase of planet formation, an event detailed in the 13 March 2008 issue of Nature, in an article co-authored by Mansur Ibrahimov of UBAI.

According to Ehgamberdiev, the Institute publishes around 20 articles every year in peer-reviewed astrophysical journals, which sets the standard for the region.

Another joint project, also involving Ibrahimov, was the monitoring of the brightness of quasars in cooperation with the University of Pittsburgh's Department of Physics and Astronomy. Quasars are considered the most luminous objects in the universe, comprising the compact region at the center of a young active galaxy.

According to Dr. Turnshek of Pittsburgh, who started working with Maidanak in the mid 90's, accurate monitoring of quasars requires long-term observation. With over two thousand clear hours per year, says Ehgamberdiev, "Maidanak has the most amenable conditions in all of Eurasia" for such studies.

Because of the observatory's ideal location and atmospheric conditions, Maidanak has joined an international program for the monitoring of the Earth's average temperature. Accurate estimates of the Earth's average temperature are impossible through traditional means of data collection; a fact which Ehgamberdiev says few people consider.

Now, however, astronomers have begun calculating the temperature based on Earth's global albedo, or reflectance, which shows the amount of energy directed at the planet. In order to do this, scientists monitor

"earthshine", or the amount of sunlight reflected from the Earth onto the lunar surface. It is an important global project in which Maidanak has a key role.

In addition to seeking more opportunities for international cooperation with Korea, Japan, and others, UBAI also hopes to publish a Maidanak Catalogue of Quasars, a groundbreaking effort comprised of more than 10 years of study. Uzbek astronomers aren't just allowing the use of their facilities for international projects, however.

Another astronomer from the Institute, Shukur Kholikov, is currently working in Arizona with the Global Oscillations Network Group (GONG), in cooperation with the National Solar Observatory, to conduct a detailed study of the sun's internal composition. He works with an international staff of the best solar scientists to study data with immediate implications for space travel and climate studies.

Clearly, the Ulugbek Astronomical Institute is doing more than just discovering new minor planets. Through hard work and cooperation with the global community of astronomers, they have turned Maidanak into a world-class observatory that is helping to solve some of the universe's most complex puzzles. With a young, earnest group of scholars at UBAI, and a new discovery to ignite the interest of the public, the future looks bright for astronomy in Uzbekistan.

(THROUGH ASIA PULSE)

10-08 2010

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Record - 4

DIALOG(R)

Masters of disaster: asteroid hunters are determined to protect human beings from outer space invaders.

Irion, Robert,
Smithsonian, v41, n4, p90(3),
Thursday, July 1, 2010

TEXT:

MOST OF US DO WHAT WE CAN FOR THE ENVIRONMENT, but Rik Hill's actual job is to protect the planet. "Whoa, look at that!" he says, pointing at a moving blip of light on a computer screen. "It's an unknown object. We just discovered one."

We're in an observatory on the summit of Mount Lemmon, a 9,000-foot peak north of Tucson, Arizona.

Hill's boss, Ed Beshore, leans in and nods. "That's an N-E-O," he says, referring to a near Earth object. "It's a nice one. It's bright, and it's moving fast."

Hill, an astronomer, sends an e-mail to the Smithsonian Astrophysical Observatory in Cambridge, Massachusetts, where the Minor Planet Center monitors hundreds of thousands of small bodies in our solar system. The message gives the object's coordinates at the time of its discovery so other astronomers can track it. And they'll want to: an NEO is any asteroid or comet that will come within about 30 million miles of Earth's orbit.

We'll find out in the morning whether this NEO poses a threat. For now, Hill leans back, a cup of strong coffee in hand, and grins. "It's not even midnight, and it's a good night already," he says. By dawn, he will spot two more.

I went to Mount Lemmon to see the top NEO hunters in action. Beshore and Hill are part of the Catalina Sky Survey, which has found about 2,500 NEOs in the past decade--including 577 in 2009, some 70 percent of the total discovered that year. The rocks range from the size of tables to mountains. Most will bypass Earth. But NEOs have plowed into our planet countless times before, and will do so again.

In October 2008, the survey's Rich Kowalski observed a small NEO from this telescope. Within two hours, the Minor Planet Center used sightings by others to chart its trajectory. The asteroid would hit Earth in less than a day. Observers worldwide locked onto it, capturing 570 telescope images. NASA scientists calculated it would strike the Nubian Desert of northern Sudan. It was only the size of a small pickup truck, and most of it would burn up in the atmosphere. Even so, news of the imminent impact went all the way to the White House.

About 19 hours after Kowalski discovered it, asteroid 2008 TC3 lit up the sky above Sudan with the energy of more than 1,000 tons of TNT. Black fragments as large as apples landed in the desert. Two months later, NASA-led researchers collected hundreds of the extraterrestrial rocks.

In one sense, spotting the incoming asteroid was a triumph, because it demonstrated that astronomers can detect even a small projectile heading our way. But the feat was also sobering, because they saw it too late to do anything about it. Hill and his fellow NEO hunters hope to detect large asteroids sooner, preferably years or decades in advance.

"It's the only natural disaster we can stave off," says Don Yeomans,

manager of NASA's NEO command center at the Jet Propulsion Laboratory (JPL) in Pasadena, California.

ODDBALLS OF THE solar system, asteroids are battered chunks of rock and metal that have tumbled around the heavens since the Sun's eight major planets (plus demoted Pluto) formed about 4.6 billion years ago.

Astronomers have cataloged about a half-million asteroids, most in the gap between the orbits of Mars and Jupiter. About 7,000 known NEOs loop wildly among the inner planets, following paths that shift in response to gravity and the Sun's heat. "Their orbits are all over the place," says Paul Chodas of JPL. "They're rebels."

In the desert 175 miles north of Tucson, Meteor Crater is the scar where a boxcar-size hunk of iron slammed into Earth 50,000 years ago. The crater is nearly a mile wide and 550 feet deep, edged with layers of warped and shattered rock. The asteroid blew up with the energy of the largest hydrogen bombs ever detonated on Earth, vaporizing the desert and unleashing deadly supersonic winds for man miles. I visited the crater as night fell, and I felt keenly aware that fragments of the solar system can invade our cozy realm of Earth and Moon.

If a 100-foot-wide asteroid hit Earth, the shock wave from its explosion in the atmosphere could flatten trees and kill every large animal for hundreds of square miles. That's just what happened in 1908 at Tunguska, Siberia. The odds are roughly one in ten that such a blast will occur in the next 40 years. An asteroid 500 feet across could destroy a metropolitan area or spawn massive tsunamis. Those impacts occur every 30,000 years, on average.

Hundreds of known NEOs are more than a mile wide. If an asteroid that big struck Earth, firestorms could produce worldwide clouds of soot that would block sunlight and plunge the planet into an "asteroid winter." That happens every few million year's, scientists estimate. Once every 100 million years or so, an even larger asteroid may cause a mass extinction; most scientists believe a six-mile-wide asteroid doomed the dinosaurs 65 million years ago.

Astronomers with the Catalina survey find new NEOs almost every night. They start by taking four pictures of the same patch of sky, with ten minutes between each exposure, and compare them on a computer screen. While background stars shine in the same place in each image, NEOs appear as four distinct dots along a straight line. The astronomers are skilled at ruling out man-made satellites, electronic sparks from cosmic rays and other streaking objects that could be mistaken for an NEO. "They look at everything with the human eye," NASA's Yeomans says. "They've been doing it for so long, and they're so dedicated."

Hill, who has used telescopes since he was a child during the Sputnik era, has been on the team since 1999. He has found more comets--22--than all but three other people in history (Comets usually originate in the outer solar system and are less common in Earth's neighborhood than asteroids.) During my visit to Mount Lemmon, he made a trumpeting noise just before he pointed out the first NEO to us. "I love what I do," he says. "I would do this for free."

"The Catalina Sky Survey consists of nine astronomers using two modest telescopes in Arizona and one in Australia. The team refurbished a long-unused telescope at Mount Lemmon with a 60-inch mirror, small by modern standards. NASA provides \$1 million per year--peanuts in astronomy circles. "We're very careful and meticulous," says Beshore, a former software engineer who directs the survey. "We get the numbers just right."

As it happens, astronomers at the Catalina telescope in Australia and other sites around the world took pictures of the NEO after Hill discovered it the night of my visit, allowing the Minor Planet Center to calculate its orbit. By the next morning, the results had been posted online: the asteroid didn't threaten Earth. I felt a bit let down; no worldwide scoop for me.

Before Beshore joined the survey in 2002, he was skeptical that he'd spot any hazardous asteroids. "Then I realized, my God, the sky is full of these things," he says. "I have more perspective that yes, this could happen, we might get hit. It would be really satisfying to find an object and then do something about it."

DON YEOMANS often thinks about what that might be. Scale models of asteroids fill the windowsill of his office at JPL in Pasadena. He runs the lab's NEO clearinghouse, which looks nothing like a Hollywood depiction of a planetary-defense headquarters. There are no wall-size display screens, no blinking panels or red telephones, just ordinary-looking offices. But the workers are well aware of their lofty mission. "We don't let our guard down, even for a day," Yeomans says. "It's our job to monitor the inner solar system and make sure none of these objects gets close to the Earth."

The tracking starts at the Minor Planet Center, which archives data from a global network of professional and amateur astronomers. "We inventory the solar system," says center director Tim Spahr. "If the world wants to know about an asteroid, we have the catalog."

The JPL team takes orbit data from the Minor Planet Center and refines it, asteroid by asteroid. A computer program called Sentry projects each NEO's orbit for 100 years. Once an asteroid starts approaching Earth, it will do so again and again in an orbital waltz driven by gravity as both bodies

travel around the Sun. Most NEOs will plunge into the Sun after a million years of this pas de deux.

"It's a mathematical problem, and a fascinating one at that," says JPL's Chodas. "It's just exhilarating."

A 900-foot-wide asteroid called Apophis caused a stir in 2004 when JPL calculated there was a 3 percent chance it would slam into Earth in 2029. With the next set of images, JPL's Steve Chesley forecast a more precise orbit, and he ruled out an impact. However, there's still a tiny chance it will hit in 2036 or 2068--depending on the exact route the asteroid follows during its next pass near Earth.

If Apophis did drift onto a collision course and was headed for Russia, a Russian military official said last year, his country might prepare a mission to knock it off course. But that would be premature, Yeomans says. "You have to be careful about moving asteroids around in space," he adds, lest a deflection inadvertently steer Apophis toward Earth. "They should only be moved if they are a real threat."

Among the groups studying how best to prevent a collision is the B612 Foundation, named for the asteroid in Antoine de Saint-Exupery's *The Little Prince*. Led by Apollo 9 astronaut Rusty Schweickart, the foundation has proposed a mission to anon threatening asteroid to test whether gravity from a hovering spacecraft could shift the asteroid's orbit. "You don't want to blow them up," says Schweickart. "All you need to do to protect Earth is to push them gently."

Exploding an asteroid would require deploying nuclear weapons in space, scientists say. They caution that no one knows how asteroid material would respond to such a blast. Some NEOs are thought to be loosely packed piles of rubble. One recent study suggests that a deliberate explosion would barely disperse the pieces, and they would reassemble under their own gravity.

In Yeomans' mind, scientists have already demonstrated the best technique: ramming. In 2005, a NASA science mission called Deep Impact crashed an 816-pound copper mass into a comet to learn more about its icy interior. If scientists were to detect a 600-foot-wide asteroid ten years in advance, Yeomans says, it could be deflected with a two-ton projectile traveling six miles per second. He says that's enough to make it miss the Earth. Barely.

But given the limited number of astronomers and the small telescopes scanning the sky for asteroid threats, says Yeomans, we probably won't see a small incoming object until it's just a week or two away from hitting us. "In that case," he says, "all you can do is evacuate."

ROBERT IRION has written about comets, black holes, new planets and other astronomical phenomena for SMITHSONIAN.

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Wolbach Library: CfA in the News ~ Week ending 5 September 2010

1. **Research from C.L. Steinhard and co-researchers provides new data on astronomy**, Science Letter, p2422, Tuesday, September 7, 2010
2. **New astronomy study findings have been reported from E. Keto et al.**, Science Letter, p1053, Tuesday, September 7, 2010
3. **NASA SELECTS INVESTIGATIONS FOR FIRST MISSION TO ENCOUNTER SUN**, US Federal News, Friday, September 3, 2010
4. **Spitzer Finds a Flavorful Mix of Asteroids**, National Aeronautics and Space Administration Documents, Thursday, September 2, 2010
5. **Astronomers Identify Two New Solar Systems**, NPR Morning Edition, Friday, August 27, 2010

Record - 1

DIALOG(R)

Research from C.L. Steinhardt and co-researchers provides new data on Astronomy,
Science Letter, p2422
Tuesday, September 7, 2010

TEXT:

According to a study from the United States, "We use 62 185 quasars from the Sloan Digital Sky Survey (SDSS) DR5 sample to explore the quasar mass-luminosity plane view of virial mass estimation. Previous work shows deviations of similar to 0.4 dex between virial and reverberation masses."

"The decline in quasar number density for the highest Eddington ratio quasars at each redshift provides an upper bound of between 0.13 and 0.29 dex for virial mass estimate statistical uncertainties. Across different redshift bins, the maximum possible Mg ii mass uncertainties average 0.15 dex, while H beta uncertainties average 0.21 dex and C iv uncertainties average 0.27 dex. Any physical spread near the high-Eddington-ratio boundary will produce a more restrictive bound. A comparison of the sub-Eddington boundary slope using H beta and Mg ii masses finds better agreement with uncorrected Mg ii masses than with recently proposed corrections," wrote C.L. Steinhardt and colleagues (see also).

The researchers concluded: "The best agreement for these bright objects is

produced by a multiplicative correction by a factor of 1.19, smaller than the factor of 1.8 previously reported as producing the best agreement for the entire SDSS sample."

Steinhardt and colleagues published their study in Monthly Notices of the Royal Astronomical Society (The quasar mass-luminosity plane - III. Smaller errors on virial mass estimates. Monthly Notices of the Royal Astronomical Society, 2010;406(1):L1-L5).

For more information, contact C.L. Steinhardt, Harvard Smithsonian Center Astrophysics, 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)

New astronomy study findings have been reported from E. Keto et al,
Science Letter, p1053,
Tuesday, September 7, 2010

TEXT:

According to recent research from the United States, "We address the question of whether the formation of high-mass stars is similar to or differs from that of solar mass stars through new molecular line observations and modelling of the accretion flow around the massive protostar IRAS20126+4104. We combine new observations of NH₃(1,1) and (2,2) made at the Very Large Array (VLA), new observations of CH₃CN(13-12) made at the Submillimeter Array, previous VLA observations of NH₃(3,3) and NH₃(4,4) and previous Plateau de Bure observations of C₃₄S(2-1), C₃₄S(5-4) and CH₃CN(12-11) to obtain a data set of molecular lines covering 15-419 K in excitation energy."

"We compare these observations against simulated molecular line spectra predicted from a model for high-mass star formation based on a scaled-up version of the standard disc-envelope paradigm developed for accretion flows around low-mass stars. We find that in accord with the standard paradigm, the observations require both a warm, dense, rapidly rotating disc and a cold, diffuse infalling envelope," wrote E. Keto and colleagues (see also).

The researchers concluded: "This paper suggests that accretion processes around 10 M-circle dot stars are similar to those of solar mass stars."

Keto and colleagues published their study in Monthly Notices of the Royal Astronomical Society (The standard model of star formation applied to massive stars: accretion discs and envelopes in molecular lines. Monthly Notices of the Royal Astronomical Society, 2010;406(1):102-111).

For additional information, contact E. Keto, Harvard Smithsonian Center Astrophysics, 160 Garden St., Cambridge, MA 02420, 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 - 3

DIALOG(R)

NASA SELECTS INVESTIGATIONS FOR FIRST MISSION TO ENCOUNTER SUN,
US Federal News,
Friday, September 3, 2010

TEXT:

WASHINGTON, Sept. 2 -- NASA issued the following press release:

NASA has begun development of a mission to visit and study the sun closer than ever before. The unprecedented project, named Solar Probe Plus, is slated to launch no later than 2018.

The small car-sized spacecraft will plunge directly into the sun's atmosphere approximately four million miles from our star's surface. It will explore a region no other spacecraft ever has encountered. NASA has selected five science investigations that will unlock the sun's biggest mysteries.

"The experiments selected for Solar Probe Plus are specifically designed to solve two key questions of solar physics * why is the sun's outer atmosphere so much hotter than the sun's visible surface and what propels the solar wind that affects Earth and our solar system? " said Dick Fisher, director of NASA's Heliophysics Division in Washington. "We've been struggling with these questions for decades and this mission should finally

provide those answers."

As the spacecraft approaches the sun, its revolutionary carbon-composite heat shield must withstand temperatures exceeding 2550 degrees Fahrenheit and blasts of intense radiation. The spacecraft will have an up close and personal view of the sun enabling scientists to better understand, characterize and forecast the radiation environment for future space explorers.

NASA invited researchers in 2009 to submit science proposals. Thirteen were reviewed by a panel of NASA and outside scientists. The total dollar amount for the five selected investigations is approximately \$180 million for preliminary analysis, design, development and tests. The selected proposals are:

* Solar Wind Electrons Alphas and Protons Investigation: principal investigator, Justin C. Kasper, Smithsonian Astrophysical Observatory in Cambridge, Mass.

This investigation will specifically count the most abundant particles in the solar wind * electrons, protons and helium ions * and measure their properties. The investigation also is designed to catch some of the particles in a special cup for direct analysis.

* Wide-field Imager: principal investigator, Russell Howard, Naval Research Laboratory in Washington. This telescope will make 3-D images of the sun's corona, or atmosphere. The experiment actually will see the solar wind and provide 3-D images of clouds and shocks as they approach and pass the spacecraft. This investigation complements instruments on the spacecraft providing direct measurements by imaging the plasma the other instruments sample.

* Fields Experiment: principal investigator, Stuart Bale, University of California Space Sciences Laboratory in Berkeley, Calif. This investigation will make direct measurements of electric and magnetic fields, radio emissions, and shock waves that course through the sun's atmospheric plasma. The experiment also serves as a giant dust detector, registering voltage signatures when specks of space dust hit the spacecraft's antenna.

* Integrated Science Investigation of the Sun: principal investigator, David McComas of the Southwest Research Institute in San Antonio. This investigation consists of two instruments that will take an inventory of elements in the sun's atmosphere using a mass spectrometer to weigh and sort ions in the vicinity of the spacecraft.

* Heliospheric Origins with Solar Probe Plus: principal investigator, Marco

Velli of NASA's Jet Propulsion Laboratory in Pasadena, Calif. Velli is the mission's observatory scientist, responsible for serving as a senior scientist on the science working group. He will provide an independent assessment of scientific performance and act as a community advocate for the mission.

"This project allows humanity's ingenuity to go where no spacecraft has ever gone before," said Lika Guhathakurta, Solar Probe Plus program scientist at NASA Headquarters, in Washington. "For the very first time, we'll be able to touch, taste and smell our sun."

The Solar Probe Plus mission is part of NASA's Living with a Star Program. The program is designed to understand aspects of the sun and Earth's space environment that affect life and society. The program is managed by NASA'S Goddard Space Flight Center in Greenbelt, Md., with oversight from NASA'S Science Mission Directorate's Heliophysics Division. The Johns Hopkins University Applied Physics Laboratory in Laurel, Md., is the prime contractor for the spacecraft.

For more information about the Solar Probe Plus mission, visit:

<http://solarprobe.gsfc.nasa.gov/>

For more information about the Living with a Star Program, visit:

<http://science.nasa.gov/about-us/smd-programs/living-with-a-star/>. 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)

Spitzer Finds a Flavorful Mix of Asteroids,

National Aeronautics and Space Administration Documents,

Thursday, September 2, 2010

TEXT:

Feature September 2, 2010

Spitzer Finds a Flavorful Mix of Asteroids

The full version of this story with accompanying images is at:

<http://www.jpl.nasa.gov/news/news.cfm?release=2010-283&cid=release2010-283>

New research from NASA's Spitzer Space Telescope reveals that asteroids somewhat near Earth, termed near-Earth objects, are a mixed bunch, with a surprisingly wide array of compositions. Like a pinata filled with everything from chocolates to fruity candies, these asteroids come in assorted colors and compositions. Some are dark and dull; others are shiny and bright. The Spitzer observations of 100 known near-Earth asteroids demonstrate that the objects' diversity is greater than previously thought.

The findings are helping astronomers better understand near-Earth objects as a whole -- a population whose physical properties are not well known.

"These rocks are teaching us about the places they come from," said David Trilling of Northern Arizona University, Flagstaff, lead author of a new paper on the research appearing in the September issue of *Astronomical Journal*. "It's like studying pebbles in a streambed to learn about the mountains they tumbled down."

After nearly six years of operation, in May 2009, Spitzer used up the liquid coolant needed to chill its infrared detectors. It is now operating in a so-called "warm" mode (the actual temperature is still quite cold at 30 Kelvin, or minus 406 degrees Fahrenheit). Two of Spitzer's infrared channels, the shortest-wavelength detectors on the observatory, are working perfectly.

One of the mission's new "warm" programs is to survey about 700 near-Earth objects, cataloguing their individual traits. By observing in infrared, Spitzer is helping to gather more accurate estimates of asteroids' compositions and sizes than what is possible with visible light alone. Visible-light observations of an asteroid won't differentiate between an asteroid that is big and dark, or small and light. Both rocks would reflect the same amount of visible sunlight. Infrared data provide a read on the object's temperature, which then tells an astronomer more about the actual size and composition. A big, dark rock has a higher temperature than a small, light one because it absorbs more sunlight.

Trilling and his team have analyzed preliminary data on 100 near-Earth asteroids so far. They plan to observe 600 more over the next year. There are roughly 7,000 known near-Earth objects out of a population expected to number in the tens to hundreds of thousands.

"Very little is known about the physical characteristics of the near-Earth population," said Trilling. "Our data will tell us more about the population, and how it changes from one object to the next. This information could be used to help plan possible future space missions to study a near-Earth object."

The data show that some of the smaller objects have surprisingly high albedos (an albedo is a measurement of how much sunlight an object reflects). Since asteroid surfaces become darker with time due to exposure to solar radiation, the presence of lighter, brighter surfaces for some asteroids may indicate that they are relatively young. This is evidence for the continuing evolution of the near-Earth object population.

In addition, the fact that the asteroids observed so far have a greater degree of diversity than expected indicates that they might have different origins. Some might come from the main belt between Mars and Jupiter, and others could come from farther out in the solar system. This diversity also suggests that the materials that went into making the asteroids -- the same materials that make up our planets -- were probably mixed together like a big solar-system soup very early in its history.

The research complements that of NASA's Wide-field Infrared Survey Explorer, or WISE, an all-sky infrared survey mission also up in space now. WISE has already observed more than 430 near-Earth objects -- of these, more than 110 are newly discovered.

In the future, both Spitzer and WISE will tell us even more about the "flavors" of near-Earth objects. This could reveal new clues about how the cosmic objects might have dotted our young planet with water and organics -- ingredients needed to kick-start life.

Other authors of the paper include Cristina Thomas, also from Northern Arizona University; Michael Mueller and Marco Delbo of the Observatoire de la Cote d'Azur, Nice, France; Joseph Hora, Giovanni Fazio, Howard Smith and Tim Spahr of the Harvard-Smithsonian Center for Astrophysics, Cambridge, Mass.; Alan Harris of the DLR Institute of Planetary Research, Berlin, Germany (DLR is Germany's space agency and stands for Deutsches Zentrum für Luft- und Raumfahrt); Bidushi Bhattacharya of the NASA Herschel Science Center at the California Institute of Technology, Pasadena; Steve Chesley and Amy Mainzer of NASA's Jet Propulsion Laboratory, Pasadena, Calif.; Bill Bottke of the Southwest Research Institute, Boulder, Colo.; Josh Emery of the University of Tennessee, Knoxville; Bryan Penprase of the Pomona College, Claremont, Calif.; and John Stansberry of the University of Arizona, Tucson.

NASA's Jet Propulsion Laboratory, Pasadena, Calif., manages the Spitzer Space Telescope mission for NASA's Science Mission Directorate, Washington. Science operations are conducted at the Spitzer Science Center at the California Institute of Technology, also in Pasadena. Caltech manages JPL for NASA. For more information about Spitzer, visit <http://spitzer.caltech.edu/> and <http://www.nasa.gov/spitzer>.

JPL manages the Wide-field Infrared Survey Explorer for NASA's Science Mission Directorate, Washington. The principal investigator, Edward Wright, is at UCLA. The mission was competitively selected under NASA's Explorers Program managed by the Goddard Space Flight Center, Greenbelt, Md. The science instrument was built by the Space Dynamics Laboratory, Logan, Utah, and 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. More information is online at <http://www.nasa.gov/wise> and <http://wise.astro.ucla.edu>.

#2010-283

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- end -

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Record - 5

DIALOG(R)

Astronomers Identify Two New Solar Systems,

NPR Morning Edition,
Friday, August 27, 2010

TEXT:

LINDA WERTHEIMER, host:

In the field of astronomy these days, it is raining planets. Two leading teams of planet hunters, announced this week, they'd found entire solar systems - one with two or three planets, the other with as many as seven. These are not planets that could sustain life. But many scientists say detecting such planets is looking more likely. NPR's Dan Charles has more.

DAN CHARLES: Many of the world's experts on planets in outer space are playing top this at a scientific conference in southeastern France this week. Among them is Matthew Holman from the Harvard-Smithsonian Center for Astrophysics.

Mr. MATTHEW HOLMAN (Harvard-Smithsonian Center for Astrophysics): There's

always, I have to admit, an element of competition. You know, people come and want to show their best work, and they want to surprise their colleagues.

CHARLES: Holman had to keep his own surprise under wraps for a few days, because it hadn't yet been published. So he just listened as his European competitors claimed the spotlight. Christophe Lovis, from the University of Geneva in Switzerland, announced on Tuesday, his group had discovered a whole collection of planets orbiting a star 127 light-years away.

Mr. CHRISTOPHE LOVIS (University of Geneva): At least five planets, and probably seven - two of them are still a little bit uncertain.

CHARLES: It's the largest solar system ever seen outside our own. Now, Lovis didn't really see any of those planets. So far, that's impossible. He watched stars very carefully as they move through space. If they speed up or slow down a little, at a regular pattern, it shows there's something tugging on them: the gravitational pull of an orbiting planet.

This has been the most successful planet-hunting technique. But it works best for giant planets close to small stars. Of the 500 planets discovered so far, most have been like this. One of the new planets that Lovis announced, however, appears to be much smaller. Its mass is just 40 percent greater than Earth.

Mr. LOVIS: We've really moved from giant planets only to any kind of planetary system, with more and more planets, small mass planets and so on. It's really exciting.

CHARLES: And yesterday, Matthew Holman finally got to add his bit of excitement when his discovery was published by the journal Science.

Mr. HOLMAN: We're announcing the discovery of two Saturn-size planets, which we call Kepler 9b and Kepler 9c.

CHARLES: And there's evidence of a third planet, he said, a much smaller one. Its diameter appears to be just 50 percent larger than Earth's.

Mr. HOLMAN: If it is confirmed, it would have a radius of about 1.5 times the radius of the Earth.

CHARLES: Holman's discovery, in fact, is an early scientific harvest from NASA's new planet-finding machine, a telescope called Kepler. This instrument is following Earth in its orbit around the sun, staring constantly at a group of 100,000 stars in another corner of our galaxy. When the light from any of those stars dims slightly, it's evidence that a planet just crossed in front of it.

Now, the planets that scientists have found so far are not what you'd call habitable. The small ones are way too close to their stars. But Kepler was designed specifically to detect planets just like Earth. And Alan Boss, an astrophysicist at the Carnegie Institution of Washington, is increasingly confident those planets are out there.

Mr. ALAN BOSS (Astrophysicist, Carnegie Institution of Washington): We're finding more and more evidence that earth-like planets are going to be quite common. We don't have them yet, but we're well on the way towards discovering them.

CHARLES: We'll all have to be patient, though. A planet just like Earth crosses in front of its star once a year and scientists won't declare it a planet until they see the star's light dim at least three times.

Dan Charles, NPR News, Washington

(Soundbite of music)

WERTHEIMER: This is NPR News.

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Wolbach Library: CfA in the News ~ Week ending 12 September 2010

1. **Recent findings from J. Irwin and co-authors highlight research in astronomy**, Science Letter, p2111, Tuesday, September 14, 2010
2. **Findings from E.M. Hill and co-authors provide new insights into planetary science**, Science Letter, p698, Tuesday, September 14, 2010
3. **Study results from K.I.R. Oberg et al provide new insights into astronomy**, Science Letter, p5377, Tuesday, September 14, 2010
4. **Studies from S.J. Wolk et al add new findings in the area of astronomy**, Science Letter, p4822, Tuesday, September 14, 2010
5. **FALL SKY VIEWING**, MICHAEL SAUNDERS, Boston Globe (MA), p14, Sunday, September 12, 2010
6. **In tweak of the movie, these asteroids missed**, L. Finch, Boston Globe (MA), p15, Thursday, September 9, 2010
7. **We can detect volcanoes on alien worlds**, say scientists, Hindustan Times, Wednesday, September 8, 2010
8. **Astronomers seeking space volcanoes**, UPI Science News, Tuesday, September 7, 2010
9. **Mission to help define the sun**, Lee Roop, The Huntsville Times (Huntsville, AL), 2 ed, p1A, Saturday, September 4, 2010

Record - 1

DIALOG(R)

Recent findings from J. Irwin and co-authors highlight research in astronomy, Science Letter, p2111, Tuesday, September 14, 2010

TEXT:

According to recent research from the United States, "We report the discovery of an eclipsing companion to NLTT 41135, a nearby M5 dwarf that was already known to have a wider, slightly more massive common proper motion companion, NLTT 41136, at 2 ".4 separation."

"Analysis of combined-light and RV curves of the system indicates that NLTT 41135B is a (31-34) +/- 3M(Jup) brown dwarf (where the range depends on the

unknown metallicity of the host star) on a circular orbit. The visual M dwarf pair appears to be physically bound, so the system forms a hierarchical triple, with masses approximately in the ratio 8:6:1," wrote J. Irwin and colleagues (see also).

The researchers concluded: "The eclipses are grazing, preventing an unambiguous measurement of the secondary radius, but follow-up observations of the secondary eclipse (e.g., with the James Webb Space Telescope) could permit measurements of the surface brightness ratio between the two objects, and thus place constraints on models of brown dwarfs."

Irwin and colleagues published their study in *Astrophysical Journal* (NLTT 41135: A FIELD M DWARF plus BROWN DWARF ECLIPSING BINARY IN A TRIPLE SYSTEM, DISCOVERED BY THE MEARTH OBSERVATORY. *Astrophysical Journal*, 2010;718(2):1353-1366).

For additional information, contact J. Irwin, Harvard-Smithsonian Center for 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)

Findings from E.M. Hill and co-authors provide new insights into planetary Science,

Science Letter, p698,

Tuesday, September 14, 2010

TEXT:

According to recent research from the United States, "We demonstrate a new technique for using geodetic data to update a priori predictions for Glacial Isostatic Adjustment (GIA) in the Fennoscandia region. Global Positioning System (GPS), tide gauge, and Gravity Recovery and Climate Experiment (GRACE) gravity rates are assimilated into our model."

"The technique allows us to investigate the individual contributions from these data sets to the output GIA model in a self-consistent manner.

Another benefit of the technique is that we are able to estimate uncertainties for the output model. These are reduced with each data set assimilated. Any uncertainties in the GPS reference frame are absorbed by reference frame adjustments that are estimated as part of the assimilation.

Our updated model shows a spatial pattern and magnitude of peak uplift that is consistent with previous models, but our location of peak uplift is slightly to the east of many of these. We also simultaneously estimate a spatially averaged rate of local sea level rise. This regional rate (similar to 1.5 mm/yr) is consistent for all solutions, regardless of which data sets are assimilated or the magnitude of a priori GPS reference frame constraints. However, this is only the case if a uniform regional gravity rate, probably representing errors in, or unmodeled contributions to, the low-degree harmonic terms from GRACE, is also estimated for the assimilated GRACE data," wrote E.M. Hill and colleagues (see also).

The researchers concluded: "Our estimated sea level rate is consistent with estimates obtained using a more traditional approach of direct "correction" using collocated GPS and tide gauge sites."

Hill and colleagues published their study in the Journal of Geophysical Research - Solid Earth (Combination of geodetic observations and models for glacial isostatic adjustment fields in Fennoscandia. Journal of Geophysical Research - Solid Earth, 2010;115():7403).

For additional information, contact E.M. Hill, Harvard-Smithsonian Center for Astrophysics, 60 Garden St., MS 42, Cambridge, MA 02138, USA.

Publisher contact information for the Journal of Geophysical Research - Solid Earth is: American Geophysical Union, 2000 Florida Avenue NW, Washington, DC 20009, USA.

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Record - 3

DIALOG(R)

Study results from K.I.R. Oberg et al provide new insights into astronomy,
Science Letter, p5377,
Tuesday, September 14, 2010

TEXT:

According to recent research published in the Astrophysical Journal, "UV irradiation of simple ices is proposed to efficiently produce complex organic species during star formation and planet formation. Through a series of laboratory experiments, we investigate the effects of the H₂O concentration, the dominant ice constituent in space, on the photochemistry of more volatile species, especially CH₄, in ice mixtures."

"In the experiments, thin (similar to 40 ML) ice mixtures, kept at 20-60 K, are irradiated under ultrahigh vacuum conditions with a broadband UV hydrogen discharge lamp. Photodestruction cross sections of volatile species (CH₄ and NH₃) and production efficiencies of new species (C₂H₆, C₂H₄, CO, H₂CO, CH₃OH, CH₃CHO, and CH₃CH₂OH) in water-containing ice mixtures are determined using reflection-absorption infrared spectroscopy during irradiation and during a subsequent slow warm-up. The four major effects of increasing the H₂O concentration are: (1) an increase of the destruction efficiency of the volatile mixture constituent by up to an order of magnitude due to a reduction of back reactions following photodissociation, (2) a shift to products rich in oxygen, e.g., CH₃OH and H₂CO, (3) trapping of up to a factor of 5 more of the formed radicals in the ice, and (4) a disproportional increase in the diffusion barrier for the OH radical compared with the CH₃ and HCO radicals. The radical diffusion temperature dependencies are consistent with calculated H₂O-radical bond strengths," wrote K.I.R. Oberg and colleagues (see also).

The researchers concluded: "All the listed effects are potentially important for the production of complex organics in H₂O-rich icy grain mantles around protostars and should thus be taken into account when modeling ice chemistry."

Oberg and colleagues published their study in *Astrophysical Journal* (The Effect Of H₂o On Ice Photochemistry. *Astrophysical Journal*, 2010;718(2):832-840).

For additional information, contact K.I.R. Oberg, Harvard-Smithsonian Center for Astrophysics, MS 42, 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)

Studies from S.J. Wolk et al add new findings in the area of astronomy,
Science Letter, p4822,
Tuesday, September 14, 2010

TEXT:

"We report on an XMM-Newton observation of the unusual, long period (F0 supergiant + cool disk companion) eclipsing binary star epsilon Aurig

observed in X-rays prior to the onset of the 2009-2011 eclipse phase. While it appears certain that a disk-like body is obscuring the star, it remains unclear what kind of object is at the center of the disk," scientists in the United States report (see also).

"The XMM-Newton observation had a duration of similar to 25 ks. The X-ray image does not show a source at the optical position of the star. We have determined a limiting X-ray flux of about 2.5×10^{-15} erg cm⁻² s⁻¹. This flux is equivalent to a luminosity of about log L-X similar to 29.3-29.7 erg s⁻¹ for an unabsorbed source at the assumed distance, estimated to be between 650 and 1300 pc. The direct emission from an otherwise unobscured primary is excluded at a level above L-X similar to 4×10^{29} erg s⁻¹. We explore the physical constraints that these limits put on the primary and several proposed models for the system secondary. For a black hole, we find that the direct absorption required by the disk is approximately $N_H \geq 10^{25}$ cm⁻². While not unreasonable for a protoplanetary disk, the lack of secondary X-rays makes this model unlikely. For high-mass models, in which the disk harbors pre-main-sequence stars, we find a minimum disk absorption of N_H similar to 10^{23} cm⁻². Since this is not unlikely for a protoplanetary disk, this is not a significant constraint. For low-mass models, in which the disk harbors older stars, the known line-of-sight absorption is nearly enough to account for the non-detection," wrote S.J. Wolk and colleagues.

The researchers concluded: "The data do not discriminate between these models."

Wolk and colleagues published their study in *Astronomical Journal* (Xmm-newton Observations Of The Enigmatic Long Period Eclipsing Binary Epsilon Aurigae: Constraining The Physical Models. *Astronomical Journal*, 2010;140(2):595-601).

For more information, contact S.J. Wolk, Harvard-Smithsonian Center for Astrophysics, 60 Garden St., Cambridge, MA 02138, USA.

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

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Record - 5

DIALOG(R)

FALL SKY VIEWING

MICHAEL SAUNDERS,

Boston Globe (MA), p14,
Sunday, September 12, 2010

TEXT:

FALL SKY VIEWING Apparently, all the really cool constellations come out during the fall and winter, when first-teamers like Taurus, Andromeda, and Orion begin to rule the sky. Oct. 7, 7 p.m. Free. Phillips Auditorium, Harvard-Smithsonian Center for Astrophysics, Cambridge. 617-495-7461, www.cfa.harvard.edu

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Record - 6

DIALOG(R)

In tweak of the movie, these asteroids missed,

L. Finch,

Boston Globe (MA), p15,

Thursday, September 9, 2010

TEXT:

It was a close call, reminiscent of the 1998 blockbuster movie "Armageddon," in which a ragtag group of oil drillers, led by Bruce Willis, blows up an asteroid headed for Earth. But this time, Mr. Willis, your services weren't needed

Two asteroids zoomed by yesterday, zipping between our planet and the moon's orbit, according to NASA. Neither planetoid, which passed within 50,000 to 150,000 miles, was in danger of hitting Earth, officials at the Minor Planet Center at the Harvard-Smithsonian Center for Astrophysics in Cambridge determined.

"It happens a few times a year that they'll come close," said Tim Spahr, director of the Minor Planet Center. "When they come closer than the moon, we get a little interested in them."

The Catalina Sky Survey near Tucson spotted the celestial bodies Sunday morning, and officials immediately forwarded the observations to Cambridge, Spahr said. The Minor Planet Center determined "within minutes" that the asteroids posed no threat, he said

Asteroid 2010 RX30, which passed over the Earth south of Japan about 6

a.m., is estimated to be 32 to 65 feet in diameter, and 2010 RF12, which reached its closest point to Earth above Antarctica a little past 5 p.m., is about 20 to 46 feet in diameter, according to NASA. Both were visible with amateur telescopes

Asteroids very rarely enter the Earth's atmosphere, and impacts with large asteroids are even rarer, Spahr said. The last may have been in 1908, when a fragment of some object exploded about 5 miles above Siberia, flattening trees and sending shock waves through the area

L. Finch can be reached at lfinch@globe.com.

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Record - 7

DIALOG(R)

We can detect volcanoes on alien worlds, say scientists,
Hindustan Times,
Wednesday, September 8, 2010

TEXT:

Washington, Sept. 8 -- Scientists at the Harvard-Smithsonian Center for Astrophysics have said that it is possible for us to detect volcanoes on alien planets.

'You would need something truly earthshaking, an eruption that dumped a lot of gases into the atmosphere,' said Smithsonian astronomer Lisa Kaltenegger.

'Using the James Webb Space Telescope, we could spot an eruption 10 to 100 times the size of Pinatubo for the closest stars,' she added.

In a few cases, scientists have been able to detect exoplanet atmospheres for gas giants known as 'hot Jupiters.' An eruption sends out fumes and various gases, so volcanic activity on a rocky exoplanet might leave a telltale atmospheric signature.

Kaltenegger, Wade Henning and Dimitar Sasselov found that sulphur dioxide from a very large, explosive eruption is potentially measurable because a lot is produced and it is slow to wash out of the air.

The 1991 eruption of Mount Pinatubo in the Philippines spewed about 17 million tons of sulphur dioxide into the stratosphere.

'Once you detected one eruption, you could keep watch for further ones, to learn if frequent eruptions are common on other planets,' said Henning.

To look for volcanic sulphur dioxide, astronomers would rely on a technique known as the secondary eclipse, which requires the exoplanet to cross behind its star as seen from Earth.

Alpha Centauri for instance, would offer a best-case scenario for a Sun-like star. A super-Earth orbiting a smaller host star close to our own Sun would show the biggest signal. But any Earth-like planet less than 30 light-years away could show faint signs of volcanism when studied with the James Webb Space Telescope.

This research 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 - 8

DIALOG(R)

Astronomers seeking space volcanoes,

UPI Science News,

Tuesday, September 7, 2010

TEXT:

U.S. scientists studying planets outside the solar system say they think they could spot volcanoes on the distant worlds by their atmospheric signature.

Although astronomers are at least a decade away from being able to capture images of the surface of an exoplanet, they have been able to detect the atmospheres of gas giants dubbed "hot Jupiters," and any volcanic gases detected in those atmospheres could tell researchers something about the underlying surface, scientists at the Harvard-Smithsonian Center for Astrophysics said Tuesday.

"You would need something truly earthshaking, an eruption that dumped a lot of gases into the atmosphere," Smithsonian astronomer Lisa Kaltenegger said. "Using the James Webb Space Telescope, we could spot an eruption 10 to 100 times the size of Pinatubo for the closest stars."

The 1991 eruption of Mount Pinatubo in the Philippines spewed about 17 million tons of sulfur dioxide into the stratosphere, the layer of air 6 miles to 30 miles above Earth's surface.

Sulfur dioxide from a very large, explosive eruption is potentially measurable because a lot is produced and it is slow to wash out of the atmosphere, Kaltenegger said.

"Our first sniffs of volcanoes from an alien Earth might be pretty rank!" Kaltenegger said. "Seeing a volcanic eruption on an exoplanet will show us similarities or differences among rocky worlds."

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Record - 9

DIALOG(R)

Mission to help define the sun,

Lee Roop,

The Huntsville Times (Huntsville, AL), 2 ed, p1A,

Saturday, September 4, 2010

TEXT:

NASA, UAH scientists at work on probe that could revise solar astrophysics

Huntsville scientists have an important role in what one called "a dramatic and revolutionary" new probe of the sun announced by NASA this week.

Called Solar Probe Plus, the mission will launch a spacecraft the size of a small car toward an orbit that takes it to 4 million miles from the sun's surface - far closer than any probe before.

The craft will approach the sun 35 separate times during its life to study solar weather and solar winds.

"This is the equivalent of a Hubble class mission for solar physics," Huntsville scientist Dr. Jonathan Cirtain said. "So it really is dramatic and revolutionary, the expectation the data collected will have on the field of solar astrophysics."

Gary Zank, Pei Ling Chan Eminent Scholar in Physics and director of the University of Alabama in Huntsville's Center for Space and Aeronomic Research, agreed with Cirtain on the mission's importance.

"This is the defining mission in solar physics for the next 20 or 30 years and one of the definitive science missions of the 21st century," Zank said Friday. "This is an opportunity to better understand the sun's atmosphere, one of the great scientific mysteries in our universe."

Zank said winning this proposal is a unique opportunity for UAH students to help develop models, explain observations and understand the secrets of the sun.

Dick Fisher, director of NASA's Heliophysics Division in Washington, said scientists have clear goals.

"The experiments selected ... are specifically designed to solve two key questions of solar physics - why is the sun's outer atmosphere so much hotter than the sun's visible surface and what propels the solar wind that affects Earth and our solar system?" Fisher said in Washington this week. "We've been struggling with these questions for decades, and this mission should finally provide those answers."

Cirtain is building detectors for one of the Solar Probe Plus instruments with help from scientists and students at the University of Alabama in Huntsville. Together, they have \$15 million of a \$180 million instrument budget.

Probe's 5 main parts

The solar probe has five major parts:

- An experiment led by the University of California Space Sciences Laboratory in Berkeley to measure electric and magnetic fields, radio emissions and shock waves.

Cirtain's work will go into this project.

- An experiment to count, capture and measure particles in solar wind headed by the Smithsonian Astrophysical Observatory in Cambridge, Mass.

- A telescope to make 3-D images of the sun's corona, or atmosphere.

- Instruments to monitor electrons, protons and ions hurled into the sun's atmosphere.

- A NASA Jet Propulsion Laboratory scientist who will independently review each facet of the mission.

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Wolbach Library: CfA in the News ~ Week ending 19 September 2010

1. **14 large space rocks found beyond Neptune**, Hindustan Times, Tuesday, September 14, 2010
2. **Astronomers seek cosmic 'building blocks'**, UPI Science News, Tuesday, September 14, 2010
3. **2 big scope projects vying for US backing**, TOM BEAL; TOM BEAL, ARIZONA DAILY STAR, Arizona Daily Star (AZ), FINAL ed, pA1, Sunday, September 5, 2010
4. **Kepler Finds Its First Multi-planet Extra-solar System**, Frank Moring, Jr., Aerospace Daily & Defense Report, v235, n41, p7, Friday, August 27, 2010

Record - 1

DIALOG(R)

14 large space rocks found beyond Neptune,
Hindustan Times,
Tuesday, September 14, 2010

TEXT:

Washington, Sept. 14 -- A team of astronomers have found a cache of 14 large space rocks beyond the orbit of Neptune while sifting through archival observations from the Hubble Space Telescope.

Icy rocks like the newfound objects are known as trans-Neptunian objects (TNOs) because they typically reside outside Neptune's orbit.

These objects include the former planet Pluto, now classified as a dwarf planet, as well as comets like the famed Halley's comet.

Most TNOs are small and receive little sunlight, making them faint and difficult to spot.

Now, astronomers using clever techniques to cull the data archives of NASA's Hubble Space Telescope have added 14 new TNOs to the catalog. Their method promises to turn up hundreds more.

"Trans-Neptunian objects interest us because they are building blocks left over from the formation of the solar system," said lead author Cesar Fuentes, formerly with the Harvard-Smithsonian Center for Astrophysics and

now at Northern Arizona University.

As TNOs slowly orbit the Sun, they move against the starry background, appearing as streaks of light in time exposure photographs.

The team developed software to analyze hundreds of Hubble images hunting for such streaks. After promising candidates were flagged, the images were visually examined to confirm or refute each discovery.

Most TNOs are located near the ecliptic -- a line in the sky marking the plane of the solar system (since the solar system formed from a disk of material). Therefore, the team searched within 5 degrees of the ecliptic to increase their chance of success.

They found 14 objects, including one binary (two TNOs orbiting each other like a miniature Pluto-Charon system). All were very faint, with most measuring magnitude 25-27 (more than 100 million times fainter than objects visible to the unaided eye).

By measuring their motion across the sky, astronomers calculated an orbit and distance for each object.

Combining the distance and brightness (plus an assumed albedo, or reflectivity), they then estimated the size. The newfound TNOs range from 25 to 60 miles (40 to 100 km) across.

This research has been accepted for publication in The Astrophysical Journal 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 - 2

DIALOG(R)

Astronomers seek cosmic 'building blocks',

UPI Science News,

Tuesday, September 14, 2010

TEXT:

Scientists say a search for the "building blocks" of the solar system has proved fruitful as they've added new objects to their cosmic inventories.

Icy rocks beyond the orbit of Neptune are known as trans-Neptunian objects. Pluto, now classified as a dwarf planet, is one of the largest. Halley's Comet is another. All are small and receive little sunlight, making them faint and difficult to spot, astronomers at the Harvard-Smithsonian Center for Astrophysics say.

But examining data from NASA's Hubble Space Telescope has added 14 new TNOs to the catalog, with the promise of finding hundreds more, they say.

"Trans-Neptunian objects interest us because they are building blocks left over from the formation of the solar system," Cesar Fuentes, formerly with the Harvard center and now at Northern Arizona University, said.

Using software to examine hundreds of long-exposure Hubble images, scientists have begun identifying new TNOs, most with diameters of between 25 to 60 miles.

Their initial study examined only one-third of a square degree of sky, leaving much more area to survey. Hundreds of additional TNOs may lurk in the Hubble image archives, scientists say.

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Record - 3

DIALOG(R)

2 big scope projects vying for US backing,
TOM BEAL; TOM BEAL, ARIZONA DAILY STAR,
Arizona Daily Star (AZ), FINAL ed, pA1,
Sunday, September 5, 2010

TEXT:

1 conceived at UA; both could transform ground astronomy

Two huge telescope projects are vying for up to \$250 million in federal money for construction and operation - a contest neither team wants, but both want to win.

The concept for one of them - the Giant Magellan Telescope - was hatched at the University of Arizona's Steward Observatory Mirror Lab, which would develop and fabricate its eight multimillion-dollar mirrors. UA astronomers, optical scientists and engineers have worked on the project for a decade and plan to work on it for another one.

The other proposal - the Thirty Meter Telescope, called the TMT - is led by scientists at California universities.

Giant telescopes, with segmented mirrors up to 138 feet in diameter, promise to revolutionize ground-based astronomy by the end of the decade, identifying Earthlike planets and peering back in time to an infant universe. Their images will be 10 times clearer than space telescopes, and their price approaches \$1 billion each.

Both U.S.-led projects say they will build regardless of federal involvement, and both have partners that built large telescopes without it. But the pending decision by the National Science Foundation to take a 25 percent partnership in the construction and operation of one of them will shore up financial commitments, especially from foreign partners, scientists say.

The foundation decided on a 25 percent partnership based on the recommendation of the National Academy of Sciences' "decadal survey," produced every 10 years by a panel of prominent astronomers and physicists and used to guide federal spending in the fields. This year's survey gave good marks to both projects but did not rank them.

"We don't want to be in the business of killing any project," said James Ulvestad, director of the Division of Astronomical Sciences at the National Science Foundation, and the man in charge of setting up a committee of experts to make that decision. "We'd like to do both, but the decadal survey tried very hard to be realistic about what budgets will be like in the next decade."

The committee will be asked to choose a winner by the end of 2011, based on a variety of factors including technological readiness and the reality of their partnerships and funding, Ulvestad said.

Both telescopes, and the even bigger, 42-meter Extremely Large Telescope planned by the European Southern Observatory, represent a huge leap in the size of ground-based telescopes, with light-collecting areas six to 17 times larger than any now in operation.

They will be equipped with a new generation of laser-guided adaptive optics systems that compensate for the blurring caused by the atmosphere and erase the advantage held by smaller scopes in space.

Some of the technology required for these advances is unproven - but that is standard procedure in astronomy, where each leap in size requires a larger leap of faith in the ability to meet technological challenges.

"There is no unchallengeable statement we could make," said Jerry Nelson, project scientist for the Thirty Meter Telescope and a professor of astronomy and astrophysics at the University of California-Santa Cruz. "We are all wearing our rose-colored glasses."

The Thirty Meter Telescope, with a primary mirror composed of 492, 1.4-meter segments, is proposed for Mauna Kea on the island of Hawaii. "It is more science capable" than the UA-affiliated Giant Magellan Telescope, said Nelson. "It's a bigger telescope."

Nelson said the project will come in on budget at \$987 million. "We've looked at all the details and reviewed them. We've beat the cost to death," he said.

Those numbers are challenged by the decadal survey, which pegged the cost at \$1.4 billion, and by scientists working for the competition, who say the cost of building 492 off-axis mirrors could go much higher.

Nelson, conversely, questions the \$686 million estimate for the Giant Magellan Telescope. The decadal survey pegged it at \$1.1 billion.

Domestic location could also be an edge, Nelson said, though not for scientific reasons.

"The universe doesn't care very much about who owns the dirt on the planet, but on the political side, it makes a big difference."

That will not be a consideration for his committee, said Ulvestad, even though next year's appropriation for his agency carries a recommendation that the telescope be built on U.S. soil.

Location could actually favor the UA-affiliated project, as the committee looks for "synergies" between the new telescope and other projects, said Ulvestad.

Two giant survey telescopes, the Large Synoptic Survey Telescope, developed at the UA, and the Atacama Large Millimeter Array (ALMA), both being built in Chile, will be finding targets in the southern sky that can be further investigated by a larger telescope that can break down light into its spectra, revealing, for example, the chemical makeup of a potentially Earthlike planet.

The UA-affiliated project will be looking at the same sky from its perch at Las Campanas Observatory in Chile. "We think our scientific synergies are really outstanding," said project director Patrick McCarthy of the Carnegie Observatories.

His project has other advantages, said McCarthy. Its seven 8.4- meter mirrors provide larger swaths of uninterrupted light- gathering. They are easier to position and control than the competition's 492, he said, and they can be produced on time, on budget and within specifications. The proof of that is close, he said. The big technological hurdle for the Giant Magellan Telescope is production of its first off- axis mirror, which has been cast and is now being polished at the mirror lab in the bowels of Wildcat Stadium.

The mirror lab has become proficient at casting and polishing large, symmetrical mirrors. These new mirrors, because they will be arrayed around a center mirror, have their focal point at the center mirror.

You can produce the theoretical shape of an off-axis mirror with "high-school math," said UA optical scientist Jim Burge.

Producing that shape in reality, finding where each point on that theoretically perfect mirror should be when polishing to a tolerance of one-millionth of an inch, well, that's another thing entirely, said Burge.

He has worked on the problem for more than a decade since Roger Angel, the mirror lab's founder and scientific director, first came up with the concept. Burge has created four different optical tests for the task, using interferometry, lasers, mirrors, lenses and computer-generated holograms pioneered in the UA's College of Optical Sciences, where he is a professor.

He has also helped design tests for the Europeans and for the Thirty Meter Telescope. "They'll be our competitor in some sense," Burge said, "but as a community, we'd really like to see both of these things go forward."

The Giant Magellan test was the most difficult to devise, he said. The mirror is not just larger than the others - it's deeper as well, to accommodate a shorter focal point that will allow closer positioning of the secondary mirror.

"It is certainly the most difficult optical test that we have ever done and I think that has ever been done on astronomical optics anywhere," said Peter Strittmatter, director of UA's Steward Observatory.

The process has taken longer than expected, said Burge. "When we're polishing material, we're doing it one molecule at a time," he said.

Burge said Buddy Martin, the lab's polishing scientist, has the hardest task. He has to take Burge's measurements and figure out how to mechanically make them work.

All the infrastructure is now in place, said Burge, to allow production of the eight mirrors needed - including one spare - at a pace of one per year, with each aspherical segment taking 3 1/2 years from casting to finish.

Burge expects the first mirror will be finished by the end of this year, in plenty of time to prove the technological feasibility of the project to the evaluating committee.

Nelson, from the competing Thirty Meter Telescope project, said he never doubted it could be done. "They don't have as much money as we do," he said. "They very wisely picked the highest risk, most readily attacked issue: "Can you polish those mirrors?"

Nelson said the Thirty Meter is further along on overall design, thanks to work by its Canadian university partners and an early \$50 million from the Gordon and Betty Moore Foundation.

Nelson said neither project is a high risk technologically, but he says they will take more time than anyone is admitting. "I chuckle at our hubris that all of our projects are going to be up in 2018," he said.

Nelson said the Thirty Meter Telescope's proof is already built. The two 10-meter Keck telescopes in Hawaii, which he designed, employ the same basic technology. The new project will just ramp up that design from 36 mirror segments to 492.

Nelson's role in developing the current generation of large, segmented telescopes earned him recognition with a Kavli Medal for astrophysics being awarded this week in Oslo, Norway. He will split the \$1 million Kavli Prize with the UA's Angel, whose innovative large mirrors dot prominent peaks globally, and with Ray Wilson, who was instrumental in building the European Southern Observatory's Very Large Telescope.

Seems people have a hard time picking a winner in this duel of competing technologies. The decadal survey passed the buck to the NSF's new committee.

David Silva, director of the National Optical Astronomy Observatory, said he would not want to choose between the two. His agency would be involved in operating and ensuring competitive access for U.S. scientists for whatever telescope or telescopes end up with National Science Foundation money.

He had asked the decadal committee to fund both at a 25 percent level and

hopes they can eventually still do that.

"I was disappointed that the projection is that there isn't enough money to count to two immediately."

Contact reporter Tom Beal at 573-4158 or tbeal@azstarnet.com

On StarNet: Find more coverage of science and technology at azstarnet.com/news/science

Giant Magellan Telescope

SIZE:

Seven 8.4-meter petals will create a 24.5-meter (80-foot) diameter telescope

LOCATION:

Las Campanas Observatory, Chile

WHY IT MIGHT BE CHOSEN:

Success with the Large Binocular Telescope and twin 6.5-meter telescopes already on Las Campanas. It costs less and pairs well with two large survey observatories being built in Chile.

WHY IT MIGHT NOT:

The big technical hurdle is precisely measuring and fabricating the off-axis mirrors. Congress might favor a telescope on U.S. soil.

PARTNERS:

Ten institutions from Australia, Korea and the United States, including the Carnegie Observatories, Harvard, the Smithsonian Astrophysical Observatory and the UA.

MONEY COMMITTED:

\$240 million of the estimated \$686 million cost

Thirty Meter Telescope

SIZE:

30-meter diameter formed by 492 segments of 1.4 meter each

LOCATION:

Mauna Kea on the island of Hawaii

WHY IT MIGHT BE CHOSEN:

Builds on the success of the two 10-meter Keck Telescopes, also on Mauna Kea. It's the only large telescope proposed for the Northern Hemisphere, and it's on U.S. soil.

WHY IT MIGHT NOT:

It could be tough to keep 492 segments aligned, and the TMT will only see 70 percent of the sky covered by the big survey scopes.

PARTNERS:

The Association of Canadian Universities for Research in Astronomy, the California Institute of Technology and the University of California. Partial involvement with institutions in Japan, India and China.

MONEY COMMITTED:

\$300 million of \$987 million cost

DID YOU KNOW

The same National Academy of Sciences survey that set up a competition between the Thirty Meter Telescope and the Giant Magellan Telescope being developed at the University of Arizona gave unequivocal support to a Tucson-based project - the Large Synoptic Survey Telescope.

It was the No. 1 priority for ground-based astronomy and recommended for immediate funding from the National Science Foundation and the Department of Energy for two-thirds of its \$465 million cost and two-thirds of its operating costs for 10 years.

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Record - 4

DIALOG(R)

Kepler Finds Its First Multi-planet Extra-solar System,

Frank Moring, Jr.,

Aerospace Daily & Defense Report, v235, n41, p7,

Friday, August 27, 2010

TEXT:

Astronomers evaluating data from NASA's Kepler spacecraft have discovered two Saturn-sized gas giants orbiting a star in the first application of a technique that may help them find habitable Earthlike planets.

Designated Kepler 9b and 9c, the two planets are orbiting the Kepler 9 star at a distance closer than the planet Mercury orbits the Sun. Data suggest there may be a smaller "super Earth" skimming just above the star, which lies about 2,000 light years from Earth, but it remains to be confirmed.

Kepler Finds Its First Multi-planet Extra-solar System

The first 43 days of Kepler data contained more than 700 possible planets circling stars in the area surveyed, but other phenomena can give false positives and the candidates must be checked out with other methods. The measurements at Kepler 9 hold promise for future discoveries because they validate the concept of using the transit times of extra-solar planets in multi-planet systems to calculate planet masses from the influence of one planet on the time it takes another to pass in front of their star.

"The discovery of the Kepler 9 system is important because it demonstrates an additional technique, this transit timing variations technique, that can be used for confirming planets and estimating their masses," said Matthew Holman, associate director of the Theoretical Astrophysics Division at the Harvard-Smithsonian Center for Astrophysics. "This is a technique that colleagues and I first proposed in 2005. [It will be applied] to future Kepler data where it will be particularly valuable for estimating the

masses of small planets."

The Earth-orbiting Kepler spacecraft measures the slight drop in a distant star's brightness when a planet passes in front of it. From that, astronomers can determine how far a planet is from its star by how often it transits, and using the transit timing variations can gauge its mass. At Kepler 9, the innermost confirmed planet is also the larger, orbiting every 19 days. Kepler 9c has an orbital period of about 38 days. Both are gas giants like Saturn, but slight smaller than the ringed giant in Earth's solar system.

Each planet's gravity produces variations in the transit timing of the other that can be measured in "several to tens of minutes" at Kepler 9, according to Holman. The remaining Kepler 9 candidate planet would measure only about 1.5 times Earth's mass if its presence is confirmed, but first the mission's 15-member Follow-up Observing Program must declare it really is a planet.

Dual- or triple-stars behind a target star can mimic the signature of planets as they orbit and eclipse each other, so the follow-up experts must use ground-based telescopes to confirm planet finds. One approach is to analyze the spectrum generated at the target to see if it has one or more than one source.

Because the orbits of planets in the habitable zone, where temperatures might support life, are much longer than those circling near their stars, it will be at least a year before Kepler turns up possible Earthlike planets that might support life.

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Wolbach Library: CfA in the News ~ Week ending 26 September 2010

1. **Studies from R.K. Smith et al have provided new data on astronomy**, Science Letter, p3646, Tuesday, September 28, 2010
2. **New astronomy study findings recently were published by G.D.R. Attrill and co-researchers**, Science Letter, p904, Tuesday, September 28, 2010
3. **Stars hungrier than we knew**, Lee Roop, The Huntsville Times (Huntsville, AL), 2 ed, p1A, Wednesday, September 22, 2010
4. **schools**, Greensboro News & Record (NC), Greensboro ed, pGR11, Sunday, September 19, 2010

Record - 1

DIALOG(R)

Studies from R.K. Smith et al have provided new data on astronomy,
Science Letter, p3646,
Tuesday, September 28, 2010

TEXT:

"Astrophysical shocks or bursts from a photoionizing source can disturb the typical collisional plasma found in galactic interstellar media or the intergalactic medium. The spectrum emitted by this plasma contains diagnostics that have been used to determine the time since the disturbing event, although this determination becomes uncertain as the elements in the plasma return to ionization equilibrium," scientists in the United States report (see also).

"A general solution for the equilibrium timescale for each element arises from the elegant eigenvector method of solution to the problem of a non-equilibrium plasma described by Masai and Hughes & Helfand. In general, the ionization evolution of an element Z in a constant electron temperature plasma is given by a coupled set of $Z + 1$ first-order differential equations. However, they can be recast as Z uncoupled first-order differential equations using an eigenvector basis for the system. The solution is then Z separate exponential functions, with the time constants given by the eigenvalues of the rate matrix. The smallest of these eigenvalues gives the scale of the slowest return to equilibrium independent of the initial conditions, while conversely the largest eigenvalue is the scale of the fastest change in the ion population," wrote R.K. Smith and colleagues.

The researchers concluded: "These results hold for an ionizing plasma, a

recombining plasma, or even a plasma with random initial conditions, and will allow users of these diagnostics to determine directly if their best-fit result significantly limits the timescale since a disturbance or is so close to equilibrium as to include an arbitrarily long time."

Smith and colleagues published their study in *Astrophysical Journal* (Ionization Equilibrium Timescales In Collisional Plasmas. *Astrophysical Journal*, 2010;718(1):583-585).

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

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DIALOG UPDATE DATE: 20100923; 17:54:37 EST
JOURNAL SUBJECT: Science & Engineering

Record - 2

DIALOG(R)

New astronomy study findings recently were published by G.D.R. Attrill and co-researchers,
Science Letter, p904,
Tuesday, September 28, 2010

TEXT:

According to recent research from the United States, "A new analysis of the 2007 May 19 coronal wave-coronal mass ejection-dimmings event is offered employing base difference extreme-ultraviolet (EUV) images. Previous work analyzing the coronal wave associated with this event concluded strongly in favor of purely an MHD wave interpretation for the expanding bright front."

"This conclusion was based to a significant extent on the identification of multiple reflections of the coronal wave front. The analysis presented here shows that the previously identified "reflections" are actually optical illusions and result from a mis-interpretation of the running difference EUV data. The results of this new multiwavelength analysis indicate that two coronal wave fronts actually developed during the eruption," wrote G.D.R. Attrill and colleagues (see also).

The researchers concluded: "This new analysis has implications for our understanding of diffuse coronal waves and questions the validity of the analysis and conclusions reached in previous studies."

Attrill and colleagues published their study in *Astrophysical Journal* (Dispelling Illusions Of Reflection: A New Analysis Of The 2007 May 19 Coronal "wave" Event. *Astrophysical Journal*, 2010;718(1):494-501).

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

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Record - 3

DIALOG(R)

Stars hungrier than we knew,

Lee Roop,

The Huntsville Times (Huntsville, AL), 2 ed, p1A,

Wednesday, September 22, 2010

TEXT:

Chandra telescope finds older star consuming planet

Scientists are saying it's a "star-eat-planet" universe out there after discovering a so-called "cannibal" star using the Chandra X-ray telescope managed by Huntsville's Marshall Space Flight Center.

The star known as BP Piscium (BP Psc) resembles our sun, but with a disk of gas and dust surrounding it. Scientists were observing a pair of "jets" several light years long blasting out of the star system when things started getting interesting.

Normally, disks and jets are found in young stars, but data from Chandra and other sources led scientists to the opposite conclusion here. BP Psc isn't young; it's an old star in the so-called red giant phase, and the jets are the remnants of its consumption of another nearby star or planet.

"It appears that BP Psc represents a star-eat-star universe, or maybe a star-eat-planet one," said Joel Kastner of the Rochester Institute of Technology, who led the Chandra study. "Either way, it just shows it's not always friendly out there."

Several clues led to scientists' rethinking the star's age. It isn't near any star-forming cloud, and there are no other young stars in the vicinity.

Its atmosphere doesn't contain much lithium, and that's an old-star characteristic. Third, its surface gravity is too weak for a young star.

Chandra added to the evidence. Young, low-mass stars are brighter than most stars in X-ray images, and the X-rays Chandra picks up from BP Psc are being detected at a rate too low to be from a young star. Instead, the rate is consistent with a rapidly spinning giant star.

The rapid rotation is also leading to magnetic activity that led co-author Rodolfo "Rudy" Montez Jr., also from the Rochester Institute, to another conclusion.

"It seems that BP Psc has been energized by its meal," Montez said. The scientists say planet scarfing may not be the only thing happening here. While close-in planets were destroyed, another telescope found evidence of another giant planet inside the dust cloud. If it's part of the original planetary system, that's no super-sized news. But if the explosion is actually helping form new planets, it's a whole combo platter of news meaning creation and destruction occurred in the same event.

"Exactly how stars might engulf other stars or planets is a hot topic in astrophysics today," Kastner said in NASA's report on the study. "We have many important details that we still need to work out, so objects like BP Psc are really exciting to find."

Chandra's role was critical because BP Psc isn't visible. Chandra's X-ray reception is the first detection of the star.

The study results appeared in The Astrophysical Journal Letters and were reported this month on the Marshall Space Flight Center's website.

Marshall manages the Chandra program for NASA's Science Mission Directorate in Washington, D.C. The **Smithsonian** Astrophysical Observatory controls Chandra's science and flight operations from Cambridge, Mass.

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Record - 4

DIALOG(R)

schools

Greensboro News & Record (NC), Greensboro ed, pGR11,
Sunday, September 19, 2010

TEXT:

GTCC

Giovanni Fazio, a pioneer in infrared astronomy at Harvard-Smithsonian Center for Astrophysics, will give a free lecture Oct. 1 at GTCC. Fazio, the Astronomy Day lecturer, will speak at 7:30 p.m. in the auditorium of the Koury Hospitality Careers Center on the Jamestown campus. His topic will be "Viewing the Universe with Infrared Eyes: The Spitzer Space Telescope." The GTCC Astronomy Day Lecture celebrates the anniversary of the 1997 opening of the Cline Observatory.

Fazio will visit GTCC introductory astronomy classes and will participate in the annual technical meeting of N.C. professional astronomers on Oct. 2. For information, contact Tom English at trenghish@gtcc.edu or at 334-4822, Ext. 2620.

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Wolbach Library: CfA in the News ~ Week ending 3 October 2010

1. **Study results from J.A. Zuhone and colleagues broaden understanding of astronomy**, Science Letter, p4225, Tuesday, October 5, 2010
2. **Study results from C.J. Burke and colleagues broaden understanding of astronomy**, Science Letter, p4199, Tuesday, October 5, 2010
3. **Study data from O. Cohen and colleagues update understanding of astronomy**, Science Letter, p4046, Tuesday, October 5, 2010
4. **Study data from G. Dobler and co-authors update knowledge of astronomy**, Science Letter, p4018, Tuesday, October 5, 2010
5. **Studies from R. Distefano and co-researchers update current data on astronomy**, Science Letter, p3781, Tuesday, October 5, 2010
6. **Studies from J. Forbrich and colleagues yield new information about astronomy**, Science Letter, p3670, Tuesday, October 5, 2010
7. **Research from H.B. Perets and co-researchers provides new data on astronomy**, Science Letter, p2248, Tuesday, October 5, 2010
8. **Research from B.C. Kelly and co-authors reveals new findings on astronomy**, Science Letter, p2181, Tuesday, October 5, 2010
9. **Reports outline astronomy study results from S.Q. Park et al**, Science Letter, p1926, Tuesday, October 5, 2010
10. **New findings from A. Tchekhovskoy and co-authors in the area of astronomy published**, Science Letter, p1085, Tuesday, October 5, 2010
11. **NEW PLANET MAY BE ABLE TO NURTURE LIFE**, DENNIS OVERBYE, THE NEW YORK TIMES
Pittsburgh Post-Gazette (PA), SOONER ed, pA-9, Thursday, September 30, 2010
12. **New Planet May Be Able To Nurture Organisms**, DENNIS OVERBYE, New York Times (NY), Late Edition - Final ed, p28, Thursday, September 30, 2010
13. **New planet called 'game changer' in hunt for life**, DENNIS OVERBYE, International Herald Tribune, p5,

Thursday, September 30, 2010

14. **Temperature Just Right For Life On Planet 'Goldilocks'**, NPR All Things Considered, Wednesday, September 29, 2010

15. **NRL's Wide-field Imager Selected for Solar Probe Plus Mission**, Business Wire, Wednesday, September 29, 2010

16. **UNIVERSITY OF HAWAII AT MANOA'S PAN-STARRS DISCOVERS 1ST POTENTIALLY HAZARDOUS ASTEROID**, US Federal News, Tuesday, September 28, 2010

17. **Telescope spots its first asteroid target**, UPI Science News, Monday, September 27, 2010

18. Greensboro News & Record (NC), Greensboro Edition Variation ed, pB6, Sunday, September 26, 2010

19. **Astronomers get closer to finding faraway Earths: two planetary systems offer new clues on planet formation**, Cowen, Ron, Science News, v178, n7, p5(2), Saturday, September 25, 2010

20. **Extra-Solar System**, Frank Moring, Jr., Aviation Week & Space Technology, v172, n33, p22, Monday, September 6, 2010

Record - 1

DIALOG(R)

Study results from J.A. Zuhone and colleagues broaden understanding of Astronomy,

Science Letter, p4225,

Tuesday, October 5, 2010,

TEXT:

According to a study from the United States, "X-ray observations of clusters of galaxies reveal the presence of edges in surface brightness and temperature, known as "cold fronts." In relaxed clusters with cool cores, these commonly observed edges have been interpreted as evidence for the "sloshing" of the core gas in the cluster's gravitational potential. Such sloshing may provide a source of heat to the cluster core by mixing hot gas from the cluster outskirts with the cool-core gas."

"Using high-resolution N-body/Eulerian hydrodynamic simulations, we model gas sloshing in galaxy clusters initiated by mergers with subclusters. The simulations include merger scenarios with gas-filled and gasless subclusters. The effect of changing the viscosity of the intracluster medium is also explored, but heat conduction is assumed to be negligible. We find that sloshing can facilitate heat inflow to the cluster core,

provided that there is a strong enough disturbance. Additionally, sloshing redistributes the gas in the cluster core, causing the gas to expand and decreasing the efficiency of radiative cooling. In adiabatic simulations, we find that sloshing can raise the entropy floor of the cluster core by nearly an order of magnitude in the strongest cases. If the ICM is viscous, the mixing of gases with different entropies is decreased and consequently the heat flux to the core is diminished. In simulations where radiative cooling is included, we find that although eventually a cooling flow develops, sloshing can prevent the significant buildup of cool gas in the core for times on the order of a Gyr for small disturbances and a few Gyr for large ones," wrote J.A. Zuhone and colleagues (see also).

The researchers concluded: "If repeated encounters with merging subclusters sustain the sloshing of the central core gas, as is observed, this process can provide a relatively steady source of heat to the core, which can help prevent a significant cooling flow."

Zuhone and colleagues published the results of their research in *Astrophysical Journal* (Stirring Up The Pot: Can Cooling Flows In Galaxy Clusters Be Quenched By Gas Sloshing? *Astrophysical Journal*, 2010;717(2):908-928).

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

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Record - 2

DIALOG(R)

Study results from C.J. Burke and colleagues broaden understanding of Astronomy,

Science Letter, p4199,

Tuesday, October 5, 2010

TEXT:

According to a study from the United States, "We refine the physical parameters of the transiting hot Jupiter planet XO-1b and its stellar host XO-1 using Hubble Space Telescope (HST) NICMOS observations. XO-1b has a radius $R_p = 1.21 \pm 0.03 R_J$, and XO-1 has a radius $R^* = 0.94 \pm 0.02 R_{\odot}$, where the uncertainty in the mass of XO-1 dominates the uncertainty of R_p and R^* ."

"There are no significant differences in the XO-1 system properties between these broadband NIR observations and previous determinations based upon ground-based optical observations. We measure two transit timings from these observations with 9 s and 15 s precision. As a residual to a linear ephemeris model, there is a 2.0 sigma timing difference between the two HST visits that are separated by three transit events (11.8 days). These two transit timings and additional timings from the literature are sufficient to rule out the presence of an Earth mass planet orbiting in 2:1 mean motion resonance coplanar with XO-1b. We identify and correct for poorly understood "gain-like" variations present in NICMOS time series data," wrote C.J. Burke and colleagues (see also).

The researchers concluded: "This correction reduces the effective noise in time series photometry by a factor of 2 for the case of XO-1."

Burke and colleagues published their study in Astrophysical Journal (NICMOS OBSERVATIONS OF THE TRANSITING HOT JUPITER XO-1b. Astrophysical Journal, 2010;719(2):1796-1806).

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

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Record - 3

DIALOG(R)

Study data from O. Cohen and colleagues update understanding of astronomy,

Science Letter, p4046,

Tuesday, October 5, 2010

TEXT:

"We present a three-dimensional simulation of the corona of an FK Com-type rapidly rotating G giant using a magnetohydrodynamic model that was originally developed for the solar corona in order to capture the more realistic, non-potential coronal structure. We drive the simulation with surface maps for the radial magnetic field obtained from a stellar dynamo model of the FK Com system," scientists in the United States report (see also).

"This enables us to obtain the coronal structure for different field

topologies representing different periods of time. We find that the corona of such an FK Com-like star, including the large-scale coronal loops, is dominated by a strong toroidal component of the magnetic field. This is a result of part of the field being dragged by the radial outflow, while the other part remains attached to the rapidly rotating stellar surface. This tangling of the magnetic field, in addition to a reduction in the radial flow component, leads to a flattening of the gas density profile with distance in the inner part of the corona. The three-dimensional simulation provides a global view of the coronal structure. Some aspects of the results, such as the toroidal wrapping of the magnetic field, should also be applicable to coronae on fast rotators in general, which our study shows can be considerably different from the well-studied and well-observed solar corona," wrote O. Cohen and colleagues.

The researchers concluded: "Studying the global structure of such coronae should also lead to a better understanding of their related stellar processes, such as flares and coronal mass ejections, and in particular should lead to an improved understanding of mass and angular momentum loss from such systems."

Cohen and colleagues published their study in *Astrophysical Journal* (Magnetic Structure Of Rapidly Rotating Fk Comae-type Coronae. *Astrophysical Journal*, 2010;719(1):299-306).

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

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Record - 4

DIALOG(R)

Study data from G. Dobler and co-authors update knowledge of astronomy,
Science Letter, p4018,
Tuesday, October 5, 2010

TEXT:

"The FermiGamma-ray Space Telescope reveals a diffuse inverse Compton (IC) signal in the inner Galaxy with a similar spatial morphology to the microwave haze observed by WMAP, supporting the synchrotron interpretation of the microwave signal. Using spatial templates, we regress out π^0 gammas, as well as IC and bremsstrahlung components associated with known

soft-synchrotron counterparts," scientists in the United States report (see also).

"We find a significant gamma-ray excess toward the Galactic center with a spectrum that is significantly harder than other sky components and is most consistent with IC from a hard population of electrons. The morphology and spectrum are consistent with it being the IC counterpart to the electrons which generate the microwave haze seen at WMAP frequencies. In addition, the implied electron spectrum is hard; electrons accelerated in supernova shocks in the disk which then diffuse a few kpc to the haze region would have a softer spectrum," wrote G. Dobler and colleagues.

The researchers concluded: "We describe the full-sky Fermi maps used in this analysis and make them available for download."

Dobler and colleagues published their study in *Astrophysical Journal* (The Fermi Haze: A Gamma-ray Counterpart To The Microwave Haze. *Astrophysical Journal*, 2010;717(2):825-842).

For additional information, contact G. Dobler, Harvard Smithsonian Center Astrophysics, Institute Theory & Computational, 60 Garden St., MS 51, Cambridge, MA 02138, USA.

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Record - 5

DIALOG(R)

Studies from R. Distefano and co-researchers update current data on Astronomy,

Science Letter, p3781,
Tuesday, October 5, 2010

TEXT:

According to a study from the United States, "In order for a white dwarf (WD) to achieve the Chandrasekhar mass, M_C , and explode as a Type Ia supernova (SNIa), it must interact with another star, either accreting matter from or merging with it. The failure to identify the class or classes of binaries which produce SNIa is the long-standing "progenitor problem." Its solution is required if we are to utilize the full potential of SNIa to elucidate basic cosmological and physical principles."

"In single-degenerate models, a WD accretes and burns matter at high rates. Nuclear-burning white dwarfs (NBWDs) with mass close to MC are hot and luminous, potentially detectable as supersoft X-ray sources (SSSs). In previous work, we showed that >90%-99% of the required number of progenitors do not appear as SSSs during most of the crucial phase of mass increase. The obvious implication might be that double-degenerate binaries form the main class of progenitors. We show in this paper, however, that many binaries that later become double degenerates must pass through a long-lived NBWD phase during which they are potentially detectable as SSSs. The paucity of SSSs is therefore not a strong argument in favor of double-degenerate models. Those NBWDs that are the progenitors of double-degenerate binaries are likely to appear as symbiotic binaries for intervals >10(6) years. In fact, symbiotic pre-double-degenerates should be common, whether or not the WDs eventually produce SNeIa. The key to solving the Type Ia progenitor problem lies in understanding the appearance of NBWDs. Most of them do not appear as SSSs most of the time," wrote R. Distefano and colleagues (see also).

The researchers concluded: "We therefore consider the evolution of NBWDs to address the question of what their appearance may be and how we can hope to detect them."

Distefano and colleagues published their study in *Astrophysical Journal* (THE PROGENITORS OF TYPE Ia SUPERNOVAE. II. ARE THEY DOUBLE-DEGENERATE BINARIES? THE SYMBIOTIC CHANNEL *Astrophysical Journal*, 2010;719(1):474-482).

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

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Record - 6

DIALOG(R)

Studies from J. Forbrich and colleagues yield new information about Astronomy,

Science Letter, p3670,
Tuesday, October 5, 2010

TEXT:

According to recent research from the United States, "We have previously

analyzed sensitive mid-infrared observations to establish that the Pipe Nebula (PiN) has a very low star formation efficiency. That study focused on young stellar objects (YSOs) with excess infrared emission (i.e., protostars and pre-main-sequence stars with disks), however, and could have missed a population of more evolved pre-main-sequence stars or Class III objects (i.e., young stars with dissipated disks that no longer show excess infrared emission)."

"Evolved pre-main-sequence stars are X-ray bright, so we have used ROSAT All-Sky Survey data to search for diskless pre-main-sequence stars throughout the PiN. We have also analyzed archival XMM-Newton observations of three prominent areas within the Pipe: Barnard 59 (B 59), containing a known cluster of YSOs; Barnard 68, a dense core that has yet to form stars; and the Pipe molecular ring, a high-extinction region in the bowl of the Pipe. We also characterize the X-ray properties of YSOs in B 59," wrote J. Forbrich and colleagues (see also).

The researchers concluded: "The ROSAT and XMM-Newton data provide no indication of a significant population of more evolved pre-main-sequence stars within the Pipe, reinforcing our previous measurement of the Pipe's very low star formation efficiency."

Forbrich and colleagues published their study in *Astrophysical Journal* (Nothing To Hide: An X-ray Survey For Young Stellar Objects In The Pipe Nebula. *Astrophysical Journal*, 2010;719(1):691-699).

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

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Record - 7

DIALOG(R)

Research from H.B. Perets and co-researchers provides new data on astronomy,
Science Letter, p2248,
Tuesday, October 5, 2010

TEXT:

"Regular star formation is thought to be inhibited close to the massive black hole (MBH) in the Galactic center. Nevertheless, tens of young main-sequence B-stars have been observed in an isotropic distribution close

to it," scientists writing in the *Astrophysical Journal* report (see also).

"These stars are observed to have an apparently continuous distribution from very close to the MBH (<0.01 pc) and up to at least similar to 0.5 pc, suggesting a common origin. Various models have been suggested for the formation of the B-stars closest to the MBH (<0.05 pc; the S-stars), typically involving the migration of these stars from their original birthplace to their currently observed position. Here, we explore the orbital phase space distribution of the B-stars throughout the central parsec expected from the various suggested models for the origin of the B-stars. We find that most of these models have difficulties in explaining, by themselves, both the population of the S-stars (<0.05 pc) and the population of the young B-stars further away (up to 0.5 pc). Most models grossly overpredict the number of B-stars up to 0.5 pc, given the observed number of S-stars. Such models include the intermediate-mass black hole assisted cluster inspiral scenario, Kozai-like perturbations by two disks, spiral density waves migration in a gaseous disk, and some of the eccentric disk instability models. We focus on one of the other models, the massive perturbers induced binary disruption, which is consistent with both the S-stars and the extended population of B-stars further away. For this model, we use analytical arguments and N-body simulations to provide further observational predictions. These could be compared with future observations to further support this model, constrain it, or refute it," wrote H.B. Perets and colleagues.

The researchers concluded: "These predictions include the radial distribution of the young B-stars, their eccentricity distribution, and its dependence on distance from the MBH (higher eccentricities at larger distances from the MBH), as well as less specific expectations regarding their mass function."

Perets and colleagues published their study in *Astrophysical Journal* (Dynamical Constraints On The Origin Of The Young B-stars In The Galactic Center. *Astrophysical Journal*, 2010;719(1):220-228).

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

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Record - 8

DIALOG(R)

Research from B.C. Kelly and co-authors reveals new findings on astronomy,
Science Letter, p2181,
Tuesday, October 5, 2010

TEXT:

"We present an estimate of the black hole mass function of broad-line quasars (BLQSOs) that self-consistently corrects for incompleteness and the statistical uncertainty in the mass estimates, based on a sample of 9886 quasars at $1 < z < 4.5$ drawn from the Sloan Digital Sky Survey (SDSS). We find evidence for "cosmic downsizing" of black holes in BLQSOs, where the peak in their number density shifts to higher redshift with increasing black hole mass," investigators in the United States report (see also).

"The cosmic mass density for black holes seen as BLQSOs peaks at z similar to 2. We estimate the completeness of the SDSS as a function of the black hole mass and Eddington ratio, and find that at $z > 1$ it is highly incomplete at M_{BH} less than or similar to $10^9 M_{\odot}$ and L/L_{Edd} less than or similar to 0.5. We estimate a lower limit on the lifetime of a single BLQSO phase to be $t(BL) > 150 \pm 15$ Myr for black holes at $z = 1$ with a mass of $M_{BH} = 10^9 M_{\odot}$, and we constrain the maximum mass of a black hole in a BLQSO to be similar to $3 \times 10^{10} M_{\odot}$. Our estimated distribution of BLQSO Eddington ratios peaks at L/L_{Edd} similar to 0.05 and has a dispersion of similar to 0.4 dex, implying that most BLQSOs are not radiating at or near the Eddington limit; however, the location of the peak is subject to considerable uncertainty. The steep increase in number density of BLQSOs toward lower Eddington ratios is expected if the BLQSO accretion rate monotonically decays with time. Furthermore, our estimated lifetime and Eddington ratio distributions imply that the majority of the most massive black holes spend a significant amount of time growing in an earlier obscured phase, a conclusion which is independent of the unknown obscured fraction," wrote B.C. Kelly and colleagues.

The researchers concluded: "These results are consistent with models for self-regulated black hole growth, at least for massive systems at $z > 1$, where the BLQSO phase occurs at the end of a fueling event when black hole feedback unbinds the accreting gas, halting the accretion flow."

Kelly and colleagues published their study in *Astrophysical Journal* (Constraints On Black Hole Growth, Quasar Lifetimes, And Eddington Ratio Distributions From The Sdss Broad-line Quasar Black Hole Mass Function. *Astrophysical Journal*, 2010;719(2):1315-1334).
For additional information, contact B.C. Kelly, Harvard Smithsonian Center Astrophysics, 60 Garden St., Cambridge, MA 02138, USA.

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Record - 9

DIALOG(R)

Reports outline astronomy study results from S.Q. Park et al,

Science Letter, p1926,

Tuesday, October 5, 2010

TEXT:

According to a study from the United States, "This paper analyzes a sample of 489 Spitzer/Infrared Array Camera (IRAC) sources in the Extended Groth Strip (EGS), whose spectral energy distributions fit a red power law (PL) from 3.6 to 8.0 μ m. The median redshift for sources with known redshifts is $\langle z \rangle = 1.6$. Though all or nearly all of the sample galaxies are likely to be active galactic nuclei (AGNs), only 33% were detected in the EGS X-ray survey (AEGIS-X) using 200 ks Chandra observations."

"The detected sources are X-ray luminous with $L_X > 10^{43}$ erg s⁻¹ and moderately to heavily obscured with $N_H > 10^{22}$ cm⁻². Stacking the X-ray-undetected sample members yields a statistically significant X-ray signal, suggesting that they are on average more distant or more obscured than sources with X-ray detections. The ratio of X-ray to mid-infrared fluxes suggests that a substantial fraction of the sources undetected in X-rays are obscured at the Compton-thick level, in contrast to the X-ray-detected sources, all of which appear to be Compton thin. For the X-ray-detected PL sources with redshifts, an X-ray luminosity L_X similar to 10^{44} erg s⁻¹ marks a transition between low-luminosity, blue sources dominated by the host galaxy to high-luminosity, red PL sources dominated by nuclear activity. X-ray-to-optical ratios, infrared variability, and 24 μ m properties of the sample are consistent with the identification of infrared PL sources as active nuclei, but a rough estimate is that only 22% of AGNs are selected by the PL criteria," wrote S.Q. Park and colleagues (see also).

The researchers concluded: "Comparison of the PL selection technique and various IRAC color criteria for identifying AGNs confirms that high-redshift samples selected via simple IRAC colors may be heavily contaminated by starlight-dominated objects."

Park and colleagues published their study in *Astrophysical Journal* (Aegis: A Multiwavelength Study Of Spitzer Power-law Galaxies. *Astrophysical*

Journal, 2010;717(2):1181-1201).

For more information, contact S.Q. Park, Harvard Smithsonian Center Astrophysics, 60 Garden St., Cambridge, MA 02138, USA.
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Record - 10

DIALOG(R)

New findings from A. Tchekhovskoy and co-authors in the area of astronomy published,

Science Letter, p1085,
Tuesday, October 5, 2010

TEXT:

According to recent research from the United States, "Achromatic breaks in afterglow light curves of gamma-ray bursts (GRBs) arise naturally if the product of the jet's Lorentz factor γ and opening angle $\Theta(j)$ satisfies $\gamma \Theta(j) \gg 1$ at the onset of the afterglow phase, i.e., soon after the conclusion of the prompt emission. Magnetohydrodynamic (MHD) simulations of collimated GRB jets generally give $\gamma \Theta(j)$ less than or similar to 1, suggesting that MHD models may be inconsistent with jet breaks."

"We work within the collapsar paradigm and use axisymmetric relativistic MHD simulations to explore the effect of a finite stellar envelope on the structure of the jet. Our idealized models treat the jet-envelope interface as a collimating rigid wall, which opens up outside the star to mimic loss of collimation. We find that the onset of deconfinement causes a burst of acceleration accompanied by a slight increase in the opening angle. In our fiducial model with a stellar radius equal to $10(4.5)$ times that of the central compact object, the jet achieves an asymptotic Lorentz factor γ similar to 500 far outside the star and an asymptotic opening angle $\Theta(j)$ similar or equal to 0.04 rad at similar or equal to 2 degrees, giving $\gamma \Theta(j)$ similar to 20. These values are consistent with observations of typical long-duration GRBs, and explain the occurrence of jet breaks," wrote A. Tchekhovskoy and colleagues (see also).

The researchers concluded: "We provide approximate analytic solutions that describe the numerical results well."

Tchekhovskoy and colleagues published their study in *New Astronomy* (Magnetohydrodynamic simulations of gamma-ray burst jets: Beyond the progenitor star. *New Astronomy*, 2010;15(8):749-754).

For additional information, contact A. Tchekhovskoy, Harvard Smithsonian Center Astrophysics, Institute Theory & Computational, 60 Garden St., Cambridge, MA 02138, USA.

Publisher contact information for the journal *New Astronomy* is: Elsevier Science BV, PO Box 211, 1000 AE Amsterdam, Netherlands.
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Record - 11

DIALOG(R)

NEW PLANET MAY BE ABLE TO NURTURE LIFE,
DENNIS OVERBYE, THE NEW YORK TIMES,
Pittsburgh Post-Gazette (PA), SOONER ed, pA-9
Thursday, September 30, 2010

TEXT:

It might be a place that only a lichen or pond scum could love, but astronomers said Wednesday that they had found a very distant planet capable of harboring water on its surface, thus potentially making it a home for plant or animal life.

Nobody from Earth will be visiting anytime soon: The planet, which goes by the bumpy name of Gliese 581g, is orbiting a star about 20 light years away, in the constellation Libra.

But if the finding is confirmed by other astronomers, the planet -- which has about three or four times more mass than Earth -- would be the most Earthlike planet yet discovered, and the first to meet the criteria for being potentially habitable.

"It's been a long haul," said Steven S. Vogt of the University of California, Santa Cruz, who, along with R. Paul Butler of the Carnegie Institution of Washington, led the team that made the discovery. "This is the first exoplanet that has the right conditions for water to exist on its surface."

In a recent report for the National Academy of Science, astronomers declared the finding of such planets one of the major goals of this decade. NASA's Kepler satellite, launched in March 2009 as a way to detect Earthlike bodies, is expected to harvest dozens or hundreds.

Gliese 581g (pronounced GLEE-za) circles a dim red star known as Gliese 581 once every 37 days, at a distance of about 14 million miles. That is smack in the middle of the so-called Goldilocks zone, where the heat from the star is neither too cold nor too hot for water to exist in liquid form on its surface. "This is really the first Goldilocks planet," Dr. Butler said.

Other astronomers hailed the news as another harbinger that the search for "living planets," as Dimitar D. Sasselov of the Harvard-Smithsonian Center for Astrophysics calls them, is on the right track.

"I'm getting goosebumps," said Columbia University's Caleb Scharf. But they expressed caution about this particular planet, noting uncertainties about its density, composition and atmosphere, and the need for another generation of giant telescopes and spacecraft in order to find out anything more about it. Other Goldilocks planets have come and gone in recent years.

The discovery was announced at a news conference Wednesday in Washington, and the findings have been posted on the National Science Foundation's website and will be published in *The Astrophysical Journal*.

The authors said the relative ease by which planet was found -- in only 11 years -- led them to believe that such planets must be common. "Either we have just been incredibly lucky in this early detection, or we are truly on the threshold of a second Age of Discovery," they wrote in their paper.

Pressed during the news conference about the possibility of life on Gliese 581g, Dr. Vogt protested that he was an astronomer, not a biologist. Then he relented, saying that, speaking strictly personally, he believed that "the chances of life on this planet are almost 100 percent."

The latest results from Gliese 581 were harvested from observations by two often-competing teams, using telescopes in Chile and Hawaii to measure the slight gravitational tugs the star gets as its planets swing by. This is hardly the first time around the block for Gliese 581, which is a longtime favorite of planet hunters and now is known to have six planets in its retinue. It is a dwarf star about one-third the mass of the sun and only about one-hundredth as bright, allowing planets to huddle closer to the campfire. "It hauntingly reminds us of our own solar system," Dr. Butler said.

Two of Gliese's planets have already had their moment in the limelight as possible Goldilocks planets. One, known as Gliese 581c, circles just on the inner edge of the habitable zone and was thus thought to be habitable three years ago. But further analysis suggested that the greenhouse effect would

turn it into a stifling hell. Another planet, just on the outer edge of the Goldilocks zone, is probably too cold.

"One is on the hot side, the other is on the cold side," and the new planet is right in between, Dr. Vogt said. "It's bookended."

He and his colleagues estimated the average temperature on the surface of Gliese 581g to be between 10 and minus 24 degrees Fahrenheit, about the same as a summer day in Antarctica.

But that means very little, he said, because the planet, like all the others in that system, keeps the same face to the star all the time. So the temperature could vary wildly from the planet's day-side to its night-side, meaning that an organism could perhaps find a comfortable zone to live in.

But nobody really knows what is going on on Gliese 581g, said Massachusetts Institute of Technology planetary astronomer Sara Seager. "If it was all carbon dioxide, like Venus, it would be pretty hot," she said, adding that she would give the planet a 90 percent chance of holding water.

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Record - 12

DIALOG(R)

New Planet May Be Able To Nurture Organisms,

DENNIS OVERBYE,

New York Times (NY), Late Edition - Final ed, p28,

Thursday, September 30, 2010

TEXT:

It might be a place that only a lichen or pond scum could love, but astronomers said Wednesday that they had found a very distant planet capable of harboring water on its surface, thus potentially making it a home for plant or animal life.

Nobody from Earth will be visiting anytime soon: The planet, which goes by the bumpy name of Gliese 581g, is orbiting a star about 20 light-years away in the constellation Libra.

But if the finding is confirmed by other astronomers, the planet, which has three to four times the mass of Earth, would be the most Earthlike planet yet discovered, and the first to meet the criteria for being potentially habitable.

"It's been a long haul," said Steven S. Vogt of the University of

California, Santa Cruz, who, along with R. Paul Butler of the Carnegie Institution of Washington, led the team that made the discovery. "This is the first exoplanet that has the right conditions for water to exist on its surface."

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Asked the same question, Dr. Butler squirmed and said, "I like data."

After a pause he added: "And what the data say is that the planet is the right distance from the star to have water and the right mass to hold an atmosphere. What is needed simply to find lots and lots of these things is lots and lots of telescope time."

The latest results from Gliese 581 were harvested from observations by two often competing teams, using telescopes in Chile and Hawaii to measure the slight gravitational tugs the star gets as its planets swing by.

This is hardly the first time around the block for Gliese 581, which is a longtime favorite of planet hunters and now is known to have six planets in its retinue. It is a dwarf star about one-third the mass of the Sun and only about one-hundredth as bright, allowing planets to huddle closer to the campfire. "It hauntingly reminds us of our own solar system," Dr. Butler said.

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But that means very little, he said, because the planet, like all the others in that system, keeps the same face to the star all the time. So the temperature could vary wildly from the day-side to the night-side of the planet, meaning that an organism could perhaps find a comfortable zone to live in.

But nobody really knows what is going on on Gliese 581g, said Sara Seager, a planetary astronomer at the Massachusetts Institute of Technology. "If it was all carbon dioxide, like Venus, it would be pretty hot," she said, adding that she would give the planet a 90 percent chance of holding water.

That, she pointed out, is faint praise in scientific circles. "Sounds high, but would you fly on a plane that only had an 8 or 9 chance out of 10 of making it?" she asked.

"Everyone is so primed to say here's the next place we're going to find life," Dr. Seager said, "but this isn't a good planet for follow-up."

PHOTO: A rendering showing the inner four planets of the distant Gliese 581 system. The large planet in the foreground is Gliese 581g, which might be capable of harboring water on its surface. (PHOTOGRAPH BY NATIONAL SCIENCE FOUNDATION AND NASA)

GRAPHIC: Planet Gliese 581g: Astronomers have announced the discovery of the most Earthlike planet found to date. Gliese 581g is one of several lettered planets orbiting very close to Gliese 581, a dim red star about 20 lightyears away in the Libra constellation. (Source: Astrophysical Journal)

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Record - 13

DIALOG(R)

New planet called 'game changer' in hunt for life,

DENNIS OVERBYE

International Herald Tribune, p5,

Thursday, September 30, 2010

TEXT:

It might be a place that only a lichen or pond scum could love, but American astronomers said Wednesday that they had found a planet capable of harboring water on its surface and thus potentially habitable, orbiting a star about 20 light years from here.

If confirmed, the new planet, which goes by the bumpy name of Gliese 581g, would be the most Earth-like planet discovered and the first to meet the criteria for being potentially habitable.

In a recent report for the National Academy of Science, astronomers said the finding of such planets was one of the major goals of this decade. The NASA Kepler satellite alone is expected to find dozens or hundreds. In order for the planet to be considered "habitable" - the next rung on planetary preciousness - water would have to be found on it.

"This is a game changer," said Steven Vogt of the University of California, Santa Cruz, one of the leaders of the team that found the planet, according to a press release from the National Science Foundation. According to their measurements, the new planet is three or four times as large as Earth and is probably rocky like Earth. It circles a dim red star known as Gliese 581 every 37 days at a distance of about 15 million miles - right in the middle of the so-called "goldilocks" zone, where the heat from the star is neither too cold nor too hot for liquid water to exist on its surface.

Dr. Vogt and his colleagues estimated the temperature on the surface to be between 10 degrees and 24 degrees Fahrenheit (minus 4 Celsius), about the same as a summer day in Antarctica, but they and other astronomers cautioned that such estimates depended on uncertainties about the composition of the planet and assumptions about its atmosphere, although they seemed to disagree on which of these were the more worrisome. Other "goldilocks" planets have come and gone.

The discovery was announced at a news conference in Washington on Wednesday and it will be published in the *Astrophysical Journal*.

The ease with which the planet was found, the astronomers said, suggested that such planets must be common. "Either we have just been incredibly lucky in this early detection," the astronomers wrote in their paper, "or we are truly on the threshold of a second Age of Discovery."

Paul Butler, the other leader of the group, which goes by the name Lick-Carnegie Exoplanet Survey, said, "Our ability to find potentially habitable worlds is now limited only by our telescope time."

Other astronomers were excited but cautious. "I'm getting goose bumps," said Caleb Scharf, of Columbia University.

Sara Seager, a planetary astronomer at the Massachusetts Institute of Technology, called the new work a "small step for astronomers, a giant step for humankind," saying that it amounted to a proof of the concept that planets can be found in habitable zones.

This is not the first time in the limelight for Gliese 581, which has long been a favorite of planet hunters. The new results, based on 11 years of observations using telescopes in Chile and Hawaii, bring the total number of planets in the system to six, counting a new outermost planet, 581f. Because it is only about a third the mass of the sun, Gliese 581 is dimmer than the sun and thus its goldilocks zone is drawn inward, allowing planets to huddle closer and stay livable. Three years ago it was briefly thought that another one of its planets, 581c, which orbits just on the inner edge of the star's habitable zone, might be habitable until further studies suggested that the greenhouse effect would make it scorching.

Dr. Seager said she was worried that the same thing could happen on the new planet. "If it was all carbon dioxide, like Venus, it would be pretty hot," she said.

Dimitar Sasselov of the Harvard-Smithsonian Center for Astrophysics, another astronomer familiar with the Gliese 581 system, said he was elated that the discoveries had made it "such a beautifully rich planetary

system," but he urged caution. He said that according to models of planetary formation, the Gliese planets should have formed farther out from the star than they were now, in a realm dominated by ice and snow, before migrating in to warmer regions. As a result, he explained, they were more likely to be "water planets," rather than rocky ones, and too dilute to support complex chemistry like life.

"Of course," he added, "we do not know how life emerges, so all this is just speculation at some level."

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Record - 14

DIALOG(R)

Temperature Just Right For Life On Planet 'Goldilocks',

NPR All Things Considered,

Wednesday, September 29, 2010

TEXT:

ROBERT SIEGEL, host:

The possibility of life on other planets has been a staple of science fiction for decades. And now that possibility has taken a step closer to reality. Astronomers say that they've found a planet orbiting a star a mere 20 light years away and it has the right conditions for life to exist. As NPR's Joe Palca reports, the astronomers are calling this the first Goldilocks planet.

JOE PALCA: Just to review: Goldilocks was the little girl who didn't like porridge that was too hot or too cold. That's what a planet around another star would have to be like in order to harbor life.

Dr. PAUL BUTLER (Carnegie Institution of Washington): The planet has to be at the right distance from the star so that it's not too hot, not too cold, liquid water can exist. And then the planet has to have roughly the proper surface gravity.

PALCA: That's Paul Butler of the Carnegie Institution of Washington. He spoke this afternoon at a news conference organized by Butler's funder, the National Science Foundation.

Astronomers have found hundreds of planets orbiting other stars in the past decade, but they've all been so far from their suns that any water would be solid ice, or so close that liquid water would boil away. The new planet,

called Gliese 581-g, is different.

Now, Butler has no direct evidence that Gliese 581-g has water.

Dr. BUTLER: What we know is that this planet exists at the right distance for liquid water, and that it has the right amount of mass to hold on to an atmosphere and to protect its liquid water on the surface. And of course, any subsequent discussion about life is purely speculative.

PALCA: But then, he couldn't resist speculating.

Dr. BUTLER: That being said, on the Earth, anywhere you find liquid water you find life in abundance.

PALCA: There are six planets around Gliese 581. Even if 581-g doesn't have life, Steven Vogt of the University of California Santa Cruz says the solar system around Gliese 581 has an eerie resemblance to the one around our sun.

Dr. STEVEN VOGT (University of California Santa Cruz): It has an inner clutch of rocky, sort of terrestrial like planets.

PALCA: Like Mercury, Venus, Earth and Mars.

Dr. VOGT: And then this sort of loner that's sitting on the outside, which is kind of like our Jupiter, but it's scaled down. This entire solar system would fit within our own Earth's orbit.

PALCA: That's because Gliese 581 is a red dwarf, a pipsqueak of a star compared to our sun.

Dr. DAVID CHARBONNEAU (Harvard Smithsonian Center for Astrophysics): If you think of the sun as a 100-watt light bulb, this star is a one-watt light bulb. It's like a Christmas tree light.

PALCA: David Charbonneau is another planet hunter at the Harvard Smithsonian Center for Astrophysics.

Dr. CHARBONNEAU: So, to have the same temperature a planet needs to be much closer to that star than it would be from the sun to have a temperature where you might have life and liquid water.

PALCA: Charbonneau says the next step will be to try to analyze the atmosphere of this planet and other Goldilocks planets that are probably out there to see if they contain oxygen, another key chemical for life. Those findings are probably some years off, but Charbonneau predicts they will come.

Joe Palca, NPR News, Washington.

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Record - 15

DIALOG(R)

NRL's Wide-field Imager Selected for Solar Probe Plus Mission,
Business Wire,
Wednesday, September 29, 2010

TEXT:

Aerospace Writers/Business Editors/Space Writers

WASHINGTON--(BUSINESS WIRE)--September 29, 2010--NASA has chosen the Naval Research Laboratory's (NRL's) Wide-field Imager to be part of the Solar Probe Plus mission slated for launch no later than 2018. The Solar Probe Plus, a small car-sized spacecraft will plunge directly into the sun's atmosphere approximately four million miles from our star's surface. It will explore a region no other spacecraft ever has encountered in an effort to unlock the sun's biggest mysteries.

For decades, scientists have known that the corona, or the outer atmosphere, is several hundreds of times hotter than the visible solar surface and that the solar wind accelerates up to supersonic speeds as it travels through the corona. In the Solar Probe Plus mission, scientists hope to find answers to the questions: why is the solar corona so much hotter than the photosphere? And how is the solar wind accelerated? The answers to these questions can be obtained only through in-situ measurements of the solar wind down in the corona.

NRL's Wide-field Imager for Solar Probe (WISPR) is one of five science investigations selected by NASA for this mission. It is the only optical investigation because the solar environment is so hot the instruments need to be tucked behind a heat shield. NRL's Dr. Russell Howard, the principal investigator, says, "This is an extremely exciting mission - no other spacecraft has ever gone this close - it is like the early voyagers of the earth, we don't really know what to expect, but we know, whatever it is, it is going to be spectacular."

The imager is a telescope, which looks off to the side of the heat shield, and will make 2-D images of the sun's corona as the spacecraft flies through. But like a medical CAT scan, the orbit of the spacecraft through the corona will enable 3-D images and a determination of the 3-D structure of the corona. The experiment actually will see the solar wind and provide

3-D images of clouds and shocks as they approach and pass the spacecraft. "We'll be flying through the structures that we've only seen from 100 million miles away. We'll be able to see all the phenomena (mass ejections, streamers, shocks, comets, and dust) up close. Other instruments will be able to measure the magnetic and electric fields and the plasma itself," explains Howard. This investigation complements instruments on the spacecraft by providing direct measurements of the plasma far away as well as near the spacecraft - the same plasma the other instruments sample.

The other four investigations chosen for the Solar Probe Plus mission include:

-- The Solar Wind Electrons Alphas and Protons Investigation will specifically count the most abundant particles in the solar wind -- electrons, protons and helium ions -- and measure their properties. The investigation also is designed to catch some of the particles in a special cup for direct analysis. (Smithsonian Astrophysical Observatory in Cambridge, Massachusetts)

-- The Fields Experiment will make direct measurements of electric and magnetic fields, radio emissions, and shock waves that course through the sun's atmospheric plasma. The experiment also serves as a giant dust detector, registering voltage signatures when specks of space dust hit the spacecraft's antenna. (University of California Space Sciences Laboratory in Berkeley, California)

-- The Integrated Science Investigation of the Sun consists of two instruments that will take an inventory of elements in the sun's atmosphere using a mass spectrometer to weigh and sort ions in the vicinity of the spacecraft. (Southwest Research Institute in San Antonio, Texas)

-- The Heliospheric Origins with Solar Probe Plus is led by Dr. Marco Velli who is the mission's observatory scientist, responsible for overseeing assembly of the spacecraft. He will ensure adjacent instruments do not interfere with one another and guide the overall science investigations after the probe enters the sun's atmosphere. (NASA's Jet Propulsion Laboratory in Pasadena, California)

The Solar Probe Plus mission is part of NASA's Living with a Star Program. The program is designed to understand aspects of the sun and Earth's space environment that affect life and society. The program is managed by NASA'S Goddard Space Flight Center in Greenbelt, Maryland, with oversight from NASA's Science Mission Directorate's Heliophysics Division. The Johns Hopkins University Applied Physics Laboratory in Laurel, Maryland, is the prime contractor for the spacecraft.

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State Keywords: District of Columbia
Industry Keywords: Public Policy/Government; Other Policy Issues;
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Source: Naval Research Laboratory (NRL)

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Record - 16

DIALOG(R)
**UNIVERSITY OF HAWAII AT MANOA'S PAN-STARRS DISCOVERS 1ST POTENTIALLY
HAZARDOUS ASTEROID,**
US Federal News,
Tuesday, September 28, 2010

TEXT:
HONOLULU, Sept. 27 -- The University of Hawaii issued the following news
release:

The University of Hawaii at Manoa's Pan-STARRS PS1 telescope on Haleakala has discovered an asteroid that will come within 4 million miles of Earth in mid-October. The object is about 150 feet in diameter and was discovered in images acquired on September 16, when it was about 20 million miles away.

It is the first "potentially hazardous object" (PHO) to be discovered by the Pan-STARRS survey and has been given the designation "2010 ST3."

"Although this particular object won't hit Earth in the immediate future, its discovery shows that Pan-STARRS is now the most sensitive system dedicated to discovering potentially dangerous asteroids," said Dr. Robert Jedicke, a University of Hawaii at Manoa member of the PS1 Scientific Consortium (PS1SC), who is working on the asteroid data from the telescope. "This object was discovered when it was too far away to be detected by other asteroid surveys," Jedicke noted.

Most of the largest PHOs have already been catalogued, but scientists suspect that there are many more under a mile across that have not yet been

discovered. These could cause devastation on a regional scale if they ever hit our planet. Such impacts are estimated to occur once every few thousand years.

Objects the size of 2010 ST3 usually break up in Earth's atmosphere, but the resulting blast wave on the surface can still devastate an area covering hundreds of square miles. "There is a very slight possibility that ST3 will hit Earth in 2098, so it is definitely worth watching," Jedicke said.

Dr. Timothy Spahr, director of the Minor Planet Center (MPC), said, "I congratulate the Pan-STARRS project on this discovery. It is proof that the PS1 telescope, with its Gigapixel Camera and its sophisticated computerized system for detecting moving objects, is capable of finding potentially dangerous objects that no one else has found." The MPC, located in Cambridge, Mass., was established by the International Astronomical Union in 1947 to collect and disseminate positional measurements for asteroids and comets, to confirm their discoveries, and to give them preliminary designations.

Pan-STARRS expects to discover tens of thousands of new asteroids every year with sufficient precision to accurately calculate their orbits around the sun. Any sizable object that looks like it may come close to Earth within the next 50 years or so will be labeled "potentially hazardous" and carefully monitored. NASA experts believe that, given several years warning, it should be possible to organize a space mission to deflect any asteroid that is discovered to be on a collision course with Earth.

Pan-STARRS has broader goals as well. PS1 and its bigger brother, PS4, which will be operational later in this decade, are expected to discover a million or more asteroids in total, as well as more distant targets such as variable stars, supernovas, and mysterious bursts from galaxies across more than half the universe.

The PS1 surveys have been made possible through contributions of the PS1 Science Consortium (www.ps1sc.org): the University of Hawaii at Manoa Institute for Astronomy; 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, Inc.; and the National Central University of Taiwan. Construction funding for Pan-STARRS (short for Panoramic Survey Telescope & Rapid Response System) has been provided by the U.S. Air Force Research Laboratory. For any query with respect to this article or any

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Record - 17

DIALOG(R)

Telescope spots its first asteroid target,

UPI Science News,

Monday, September 27, 2010

TEXT:

An asteroid-hunting telescope in Hawaii has discovered its first potentially-hazardous asteroid, scientists say.

The Panoramic Survey Telescope & Rapid Response System instrument on the summit of Haleakala on Maui, Hawaii, has discovered an asteroid that will come within 4 million miles of Earth in mid-October, a release by the Harvard-Smithsonian Center for Astrophysics said.

The asteroid is about 150 feet in diameter and was photographed Sept. 16 when it was about 20 million miles away, the release said.

It is the first "potentially hazardous object" (PHO) to be discovered by the Pan-STARRS survey and has been given the designation "2010 ST3." "Although this particular object won't hit Earth in the immediate future, its discovery shows that Pan-STARRS is now the most sensitive system dedicated to discovering potentially dangerous asteroids," Robert Jedicke of the University of Hawaii said. "This object was discovered when it was too far away to be detected by other asteroid surveys."

Although most of the largest PHOs have already been catalogued, scientists suspect there are many more under a mile across that have not yet been discovered, and that could cause devastation on a regional scale if they ever hit our planet.

Such impacts are estimated to occur once every few thousand years, scientists say.

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Record - 18

DIALOG(R)

Greensboro News & Record (NC), Greensboro Edition Variation ed, pB6,
Sunday, September 26, 2010

TEXT:

Giovanni Fazio, a pioneer in infrared astronomy at Harvard-Smithsonian Center for Astrophysics, will give a free public lecture at 7:30 p.m. Oct. 1 at GTCC's Koury Hospitality Careers Center on the Jamestown campus.

His topic will be "Viewing the Universe with Infrared Eyes: The Spitzer Space Telescope." For more information, call 334-4822.

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Record - 19

DIALOG(R)

Astronomers get closer to finding faraway Earths: two planetary systems offer new clues on planet formation.,

Cowen, Ron,
Science News, v178, n7, p5(2),
Saturday, September 25, 2010

TEXT:

Only a few years ago, astronomers were thrilled if they found a star beyond the solar system harboring a single planet. Now they're discovering more and more multiple-planet systems that may offer new clues about the formation of planets and their evolution.

In one new study, scientists have discovered a star with at least five and as many as seven planets, which would make it the richest known planetary retinue beyond the solar system. A second study has revealed a star with two roughly Saturn-mass planets locked in a special gravitational embrace that allows astronomers to study the pair in unusual detail. Researchers have also found hints of a third planet orbiting with the two that, if confirmed, would be the tiniest extrasolar orb known, with a diameter only about 1.5 times that of Earth.

With these multiple-planet systems, "we're entering a new era of exoplanets," says theorist Sara Seager of MIT. Instead of focusing on individual discoveries, she adds, "we're moving on to complex planetary system architectures and the hope of being able to understand how they got

that way."

Using NASA's Kepler spacecraft, Matthew Holman of the Harvard-Smithsonian Center for Astrophysics in Cambridge, Mass., and his colleagues found two planets orbiting a dim sunlike star, dubbed Kepler-9, about 2,100 light-years from Earth. Each planet blocks a tiny amount of starlight when it transits, or passes across the face of the star.

[ILLUSTRATION OMITTED]

Kepler-9 is the first system confirmed to have more than one transiting planet. What's more, the two planets have migrated into orbits that have a special gravitational synchrony--every time the outer planet makes one lap around Kepler-9, the inner planet makes two, Holman and his collaborators report online August 26 in *Science*.

During seven months of observations, Kepler not only measured dips in starlight, which reveal the planets' diameters, but also found that the transit time of each planet varied by minutes due to the orbs' mutual gravitational tug.

Holman and his collaborators used the timing variations to determine that both planets have masses similar to Saturn, a finding confirmed by ground-based observations of the back-and-forth motion, or wobble, of the parent star. In the future, says Holman, variations in transit timing recorded by Kepler may reveal the masses of planets similar to Earth--bodies too lightweight to induce a detectable wobble in the orbit of their star.

A much smaller dip in starlight may be caused by a third, tinier planet with a diameter only about 1.5 times that of Earth. The candidate planet would lie much too close to the star to support life. Holman and his collaborators posted their analysis of the proposed "super-Earth" signal August 27 at arXiv.org.

If confirmed, the super-Earth would be the "smoking gun" for a leading theory of planet formation, comments theorist Doug Lin of the University of California, Santa Cruz. According to that theory, known as core accretion, bits of material from a disk of gas, dust and ice swaddling newborn stars coalesce to form a solid core. Then the core may snare a massive amount of gas from the planet-forming disk to create a gas giant like Jupiter. If the gaseous disk disperses before that can happen, a rocky naked core more like Venus, Earth, Mars or Mercury remains (SN: 3/26/05, p. 203).

A rocky super-Earth that orbits closer to Kepler-9 than the gaseous Saturn-like planets do would be strong evidence of just such a naked core,

pushed within roasting distance of the star by the two heavier planets, says Lin.

As intriguing as the Kepler-9 system appears, it's downright simple compared with the gaggle of planets orbiting HD 10180, about 127 light-years from Earth. Tracking the motion of the star for more than six years with a sensitive spectrograph on the European Southern Observatory's 3.6-meter telescope at La Silla, Chile, researchers have found evidence for at least five planets, with hints of an additional two.

[ILLUSTRATION OMITTED]

The five confirmed planets have minimum masses similar to that of Neptune and are packed inside a region roughly equal in diameter to Mars' orbit around the sun, Christophe Lovis of the Observatory of Geneva in Switzerland and his colleagues report in an upcoming *Astronomy & Astrophysics*. The system is much more densely populated than the inner solar system and also appears to lack a giant Jupiter-sized planet.

Understanding how the HD 10180 system came to be poses challenges that promise to provide additional clues about planet formation and the conditions necessary to make and retain Earth-mass bodies, says Lin.

Exoplanet scorecard

In the 15 years since they first detected a planet orbiting a distant sunlike star, astronomers have made great strides toward finding a habitable, Earthlike world in another part of the galaxy. Their findings, as of August 27:

Confirmed exoplanets:

490

Stars known to have multiple exoplanets:

45

Most confirmed exoplanets orbiting a star: 5

HD 10180 and 55 Cancri (SN: 11/24/07, p. 334)

Minimum mass of heaviest known exoplanet:

25

Jupiter masses

HD 43848 b

Largest known exoplanet:

2.2

Jupiter diameters

CT Cha b

Smallest known exoplanet:

1.7

Earth diameters

COROT-7b (SN: 10/10/09, p. 8)

Number of known habitable planets:

0

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Record - 20

DIALOG(R)

Extra-Solar System,

Frank Morring, Jr.,

Aviation Week & Space Technology, v172, n33, p22,

Monday, September 6, 2010

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TEXT:

Astronomers evaluating data from NASA's Kepler spacecraft will have a new tool for estimating the size of extra-solar planets after discovering the mission's first two planets orbiting the same star. Ultimately, they hope to use the transit timing variations technique to help find Earthlike planets in the habitable zone. Designated Kepler 9b and 9c, the two Saturn-size gas giants are orbiting the Kepler 9 star at a distance closer than the planet Mercury orbits Earth's Sun. Scientists poring over data from what may be as many as 700 possible planets detected in the spacecraft's first 43 days of operation have confirmed that they can calculate the mass of planets in multi-planet systems, according to Matthew Holman, associate director of the Theoretical Astrophysics Div.

at the Harvard-Smithsonian Center for Astrophysics. Data from Kepler 9 suggest there also may be a smaller "super Earth" skimming just above the star, which lies about 2,000 light years from Earth. The Earth-orbiting Kepler spacecraft measures the slight drop in a distant star's brightness when a planet passes in front of it. From that, astronomers can determine a planet's orbit by how often it transits, and use transit timing variations to gauge its mass.

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Wolbach Library: CfA in the News ~ Week ending 10 October 2010

1. **Study data from V.A. Acciari and colleagues update understanding of astronomy**, Science Letter, p4080, Tuesday, October 12, 2010
2. **Research from P. Slane et al broadens understanding of astronomy**, Science Letter, p2372, Tuesday, October 12, 2010
3. **Report summarizes astronomy study findings from V. Lattanzi and co-researchers**, Science Letter, p1713, Tuesday, October 12, 2010
4. **Recent studies by K.I. Oberg and co-authors add new data to astronomy findings**, Science Letter, p1690, Tuesday, October 12, 2010
5. **New astronomy study findings have been published by R. Tullmann and colleagues**, Science Letter, p922, Tuesday, October 12, 2010
6. **Data on astronomy published by S.R. Cranmer and colleagues**, Science Letter, p381, Tuesday, October 12, 2010
7. **Data on astronomy published by L.A. Buchhave and colleagues**, Science Letter, p380, Tuesday, October 12, 2010
8. **Astro Bob blog: Meet Miss Wonderful**, Bob King, Duluth News Tribune (MN), Friday, October 8, 2010

Record - 1

DIALOG(R

Study data from V.A. Acciari and colleagues update understanding of astronomy,

Science Letter, p4080,
Tuesday, October 12, 2010

TEXT:

According to a study from the United States, "Indirect dark matter searches with ground-based gamma-ray observatories provide an alternative for identifying the particle nature of dark matter that is complementary to that of direct search or accelerator production experiments. We present the results of observations of the dwarf spheroidal galaxies Draco, Ursa Minor, Bootes 1, and Willman 1 conducted by the Very Energetic Radiation Imaging Telescope Array System (VERITAS)."

"These galaxies are nearby dark matter dominated objects located at a

typical distance of several tens of kiloparsecs for which there are good measurements of the dark matter density profile from stellar velocity measurements. Since the conventional astrophysical background of very high energy gamma rays from these objects appears to be negligible, they are good targets to search for the secondary gamma-ray photons produced by interacting or decaying dark matter particles. No significant gamma-ray flux above 200 GeV was detected from these four dwarf galaxies for a typical exposure of similar to 20 hr. The 95% confidence upper limits on the integral gamma-ray flux are in the range $(0.4-2.2) \times 10^{(-12)}$ photons $\text{cm}^{(-2)} \text{s}^{(-1)}$. We interpret this limiting flux in the context of pair annihilation of weakly interacting massive particles (WIMPs) and derive constraints on the thermally averaged product of the total self-annihilation cross section and the relative velocity of the WIMPs ($\langle \sigma v \rangle$ less than or similar to $10^{(-23)} \text{cm}^3 \text{s}^{(-1)}$ for $m(\chi)$ greater than or similar to 300 GeV $\text{c}^{(-2)}$). This limit is obtained under conservative assumptions regarding the dark matter distribution in dwarf galaxies and is approximately 3 orders of magnitude above the generic theoretical prediction for WIMPs in the minimal supersymmetric standard model framework," wrote V.A. Acciari and colleagues (see also).

The researchers concluded: "However, significant uncertainty exists in the dark matter distribution as well as the neutralino cross sections which under favorable assumptions could further lower this limit."

Acciari and colleagues published the results of their research in *Astrophysical Journal* (Veritas Search For Vhe Gamma-ray Emission From Dwarf Spheroidal Galaxies. *Astrophysical Journal*, 2010;720(2):1174-1180). For additional information, contact V.A. Acciari, Harvard Smithsonian Center Astrophysics, Fred Lawrence Whipple Observ, Amado, AZ 85645, 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 - 2

DIALOG(R)

Research from P. Slane et al broadens understanding of astronomy,
Science Letter, p2372,
Tuesday, October 12, 2010

TEXT:

"We present observations of HESS J1640-465 with the Fermi-Large Area Telescope. The source is detected with high confidence as an emitter of

high-energy gamma-rays," scientists in the United States report (see also).

"The spectrum lacks any evidence for the characteristic cutoff associated with emission from pulsars, indicating that the emission arises primarily from the pulsar wind nebula (PWN). Broadband modeling implies an evolved nebula with a low magnetic field resulting in a high gamma-ray to X-ray flux ratio," wrote P. Slane and colleagues.

The researchers concluded: "The Fermi emission exceeds predictions of the broadband model, and has a steeper spectrum, possibly resulting from a distinct excess of low energy electrons similar to what is inferred for both the Vela X and Crab PWNe."

Slane and colleagues published their study in *Astrophysical Journal* (Fermi Detection Of The Pulsar Wind Nebula Hess J1640-465. *Astrophysical Journal*, 2010;720(1):266-271).

For more information, contact P. Slane, 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)

Report summarizes astronomy study findings from V. Lattanzi and co-researchers,
Science Letter, p1713,
Tuesday, October 12, 2010

TEXT:

"The rotational spectrum of the negative molecular ion NCO⁻ has been observed both in a supersonic molecular beam and in a low-pressure glow discharge. The identification is ironclad because of the previous infrared detection of NCO⁻, the presence of well-resolved nitrogen quadrupole hyperfine structure, and the observation of nine harmonically related transitions in the millimeter band," scientists in the United States report (see also).

"The spectroscopic constants B and D are three orders of magnitude more accurate than those derived from the earlier IR measurements, and the theoretical eQq is in good agreement with that measured. The entire

rotational spectrum can now be calculated well into the THz region to 1 km s⁻¹ in equivalent radial velocity or better. NCO⁻ is an excellent candidate for radio astronomical detection because of its high stability, polarity, and favorable partition function," wrote V. Lattanzi and colleagues.

The researchers concluded: "The fairly high concentration of NCO⁻ in our laboratory source implies that other molecular anions containing the NCO group may be detectable in the radio band."

Lattanzi and colleagues published their study in *Astrophysical Journal* (The Rotational Spectrum Of The Nco⁻ Anion. *Astrophysical Journal*, 2010;720(2):1717-1720).

For more information, contact V. Lattanzi, 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 - 4

DIALOG(R)

Recent studies by K.I. Oberg and co-authors add new data to astronomy

Findings,

Science Letter, p1690,

Tuesday, October 12, 2010

TEXT:

According to recent research published in the *Astrophysical Journal*, "Chemistry plays an important role in the structure and evolution of protoplanetary disks, with implications for the composition of comets and planets. This is the first of a series of papers based on data from DISCS, a Submillimeter Array survey of the chemical composition of protoplanetary disks."

"The six Taurus sources in the program (DM Tau, AA Tau, LkCa 15, GM Aur, CQ Tau, and MWC 480) range in stellar spectral type from M1 to A4 and offer an opportunity to test the effects of stellar luminosity on the disk chemistry. The disks were observed in 10 different lines at similar to 3" resolution and an rms of similar to 100 mJy beam⁻¹ at similar to 0.5 km s⁻¹. The four brightest lines are CO 2-1, HCO⁺ 3-2, CN 2(33/4/2) - 1(22/3/1), and HCN 3-2, and these are detected toward all sources (except

for HCN toward CQ Tau). The weaker lines of CN 2(22)-1(11), DCO+ 3-2, N₂H+ 3-2, H₂CO 3(03)-2(02), and 4(14)-3(13) are detected toward two to three disks each, and DCN 3-2 only toward LkCa 15. CH₃OH 4(21)-3(12) and c-C₃H₂ are not detected. There is no obvious difference between the T Tauri and Herbig Ae sources with regard to CN and HCN intensities," wrote K.I. Oberg and colleagues (see also).

The researchers concluded: "In contrast, DCO+, DCN, N₂H+, and H₂CO are detected only toward the T Tauri stars, suggesting that the disks around Herbig Ae stars lack cold regions for long enough timescales to allow for efficient deuterium chemistry, CO freeze-out, and grain chemistry."

Oberg and colleagues published their study in *Astrophysical Journal* (The Disk Imaging Survey Of Chemistry With Sma. I. Taurus Protoplanetary Disk Data. *Astrophysical Journal*, 2010;720(1):480-493).

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

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Record - 5

DIALOG(R)

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

Science Letter, p922,

Tuesday, October 12, 2010

TEXT:

According to a study from the United States, "Using the Chandra X-ray Observatory, we have pinpointed the location of a faint X-ray point source (CXOU J182913.1-125113) and an associated diffuse nebula in the composite supernova remnant (SNR) G18.95-1.1. These objects appear to be the long-sought pulsar and its wind nebula."

"The X-ray spectrum of the point source is best described by an absorbed power-law model with $\Gamma = 1.6$ and an N-H of similar to 1×10^{22} cm⁻². This model predicts a relatively low unabsorbed X-ray luminosity of about L-X(0.5-8.0 keV) similar or equal to $4.1 \times 10^{31} D^{-2}$ erg s⁻¹, where D is the distance in units of 2 kpc. The best-fit model of the diffuse nebula is a combination of thermal (kT = 0.48 keV) and non-thermal ($1.4 \leq \Gamma \leq 1.9$) emission. The unabsorbed X-ray luminosity of L-X

similar or equal to $5.4 \times 10^{33} \text{ D-2(2) erg s}^{-1}$ in the 0.5-8 keV energy band seems to be largely dominated by the thermal component from the SNR, providing 87% of L-X in this band. No radio or X-ray pulsations have been reported for CXOU J182913.1-125113," wrote R. Tullmann and colleagues (see also).

The researchers concluded: "If we assume an age of similar to 5300 yr for G18.95-1.1 and use the X-ray luminosity for the pulsar and the wind nebula together with the relationship between spin-down luminosity (via magnetic dipole radiation) and period, we estimate the pulsar's period to be P similar or equal to 0.4 s. Compared to other rotation-powered pulsars, a magnetic field of $2.2 \times 10^{13} \text{ G}$ is implied by its location in the P-(P) over dot diagram, a value which is close to that of the quantum critical field."

Tullmann and colleagues published the results of their research in Astrophysical Journal (Searching For The Pulsar In G18.95-1.1: Discovery Of An X-ray Point Source And Associated Synchrotron Nebula With Chandra. Astrophysical Journal, 2010;720(1):848-852).

For additional information, contact R. Tullmann, 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 - 6

DIALOG(R)

Data on astronomy published by S.R. Cranmer and colleagues,
Science Letter, p381,
Tuesday, October 12, 2010

TEXT:

"The physical processes that heat the solar corona and accelerate the solar wind remain unknown after many years of study. Some have suggested that the wind is driven by waves and turbulence in open magnetic flux tubes, and others have suggested that plasma is injected into the open tubes by magnetic reconnection with closed loops," researchers in the United States report (see also).

"In order to test the latter idea, we developed Monte Carlo simulations of the photospheric "magnetic carpet" and extrapolated the time-varying coronal field. These models were constructed for a range of different

magnetic flux imbalance ratios. Completely balanced models represent quiet regions on the Sun and source regions of slow solar wind streams. Highly imbalanced models represent corona] holes and source regions of fast wind streams. The models agree with observed emergence rates, surface flux densities, and number distributions of magnetic elements. Despite having no imposed supergranular motions in the models, a realistic network of magnetic "funnels" appeared spontaneously. We computed the rate at which closed field lines open up (i.e., recycling times for open flux), and we estimated the energy flux released in reconnection events involving the opening up of closed flux tubes. For quiet regions and mixed-polarity coronal holes, these energy fluxes were found to be much lower than that which is required to accelerate the solar wind. For the most imbalanced coronal holes, the energy fluxes may be large enough to power the solar wind, but the recycling times are far longer than the time it takes the solar wind to accelerate into the low corona," wrote S.R. Cranmer and colleagues.

The researchers concluded: "Thus, it is unlikely that either the slow or fast solar wind is driven by reconnection and loop-opening processes in the magnetic carpet."

Cranmer and colleagues published their study in *Astrophysical Journal* (Can The Solar Wind Be Driven By Magnetic Reconnection In The Sun's Magnetic Carpet? *Astrophysical Journal*, 2010;720(1):824-847).

For additional information, contact S.R. Cranmer, 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 - 7

DIALOG(R)

Data on astronomy published by L.A. Buchhave and colleagues,
Science Letter, p380,
Tuesday, October 12, 2010

TEXT:

According to recent research from the United States, "We report the discovery of HAT-P-16b, a transiting extrasolar planet orbiting the $V = 10.8$ mag F8 dwarf GSC 279201700, with a period $P = 2.775960 \pm 0.000003$ days, transit epoch $T-c = 2455027.59293 \pm 0.00031$ (BJD10), and transit duration 0.1276 ± 0.0013 days. The host star has a mass of 1.22 ± 0.04

(M)circle dot, radius of $1.24 \pm 0.05 R\text{-circle dot}$, effective temperature 6158 ± 80 K, and metallicity $[Fe/H] = + 0.17 \pm 0.08$."

"The planetary companion has a mass of $4.193 \pm 0.094 M\text{-J}$ and radius of $1.289 \pm 0.066 R\text{-J}$, yielding a mean density of $2.42 \pm 0.35 \text{ g cm}^{-3}$. Comparing these observed characteristics with recent theoretical models, we find that HAT-P-16b is consistent with a 1 Gyr H/He-dominated gas giant planet," wrote L.A. Buchhave and colleagues (see also). The researchers concluded: "HAT-P-16b resides in a sparsely populated region of the mass-radius diagram and has a non-zero eccentricity of $e = 0.036$ with a significance of 10σ ."

Buchhave and colleagues published their study in *Astrophysical Journal* (HAT-P-16b: A 4 M-J PLANET TRANSITING A BRIGHT STAR ON AN ECCENTRIC ORBIT. *Astrophysical Journal*, 2010;720(2):1118-1125).

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

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Record - 8

DIALOG(R)

Astro Bob blog: Meet Miss Wonderful,

Bob King,

Duluth News Tribune (MN)

Friday, October 8, 2010

TEXT:

Meet Miss Wonderful

Posted on October 8, 2010 by astrobob

Last night, Comet Hartley 2 pulled to within spitting distance of the rich pair of cluster NGC 869 (left) and NGC 884. Details: 200mm lens at f/2.8, ISO 800, 2-minute exposure on a tracking mount. Photo: Bob King

Yesterday night was splendid for comet photography. Comet Hartley 2 slowly edged in toward the Double Cluster making for a picturesque portrait of two faraway star clusters and one fuzzy green visitor from the inner solar system. I hope you had the opportunity to see the comet yourself last

night. Tonight Hartley 2 will still be in the neighborhood but on the other side or east of the clusters.

This map shows the sprawling constellation Cetus around 11 o'clock in early October. Deneb Kaitos is two outstretched fists below Jupiter. Mira is level with and about three fists directly to the left of Deneb Kaitos. Mira is currently a bit brighter than Gamma (magnitude 3.5) and a little dimmer than Alpha (2.7). Created with Stellarium

As the ceaseless rotation of the Earth put the western stars to bed, Cetus the Whale rose to prominence in the southeastern sky. Fittingly, this whale of a constellation takes up a large chunk of sky. I only wish it had a few more bright stars to make its gangly easier to see; second magnitude Deneb Kaitos is the best it can muster. But what Cetus lacks in luster, it more than makes up for in Mira. This oddball star, located a couple "fingers" to the right or west of Alpha Ceti, is "missing" most of the year. You would have searched in vain for it during August and early September - unless you had a telescope. Mira spends much of the year below naked brightness and only a few months above. We're lucky that it's at peak brightness right now and plainly visible without optical aid.

Mira photographed in visible light by the Hubble Space Telescope. It bloated, tenuous atmosphere distorts the shape of the star, which is 420 light years from Earth. Credit: NASA/ESA

Mira is the prototype of a class of stars called long-period variables (LPVs). Though similar in mass to our sun, they're far larger and pulsate - physically expanding and shrinking - over regular intervals. Mira was discovered by David Fabricius in 1596. Prior to that time, no one knew a star could appear and disappear, which is why it was eventually named after the Latin word for "wonderful". Over the course of 11 months, Mira ranges from ninth magnitude (visible only in a small telescope) to as bright as second (similar to the Big Dipper stars). This month it hovers near its current maximum brightness of around third magnitude or one level fainter than the Dipper stars.

Mira oscillates from 400 to 700 times the size of the sun over a period of 332 days. While it might seem odd at first, the star is brightest when smallest or most condensed. As it shrinks, the amount of energy radiating from a particular patch on the star's surface increases, making it overall brighter and hotter. That's the stage Mira's in this month. Just the opposite happens when the star expands to its maximum diameter. That same energy is then spread over a much larger surface area and the star's surface radiates less heat and light. As Mira cools from around 5000 degrees Fahrenheit to 3000, a compound found in sunscreen, titanium dioxide, condenses in its atmosphere and does the same thing it does on

your body - block UV light. It not only removes UV radiation but some visible light as well, resulting in additional dimming.

Mira is a red giant star on its way to becoming a white dwarf. It also has a white dwarf companion (right) which undoubtedly evolved from a similar red giant. Credit: David Aguilar, Harvard-Smithsonian Center for Astrophysics

When Mira's huge, it can barely hold onto its vast atmosphere. Powerful winds blast away 10 million times more material into space each year than our own sun's solar wind. Mira's evaporating! Soon its atmosphere will expand away into space as a beautiful planetary nebula illuminated by Mira's core, now reduced to a white dwarf, a blazingly-hot but tiny star the size of the Earth. Take a good look at yourself. While we're mostly made of water, we also contain plenty of carbon. Elements like carbon are cooked up in the core of stars like Mira and then released into space by those strong stellar winds. Those elements eventually found their way right into our very being. If that ain't a whole lotta wonderful, I don't know what is.

The sun's evolutionary path will parallel that of Mira's, but those days are still several billions of years in the future. I hope you'll take the time to find our "wonderful star" this fall. If you spot it now, you'll have the pleasure of following its inevitable fading in the coming months. Or perhaps it will even get brighter - LPVs aren't 100% predictable. During one cycle, Mira became nearly as bright as first magnitude Aldebaran; I've seen it hit second. Can you see its warm hue with your naked eye? I think I can. Binoculars show it with ease when near maximum.

For the more adventurous, try making careful estimates of Mira's changing light by checking out the American Association of Variable Star Observers website. In the 'Star Finder' window at right, type in 'Mira' and click 'Create a finder chart'. When you're presented with the default chart, click on 'Change chart parameters and replot', select 'A' in the Legacy chart scale window and click 'Plot chart'. Star brightnesses on the charts are given to the tenth of a magnitude with the decimal omitted.

Tagged Astro Bob, Comet Hartley 2, Mira, variable

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Leave a comment

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1. **Research from A.M. Hughes and co-authors yields new data on astronomy**, Science Letter, p3268, Tuesday, October 19, 2010
2. **Astronomers Discover Massive Galaxy Cluster**, Fars News Agency (Iran), Sunday, October 17, 2010
3. **Yakov Alpert, at 99; refusenik did pioneering radio wave studies**, Bryan Marquard, Boston Globe (MA), p11, Sunday, October 17, 2010
4. **How a moon can reveal a star's weight**, ANI, Asian News International, Saturday, October 16, 2010
5. **Scientist ready to 'weigh' distant stars**, UPI Science News, Friday, October 15, 2010
6. **Giant, distant galaxy cluster found**, UPI Science News, Thursday, October 14, 2010
7. **Massive galaxy cluster weighs as much as 800 trillion Suns**, ANI, Asian News International, Thursday, October 14, 2010
8. **John Huchra, 61, Dies; Maps Altered Ideas on Universe**, DENNIS OVERBYE, New York Times (NY), Late Edition - Final ed, p19, Thursday, October 14, 2010
9. **Exhibit sends visitors on a virtual voyage to a black hole**, M2 PressWIRE, Thursday, October 7, 2010

Record - 1

DIALOG(R)

Research from A.M. Hughes and co-authors yields new data on astronomy,
Science Letter, p3268,
Tuesday, October 19, 2010

TEXT:

"The late stages of evolution of the primordial circumstellar disks surrounding young stars are poorly understood, yet vital to constraining theories of planet formation. We consider basic structural models for the disks around two similar to 10 Myr old members of the nearby RCrA association: RX J1842.9-3532 and RX J1852.3-3700," scientists in the United States report (see also).

"We present new arc second-resolution maps of their 230 GHz continuum

emission from the Submillimeter Array and unresolved CO(3-2) spectra from the Atacama Submillimeter Telescope Experiment. By combining these data with broadband fluxes from the literature and infrared fluxes and spectra from the catalog of the Formation and Evolution of Planetary Systems Legacy program on the Spitzer Space Telescope, we assemble a multiwavelength data set probing the gas and dust disks. Using the Monte Carlo radiative transfer code RADMC to model simultaneously the spectral energy distribution and millimeter continuum visibilities, we derive basic dust disk properties and identify an inner cavity of radius 16 AU in the disk around RX J1852.3-3700. We also identify an optically thin 5 AU cavity in the disk around RX J1842.9-3532, with a small amount of optically thick material close to the star. The molecular line observations suggest an intermediate disk inclination in RX J1842.9-3532, consistent with the continuum emission," wrote A.M. Hughes and colleagues.

The researchers concluded: "In combination with the dust models, the molecular data allow us to derive a lower CO content than expected, suggesting that the process of gas clearing is likely underway in both systems, perhaps simultaneously with planet formation."

Hughes and colleagues published their study in *Astronomical Journal* (Structure And Composition Of Two Transitional Circumstellar Disks In Corona Australis. *Astronomical Journal*, 2010;140(3):887-896).

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

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Record - 2

DIALOG(R)

Astronomers Discover Massive Galaxy Cluster,

Fars News Agency (Iran),

Sunday, October 17, 2010

TEXT:

The cluster (designated SPT-CL J0546-5345) weighs in at around 800 trillion Suns, and holds hundreds of galaxies. "This galaxy cluster wins the heavyweight title. It's among the most massive clusters ever found at this distance," said Mark Brodwin, a Smithsonian astronomer at the Harvard-Smithsonian Center for Astrophysics. Brodwin is first author on the

paper announcing the discovery, which appeared in the *Astrophysical Journal*. Redshift measures how light from a distant object has been stretched by the universe's expansion. Located in the southern constellation Pictor (the Painter), the cluster has a redshift of $z=1.07$. This puts it at a distance of about 7 billion light-years, meaning we see it as it appeared 7 billion years ago, when the universe was half as old as now and our solar system didn't exist yet. Even at that young age, the cluster was almost as massive as the nearby Coma cluster. Since then, it should have grown about four times larger. If we could see it as it appears today, it would be one of the most massive galaxy clusters in the universe. "This cluster is full of 'old' galaxies, meaning that it had to come together very early in the universe's history -- within the first two billion years," stated Brodwin. Galaxy clusters like this can be used to study how dark matter and dark energy influenced the growth of cosmic structures. Long ago, the universe was smaller and more compact, so gravity had a greater influence. It was easier for galaxy clusters to grow, especially in areas that already were denser than their surroundings. "You could say that the rich get richer, and the dense get denser," quipped Harvard astronomer Robert Kirshner, commenting on the study. As the universe expanded at an accelerating rate due to dark energy, it grew more diffuse. Dark energy now dominates over the pull of gravity and chokes off the formation of new galaxy clusters. Brodwin and his colleagues spotted their quarry in the first 200 square degrees of data collected from the new South Pole Telescope. The SPT is currently completing its pioneering millimeter-wave survey of a huge swath of sky covering 2,500 square degrees. They're hunting for giant galaxy clusters using the Sunyaev-Zel'dovich effect -- a small distortion of the cosmic microwave background (a pervasive all-sky glow left over from the Big Bang). Such distortions are created as background radiation passes through a large galaxy cluster. Surveying for this effect has significant advantages over other search techniques. It works just as well for very distant clusters as for nearby clusters, which allows astronomers to find very rare, distant, massive clusters. Further, it provides accurate measurements of the masses of these clusters, which are crucial to unraveling the nature of dark energy. The main goal of the SPT survey is to find a large sample of massive galaxy clusters in order to measure the equation of state of the dark energy, which characterizes cosmic inflation and the accelerated expansion of the universe. Additional goals include understanding the evolution of hot gas within galaxy clusters, studying the evolution of massive galaxies in clusters, and identifying distant, gravitationally lensed, rapidly star-forming galaxies. Once this distant cluster was found, the team studied it with the Infrared Array Camera on the Spitzer Space Telescope to pinpoint galaxies within the cluster. Detailed observations of the galaxies' speeds with the Magellan telescopes in Chile proved that the galaxy cluster was a heavyweight. The team expects to find many more giant galaxy clusters lurking in the distance once the South Pole Telescope

survey is completed. "After many years of effort, these early successes are very exciting. The full SPT survey, to be completed next year, will rewrite the book on the most massive clusters in the early universe," added Brodwin.

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Record - 3

DIALOG(R)

Yakov Alpert, at 99; refusenik did pioneering radio wave studies,

Bryan Marquard,

Boston Globe (MA), p11,

Sunday, October 17, 2010

TEXT:

Yakov Alpert called his memoir "Making Waves," a concise metaphor for his life's labors in and out of scientific laboratories

He was respected internationally for his pioneering studies of how radio waves react to disruptive forces as they move through the ionosphere, that part of the upper atmosphere that is near the threshold of outer space. Back on Earth, he gained nearly as much attention through his response to the political disarray that erupted when the Soviet Union invaded Czechoslovakia in August 1968

"Step by step, the conviction that the USSR was a fascist country became stronger in my mind," he wrote in the book, published a decade ago, about his decision in 1973 to leave the Soviet Union. "The regime was inescapably totalitarian and anti-Semitic. The lie of the system pervaded all public life and spoiled private life, too. . . . At this juncture, I understood that I could not and should not be reconciled with the Soviet system any longer. I had to make a choice."

By attempting to leave, he embarked on a path into "the world of dissidents and refuseniks, two distinct but related, and sometimes overlapping, groups," a journey that took him from Moscow to Cambridge. Dr. Alpert, who became a senior scientist at the Harvard-Smithsonian Center for Astrophysics, died Oct. 5 in Coolidge House, a nursing care center in Brookline. He was 99 and lived in Brighton, where in recent years he suffered heart attacks and hip fractures

"Never one to choose an easier path for the sake of convenience, he

participated as activist and observer in the historic confrontation between a handful of scientists and the massive power of the Soviet state," Arno Penzias, who shared the Nobel Prize for physics in 1978, wrote in the introduction to Dr. Alpert's memoir

For nearly 15 years, Dr. Alpert and his wife, Svetlana Pivkova, were refuseniks - citizens denied permission to leave the Soviet Union. The simple request to emigrate incurred the wrath of the government, which prevented them from continuing their scientific research. She had been a senior engineer in Moscow, working in medicine and biology. To keep their intellects sharp, they participated in scientific seminars with other refuseniks such as Andrei Sakharov, a Soviet physicist who was awarded the Nobel Peace Prize in 1975 for his human rights work. Dr. Alpert and his wife hosted many seminars in their Moscow apartment, which meant attracting surveillance by the KGB secret police

"They never actually disconnected our phone, you know, because they were listening in," said Pivkova, who added that they used public pay phones to invite participants. "Sometimes there were 40 people in our one-bedroom apartment. People were sitting on the floor."

Eugene Chudnovsky, a professor of physics and astronomy at City University of New York, praised Dr. Alpert's research and said his writings "have become textbooks for generations of people who study propagation of electromagnetic waves in space."

Just as important, Chudnovsky said, was Dr. Alpert's role in helping focus international attention on the scientific work of refuseniks and dissidents during the 1970s and '80s. Dr. Alpert, he said, arranged to get research papers out of the Soviet Union by passing them to scientists from other countries who visited to attend the refusenik seminars

"This was how we were able to maintain contact with other scientists," Chudnovsky said. "He made a profound impact on the lives of many people who became prominent scientists in the United States and European countries. For many, many years, and they were dark years in Russia, he was helping scientists to maintain their careers."

Clifford Taubes, the William Petschek professor of mathematics at Harvard, got to know Dr. Alpert when Pivkova came to work in his department after the couple immigrated, and called them role models of moral strength

"I have trouble imagining me being as brave as they were," Taubes said. "They had the courage to stand up to the Soviet Union, the sort of courage that you don't see among very many people today. They were almost like mythical characters from Greece who happened to be here and working in the office next to me."

All this seemed impossibly distant from Ivnitsy, the small Ukrainian village near Zhitomir, where Dr. Alpert first showed academic promise

"For the most part I educated myself about school subjects and also about other subjects that sparked my interest," he wrote in his memoir. Upon graduating from primary school, "our Russian language teacher presented me with the words, 'Here you have a professor.' "

As a teenager he built a radio receiver, collected butterflies and beetles, and raced through books

"Reading novels was for me a pressing need," he wrote. "I wanted to learn about the natural phenomena of human beings, just as much as I did the natural phenomena of insects and electricity."

Dr. Alpert received an undergraduate degree in physics from Moscow State University in 1939 and a doctorate in physical and mathematical sciences from the Lebedev Physical Institute in Moscow in 1948

For 35 years, he worked at the Institute of Terrestrial Magnetism, Ionosphere, and Propagation of Radio Waves for the Soviet Academy of Sciences

During much of that time, he was scientific deputy director and chief of laboratory for the department of space physics of near-earth plasma. After Dr. Alpert attempted to leave the country, the institute demoted him to senior scientist and professor adviser. His superiors only let him work part time and he was not allowed to conduct research, which he found devastating

"Science was the most important thing in his life," Pivkova said.

Dr. Alpert did not want a funeral, though Pivkova said scientists are discussing holding a gathering to honor his research and the courage he showed valuing moral convictions more than his prominent job in the Soviet Union

"I have always found it difficult, even impossible, to behave in such a way as to be in contradiction with myself, to be at odds with my own conscience," Dr. Alpert wrote in his memoir. "I am aware that such a stance can lead to conflict with others, and in fact, it did lead to conflicts in my life. But such is my nature. It helped me save my self-respect."

Bryan Marquard can be reached at bmarquard@globe.com.

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DIALOG(R)

How a moon can reveal a star's weight,

ANI,
Asian News International,
Saturday, October 16, 2010

TEXT:

Washington, Oct 16 (ANI): In several cases, the weight of a star can be measured directly, but if the star has a planet and that planet has a moon, then scientists can measure their sizes and orbits to learn about the star, according to a new study.

"I often get asked how astronomers weigh stars. We've just added a new technique to our toolbox for that purpose," said Kipping, a predoctoral fellow at the Harvard-Smithsonian Center for Astrophysics.

"Basically, we measure the orbits of the planet around the star and the moon around the planet. Then through Kepler's Laws of Motion, it's possible to calculate the mass of the star," explained Kipping.

By measuring how the star's light dims when planet and moon transit, astronomers learn three key numbers: the orbital periods of the moon and planet, the size of their orbits relative to the star, and the size of planet and moon relative to the star.

Plugging those numbers into Kepler's Third Law yields the density of the star and planet. Since density is mass divided by volume, the relative densities and relative sizes gives the relative masses.

Finally, scientists measure the star's wobble due to the planet's gravitational tug, known as the radial velocity. Combining the measured velocity with the relative masses, they can calculate the mass of the star directly.

"No moon means we can't work out the exact density of the planet, so the whole thing grinds to a halt," Kipling said.

Kipping hasn't put his method into practice yet, since no star is known to have both a planet and moon that transit. However, NASA's Kepler spacecraft should discover several such systems. (ANI)

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Record - 5

DIALOG(R

Scientist ready to 'weigh' distant stars,

UPI Science News,

Friday, October 15, 2010

TEXT:

Determining the weight of a distant star usually yields just an estimate, but one U.S. scientist says in special cases a star can be "weighed" directly.

Astronomers have found more than 90 planets that cross in front of, or transit, their stars, and by measuring the amount of starlight that's blocked, they can calculate how big the planet is relative to the star. But they can't know exactly how big the planet is, because they can only estimate the size and the mass of the star, scientists at the Harvard-Smithsonian Center for Astrophysics say.

Research by center astrophysicist David Kipping shows that in some cases, the exact weight can be determined, an institute release says.

If the star has a planet, and that planet has a moon, and both of them cross in front of their star, their sizes and orbits -- and the weight of the star -- can be calculated, Kipping says.

"Basically, we measure the orbits of the planet around the star and the moon around the planet," he says. "Then through Kepler's Laws of Motion, it's possible to calculate the mass of the star."

The planet's moon is vital to the process, he says.

"If there was no moon, this whole exercise would be impossible," he says.

"No moon means we can't work out the density of the planet, so the whole thing grinds to a halt."

Since no star with both a planet and a moon that transit has been found yet, Kipping hasn't been able to put his method into practice.

NASA's Kepler spacecraft is expected to be able to find several such systems.

"When they're found, we'll be ready to weigh them," he says.

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Record - 6

DIALOG(R)

Giant, distant galaxy cluster found,

UPI Science News,

Thursday, October 14, 2010

TEXT:

U.S. astronomers say they've discovered the biggest galaxy cluster ever seen, a massive grouping of hundreds of galaxies 7 billion light-years from Earth.

Researchers from the Harvard-Smithsonian Center for Astrophysics found the cluster using the South Pole Telescope, a Harvard release said.

"This galaxy cluster wins the heavyweight title. It's among the most massive clusters ever found at this distance," said Mark Brodwin, a Smithsonian astronomer at the center.

Because it's 7 billion light-years distant, we're seeing it as it was 7 billion years ago when the universe was only half its present age and our solar system didn't exist yet, researchers say.

"This cluster is full of 'old' galaxies, meaning that it had to come together very early in the universe's history -- within the first 2 billion years," Brodwin said.

The Harvard-Smithsonian team said it expects to find many more giant galaxy clusters once the South Pole Telescope survey is completed.

"After many years of effort, these early successes are very exciting. The full SPT survey, to be completed next year, will rewrite the book on the most massive clusters in the early universe," Brodwin said.

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Record - 7

DIALOG(R)

Massive galaxy cluster weighs as much as 800 trillion Suns,

ANI,

Asian News International,

Thursday, October 14, 2010

TEXT:

Washington, Oct 14 (ANI): Using the South Pole Telescope, astronomers have discovered the most massive galaxy cluster yet seen at a distance of 7 billion light-years.

The cluster (designated SPT-CL J0546-5345) weighs in at around 800 trillion Suns, and holds hundreds of galaxies.

"This galaxy cluster wins the heavyweight title. It's among the most massive clusters ever found at this distance," said Mark Brodwin, a Smithsonian astronomer at the Harvard-Smithsonian Center for Astrophysics. Brodwin is first author on the paper announcing the discovery.

Galaxy clusters like this can be used to study how dark matter and dark energy influenced the growth of cosmic structures.

Long ago, the universe was smaller and more compact, so gravity had a greater influence. It was easier for galaxy clusters to grow, especially in areas that already were denser than their surroundings.

"You could say that the rich get richer, and the dense get denser," quipped Harvard astronomer Robert Kirshner, commenting on the study.

As the universe expanded at an accelerating rate due to dark energy, it grew more diffuse. Dark energy now dominates over the pull of gravity and chokes off the formation of new galaxy clusters.

The study appears in the *Astrophysical Journal*. (ANI)

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Record - 8

DIALOG(R)

John Huchra, 61, Dies; Maps Altered Ideas on Universe,
DENNIS OVERBYE,
New York Times (NY), Late Edition - Final ed, p19,
Thursday, October 14, 2010

TEXT:

John Huchra, a man who loved telescopes and whose pioneering maps of a

bubbly universe challenged notions of how the galaxies were born, died on Friday at his home in Lexington, Mass. He was 61.

The cause was a heart attack, his wife, Rebecca M. Henderson, said.

Dr. Huchra (pronounced HUCK-rah) was an enthusiastic observer, logging as many as 130 nights a year at telescopes around the world. He was gregarious as well, bringing home students for Thanksgiving and holding a leadership role or membership in virtually every important body related to astronomy, including the American Astronomical Society, of which he had been president.

"His passing has upset more of us than I remember for any other astronomer," said Tod Lauer, an astronomer at the National Optical Astronomy Observatory in Tucson.

Dr. Huchra will be remembered as well for what looks for all the world like a child's stick-figure drawing of a man, but in fact is a map showing how the galaxies are distributed through about 600 million light-years of space.

Astronomers had long presumed that if they looked out far enough beyond the Local Group of galaxies to which the Milky Way belongs, galaxies would be spread more or less evenly. Dr. Huchra's map, produced in 1986 with Margaret J. Geller and Valerie de Lapparent, showed instead that the galaxies seemed to be confined to great sheets arcing around enormous dark and presumably empty voids millions of light-years across, clustering in dense knots where the sheets intersected.

"Margaret coined the analogy of the soap bubble universe, and it stuck," Dr. Huchra wrote on a Web site for the Harvard-Smithsonian Center for Astrophysics, where he spent his career.

Since then, maps engulfing larger and larger swaths of a foamy-looking cosmos have become a staple of astronomy. "Today, all the big computer simulations show that a dark matter universe will clump up into a cosmic web of voids and filaments," Robert Kirshner, a Harvard astronomer, said. "John's work with Margaret showed the way to this common view."

John Peter Huchra was born on Dec. 23, 1948, in Jersey City and grew up in Ridgefield Park, N.J., reading science fiction and popular cosmological books. His father was a railroad conductor and his mother a homemaker.

He attended the Massachusetts Institute of Technology, where he was on the wrestling team and dabbled in antiwar politics, graduating with a degree in physics in 1970. He received a Ph.D. in astronomy from the California Institute of Technology.

Dr. Huchra arrived in Cambridge in 1976 as a postdoctoral fellow at the newly created Harvard-Smithsonian Center for Astrophysics and never really left.

He made his first splash in 1978, when he, Marc Aaronson of the University of Arizona and Jeremy Mould, now at the University of Melbourne in Australia, announced that the universe was expanding twice as fast and was therefore only half as old -- about nine billion years -- as most astronomers had thought.

The work, using the brightness and rotation speeds of spiral galaxies as a cosmic distance marker, propelled the young astronomers into the middle of a bitter, longstanding debate among older astronomers who could not agree within a factor of 2 about the size and age of the universe.

"There are only a handful of people in this game, and they all hate each other," Dr. Huchra once told an interviewer. "Nobody likes to be proved wrong."

Paul Schechter of M.I.T. said of the three, "They broke the logjam and came up with something new." They went on to play a key role in a project that used the Hubble Space Telescope to measure the expansion rate of the universe.

Meanwhile Dr. Huchra had also joined an effort led by Marc Davis, then at the Center for Astrophysics and now at the University of California, Berkeley, to map the nearby universe. In an expanding universe, the relative distances of galaxies could be obtained from the speeds with which they were rushing away from us. The speeds are known as redshift velocities, for their effect on a galaxy's spectrum.

Dr. Huchra, drawing on experience working on Palomar Mountain during his Caltech days, was the only group member who had measured a galaxy redshift, so he did most of the observing for the project, on a 60-inch telescope on Mount Hopkins in Arizona. The work involved running upstairs and downstairs every few minutes between a recording device in the observatory's basement and its dome to turn the telescope to find the next galaxy.

The first Harvard-Smithsonian survey, completed in 1981, mapped 2,400 galaxies. The second one, directed by Dr. Huchra and Dr. Geller, was completed in 1995 and mapped 18,000. Besides the famous stick figure, the survey revealed a "Great Wall" of galaxies 600 million light-years long and 250 million light-years wide. It is one of the largest cosmic structures ever discovered.

Besides his wife, a professor at Harvard Business School whom he married in 1992, Dr. Huchra is survived by their son, Harry; his parents, Mieczyslaw Huchra and Helen Lewicki, of Ridgefield Park; and a sister, Christine Lehman, of Murrells Inlet, S.C.

Dr. Huchra was director of the Smithsonian's Fred Lawrence Whipple Observatory on Mount Hopkins from 1994 to 1998 and interim director of the Center for Astrophysics in 2004. He became vice provost for research at Harvard and a tenured professor there in 2005, but stepped down from the provost job a year later after a heart attack.

One of his most enduring appointments, however, is in the sky. The Harvard-Smithsonian survey found a galaxy in the constellation Pegasus so perfectly aligned with a distant quasar that the galaxy's gravitational field bends and splits the light from the quasar into four separate images around itself, forming what is called an Einstein Cross. Dr. Huchra discovered the formation in 1990 while inspecting data from the survey in 1985.

It is now known as Huchra's Lens.

PHOTO: John P. Huchra was an astronomer at the Harvard-Smithsonian Center for Astrophysics. (PHOTOGRAPH BY HARVARD-SMITHSONIAN CENTER FOR ASTROPHYSICS)

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Record - 9

DIALOG(R)

Exhibit sends visitors on a virtual voyage to a black hole,

M2 PressWIRE,

Thursday, October 7, 2010

TEXT:

RDATE:07102010

Promotional artwork for "Black Holes: Space Warps & Time Twists," the new exhibition at the Peabody Museum.

A new exhibition opening at the Yale Peabody Museum of Natural History explores what we know, what we don't know, and what we think we know about one of the world's greatest space mysteries: black holes.

Titled "Black Holes: Space Warps & Time Twists," the exhibition will be on view Oct. 9-May 1.

Black holes have gravity so powerful that light cannot escape and matter drawn into them is lost forever. Einstein imagined the possibility of black holes but doubted they could exist in nature. Today evidence suggests they are quite common.

"Black Holes: Space Warps & Time Twists" is designed like a space mission. Visitors step into an immersive excursion pod and set their course for a fantasy voyage to a supermassive black hole at the center of our galaxy, the Milky Way. The challenge is to pilot the pod to an alien spacecraft wreck at the edge of the black hole and dive down to discover its hidden treasure. Travelers will experience the black hole's effect on environment, space and time while keeping an eye on the clock to avoid being left behind when their galactic cruise ship departs. They must also guard against unexpected emergencies that could prompt a fall into the black hole itself.

Visitors create an electronic journal and a personalized website about their visit, which is accessible later from home. The website is part personal diary, part observer's log featuring data they have gathered and photos they've captured of their activities. Helping guide them through their explorations are videos of scientists, engineers and Youth Team exhibit collaborators.

The Peabody has augmented the exhibition with a section on Yale scientists who are looking for and studying black holes. Some are investigating the smaller "stellar black holes" generated by collapsing stars, particularly those in double star systems. Others utilize the online astronomy project "Galaxy Zoo," co-founded by a Yale astrophysicist, to explore the influence of supermassive black holes on the evolution of galaxies.

In conjunction with the exhibition, the museum is hosting a talk titled "How to See a Black Hole" at 12:30 p.m. on Friday, Oct. 22, in the third-floor auditorium. Professor Charles Bailyn of Yale, winner of the Rossi Prize from the American Astronomical Society for his research on black holes, will discuss how these phenomena can be studied, despite the fact that they emit no observable radiation, and what scientists know about them.

"Black Holes: Space Warps & Time Twists" was produced by the Harvard-Smithsonian Center for Astrophysics. Teams of teenagers from the Youth Astronomy Apprenticeship Program at the Massachusetts Institute of Technology and the Galaxy Explorers Black Hole Youth Media Team at the Chabot Space & Science Center in Oakland, California, also collaborated with the exhibit designers. Funding was provided by a grant from the

National Science Foundation with additional major support from the National Aeronautics and Space Administration.

The Yale Peabody Museum of Natural History, located at 170 Whitney Avenue, is open Monday through Saturday from 10 a.m. to 5 p.m. and Sundays from noon to 5 p.m.. Admission is \$9 for adults, \$8 for seniors age 65 and over, and \$5 for those age 3-18 and college students with I.D. Children under age 3 are always free. No admission is charged 2 to 5 p.m. on Thursdays from September to June. The museum is closed six days of the year: Jan. 1, Easter, July 4, Thanksgiving, and Dec. 24 and 25.

For more information, click [here](#) or call the Infotape at 203-432-5050.

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Wolbach Library: CfA in the News ~ Week ending 24 October 2010

1. **Asteroid named for UND aerospace school founder**, AP Alert - North Dakota, Friday, October 22, 2010
2. **Most distant object in universe confirmed**, UPI Science News, Thursday, October 21, 2010
3. **Professor John Huchra**, Daily Telegraph (UK), 01 ed, Wednesday, October 20, 2010
4. **Salinan enjoys role as a 'planet hunter'**, David Clouston, Salina Journal (KS), Tuesday, October 19, 2010
5. **A moon can help weigh a distance star: scientist**, PTI - The Press Trust of India Ltd., Sunday, October 17, 2010
6. **Black hole silhouette: scientists attempt to image a shadow and its tumultuous ring.**, Petit, Charles, Science News, v178, n8, p22(5), Saturday, October 9, 2010
7. **Close encounter fascinates media: small space rocks often pass within radius of moon's orbit.**, Cowen, Ron, Science News, v178, n8, p9(1) Saturday, October 9, 2010

Record - 1

DIALOG(R)

Asteroid named for UND aerospace school founder,
AP Alert - North Dakota,
Friday, October 22, 2010

TEXT:

GRAND FORKS, N.D._An asteroid has been named for the founder and first dean of the University of North Dakota's aerospace school.

An International Astronomical Union committee approved the asteroid named for John D. Odegard.

Vishnu Reddy, a research faculty member in the UND Department of Space Studies, nominated the aviation pioneer's name after discovering the asteroid in March 2003. It orbits the sun between Mars and Jupiter.

The new name was published in the Minor Planet Circular from the Smithsonian Astrophysical Observatory.

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Record - 2

DIALOG(R)

Most distant object in universe confirmed,

UPI Science News,
Thursday, October 21, 2010

TEXT:

French scientists say they've confirmed the most distant astronomical object known, a galaxy 13.071 billion light-years away.

The galaxy, dubbed UDFy-38135539, is so far away the light now reaching Earth left it less than 600 million years after the Big Bang, ScienceNews.org reported.

Scientists at the Observatory of Paris studied images captured by the Hubble telescope to measure the galaxy's redshift -- the extent to which light emitted by a body is shifted to longer, or redder, wavelengths by the expansion of the universe -- to determine its distance.

The more distant a body, the greater its redshift. They measured the redshift of UDFy-38135539 at 8.56, showing it to be about 35 million light-years farther away than the previous distance holder, a powerful cosmic explosion known as a gamma-ray burst.

Observing the light from galaxies as far away as UDFy-38135539 and even much fainter galaxies will become easier with the 2014 launch of the infrared James Webb Space Telescope, Avi Loeb of the Harvard-Smithsonian Center for Astrophysics in Cambridge, Mass., said.

The Hubble telescope has already found other galaxies that may lie farther away than UDFy-38135539, but scientists will need the new infrared telescope to measure the distances.

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Record - 3

DIALOG(R)

Professor John Huchra,

Daily Telegraph (UK), 01 ed,
Wednesday, October 20, 2010

TEXT:

PROFESSOR JOHN HUCHRA, who died on October 8 aged 61, was an astronomer and cosmologist best known for mapping the large-scale structure of the universe, work that revealed thousands of galaxies distributed in thin sheets surrounding huge, bubblelike voids.

Until the mid-1980s cosmologists thought that the universe was a uniform "soup", with galaxies (lumpy areas where gravity had successfully resisted the pull of an expanding universe) dotted randomly but more or less evenly around the broth.

In the early 1980s Huchra and his colleague Margaret Geller, of the Harvard-Smithsonian Center for Astrophysics, began working at the Smithsonian's Whipple Observatory on Mount Hopkins, Arizona, to measure the "red shift" of galaxies within about 650 million light years of Earth.

By 1985 they were getting around to the job of plotting the first 1,000 of these on a three-dimensional map.

"We were so certain that we weren't going to see anything interesting, and my first reaction to that map was, 'I must have done something wrong'," Huchra recalled. "The map was telling us that the universe is like a bowl of soap suds, not soup. It's not uniformly filled with galaxies. It's mostly empty, with galaxies lying on the surface of the bubbles."

As successive slices of the sky were added to the map, even stranger structures emerged: voids 150 million light years across, and a "Great Wall" of galaxies at least 500 million light years long. The completed map, published in 1995, showed the galaxies clustering in dense knots where the bubbles intersected.

These results kindled a renewed interest in the study of the structure of the universe and forced cosmologists to scrap longheld theories about its origin and evolution. Large structures such as the Great Wall are too large to have formed as a result of gravity since the Big Bang, unless a significant amount of "clumpiness" was present at the origin of the universe. This early "clumpiness", however, is contradicted by the smoothness of the cosmic microwave background, or "echo" of the Big Bang. A theory gaining ground holds that dark matter - invisible elementary particles left over from the Big Bang - is responsible, a theory which appears to be confirmed by computer simulations. But even dark matter may not be capable of producing so large an object as the Great Wall.

The subject continues to generate impassioned debate among cosmologists. "There are only a handful of people in this game," Huchra was quoted as saying in 1991, "and they all hate each other."

The son of a railway builder, John Peter Huchra was born on December 23 1948 in Jersey City and grew up at Ridgefield Park, New Jersey. He read Physics at the Massachusetts Institute of Technology, where he was on the wrestling team, graduating in 1970. He then took a doctorate in Astronomy at the California Institute of Technology.

In 1976 he arrived in Cambridge, Massachusetts, as a postdoctoral fellow at the new Harvard-Smithsonian Center for Astrophysics. He remained there for the rest of his career, logging as many as 130 nights a year at telescopes around the world.

In 1978, with Marc Aaronson and Jeremy Mould, Huchra pitched himself into the centre of a long-standing controversy with the announcement that the universe was expanding twice as fast - and was therefore only half as old (about nine billion years) - as many astronomers had thought. Later he joined the effort, led by Marc Davis of the Center for Astrophysics, to map the universe. In 1990 he discovered a galaxy in the constellation Pegasus so perfectly aligned with a distant quasar that the galaxy's gravitational field bends and splits the light from the quasar into four separate images around itself, forming what is called an Einstein Cross. The galaxy is now known as Huchra's Lens.

Huchra was director of the Smithsonian's Fred Lawrence Whipple Observatory on Mount Hopkins from 1994 to 1998 and interim director of the Center for Astrophysics in 2004. He became viceprovost for research at Harvard and was appointed professor in 2005. He served as president of the American Astronomical Society.

John Huchra is survived by his wife, Rebecca, and their son.

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Record - 4

DIALOG(R)

Salinan enjoys role as a 'planet hunter',

David Clouston,

Salina Journal (KS),

Tuesday, October 19, 2010

TEXT:

Oct. 19--News accounts have dubbed astrophysicist Matthew Holman a "planet hunter." Another description might be he's a guy who's really jazzed about math.

Holman, a scientist at the Harvard-Smithsonian Center for Astrophysics in Cambridge, Mass., was on a team that in August announced it had discovered two Saturn-sized planets, Kepler 9B and Kepler 9C.

And there's evidence of a third planet -- a much smaller one, with a diameter that appears to be just 50 percent larger than Earth's.

Holman is a 1985 graduate of Salina Central High School. He holds a bachelor's degree in math and a doctorate in planetary sciences, both from the Massachusetts Institute of Technology, better known by its initials, MIT. Today, besides his research work at the Harvard-Smithsonian, he's also a lecturer in the Harvard University department of astronomy.

He's also credited with discoveries of moons of Jupiter, Saturn, Uranus and Neptune.

Holman grew up in Salina, the son of a longtime psychiatrist, Dr. John Holman. At Central, he was interested in science a lot -- "but it was really math that turned me on," he said. "There were a bunch of math teachers in school I really enjoyed."

He attended college for three semesters at the University of Kansas and four at MIT in Cambridge, Mass., before receiving his undergraduate degree. Then he started his graduate studies at MIT.

In August, his team's planet discovery was published by the journal *Science*. The team's discovery was an early scientific harvest from NASA's new planet-finding machine -- the Kepler Telescope.

The space-based observatory was launched in March 2009 and is staring constantly at a group of 150,000 stars in another corner of the Milky Way galaxy.

Faint dips in starlight

The Kepler telescope looks for the faint dips in the intensity of starlight that happen regularly when a planet crosses in front of a star.

"The amount of light blocked depends on the size of the planet," Holman said. Something the size of Earth, orbiting a star the size of our sun, for example, blocks one part in 10,000 of the light from a star, or about 1 percent of 1 percent.

The Kepler 9B and Kepler 9C -- named for the instrument that discovered them -- block something along the lines of one-half percent of their star's light, he said.

The scientists deduce the presence of planets by measuring what are called transit timing variations in starlight -- meaning there are dips in starlight that occur as a body suspected of being a planet completes its orbit. The orbit can vary due to its interaction with other planets in the system. Based on the timing variations, it's possible to estimate the mass of the objects; the size can be calculated from the amount of light blocked, Holman said.

Kepler 9C circles a sun-like star 2,300 light years away from Earth in an orbit that varies up to 39 minutes every 38.9 days.

Earth-like planets

The planets Kepler 9B and 9C, like Saturn and Jupiter, are gaseous bodies composed mostly of hydrogen and helium, Holman said. The third Earth-scale planet candidate isn't likely to be habitable because it circles the parent star in a hellishly close orbit -- about 1.6 days, he said.

"I'm confident that our main scientific goal, finding Earth-size planets in habitable zones like our sun's, will be met," Holman said. "Meaning we'll find planets at the right distance from their star to have liquid water on their surface. That's what scientists have set as a working definition of habitability."

Holman didn't take an early interest in astronomy growing up. He never had a telescope as a teenager. But in his senior year at MIT, he took an optical astronomy class to fulfill a lab requirement. The class involved visits to an observatory northwest of Boston, and Holman quickly grew to appreciate the subject. When it came time to apply to graduate programs, he focused on planetary sciences.

40 members on the team

Holman wrote the scholarly paper revealing the discovery that was published in Science. But there were 40 team members who contributed to its publication. The group included scientists and engineers who contributed to the spacecraft's design and operation.

"We wouldn't have been able to do this without the Kepler spacecraft and a whole team of scientists analyzing the data," he said.

Holman is married -- to a psychiatrist. He and his wife have two sons, ages 4 and 1 1/2. His parents are retired and live in Leawood.

Holman says his future will include doing research, but also teaching and supervising graduate and undergraduate astronomy students.

"I'm going to keep on doing what I'm doing," he said.

n Reporter David Clouston can be reached at 822-1403 or by e-mail at dclouston@salina.com.

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Record - 5

DIALOG(R)

A moon can help weigh a distance star: scientist,
PTI - The Press Trust of India Ltd.,
Sunday, October 17, 2010

TEXT:

A moon can help weigh a distance star: scientist

London, October 17, 2010 (PTI) -- Astronomers generally weigh a distance star using computer models which yields only an estimate. Now, a US scientist has claimed using a new method a star can be "weighed directly" with the help of a moon.

If the star has a planet and that planet has a moon, and both of them cross in front of their star, then we can measure their sizes and orbits to learn about the star, said David Kipping, an astrophysicist at the Harvard-Smithsonian Centre for Astrophysics in Cambridge, UK.

"I often get asked how astronomers weigh stars. We've just added a new technique to our toolbox for that purpose," said Kipping. Astronomers have found more than 90 planets that cross in front of, or transit, their stars. By measuring the amount of starlight that's blocked, they can calculate how big the planet is relative to the star.

But they can't know exactly how big the planet is unless they know the actual size of the star. Computer models give a very good estimate but not the real measurement.

Kipping realised that if a transiting planet has a moon big enough to see (by also blocking starlight), then the planet-moon-star system could be measured in a way that lets us calculate exactly how large and massive all three bodies are.

"Basically, we measure the orbits of the planet around the star and the moon around the planet. Then through Kepler's Laws of Motion, it's possible to calculate the mass of the star," explained Kipping.

The process isn't easy and requires several steps. By measuring how the star's light dims when planet and moon transit, astronomers learn three key numbers: the orbital periods of the moon and planet, the size of their orbits relative to the star, and the size of planet and moon relative to the star.

Plugging those numbers into Kepler's Third Law yields the density of the star and planet. Since density is mass divided by volume, the relative densities and relative sizes gives the relative masses.

Finally, scientists measure the star's wobble due to the planet's gravitational tug, known as the radial velocity. Combining the measured velocity with the relative masses, they can calculate the mass of the star directly.

"If there was no moon, this whole exercise would be impossible," stated Kipping. "No moon means we can't work out the density of the planet, so the whole thing grinds to a halt."

Kipping hasn't put his method into practice yet, since no star is known to have both a planet and moon that transit. However, NASA's Kepler spacecraft should discover several such systems.

"When they're found, we'll be ready to weigh them," said Kipping, whose research will appear in the 'Notices of the Royal Astronomical Society'.
PTI SKP AKJ SKP 10171511

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Record - 6

DIALOG(R)

Black hole silhouette: scientists attempt to image a shadow and its tumultuous ring.

Petit, Charles,

Science News, v178, n8, p22(5),

Saturday, October 9, 2010

TEXT:

[ILLUSTRATION OMITTED]

Black holes are among the most bashful yet flamboyant characters on the cosmic stage. They consume matter so voraciously that the violence can ignite brilliant beacons called quasars, bright enough to outshine entire

galaxies. Yet because they prevent light from escaping or even bouncing off, black holes themselves are also the ultimate unseeables.

Astronomers have now drawn up plans to gather an image of something almost as good: a black hole's silhouette. They will do it with a virtual telescope spanning the globe, electronically roping together scores of smaller instruments at observatories that usually operate independently. The new array's magnifying power will exceed that of any telescope or array made so far. Two targets await: the monster black hole believed to reside at the center of the Milky Way, home galaxy to sun and Earth, and an even more massive black hole at the core of a distant galaxy.

"If we get the first image of the silhouette of a black hole, it will be on the cover of textbooks the next year," says Avi Loeb, a member of the team pushing the idea and head of the Institute for Theory and Computation at the Harvard-Smithsonian Center for Astrophysics in Cambridge, Mass.

A close collaborator of Loeb's, Avery Broderick, has been working on black holes and extreme gravitational fields since he began his studies at New York's Stony Brook University, and then at Caltech. Now at the Canadian Institute for Theoretical Astrophysics in Toronto, he sees a rare chance to add observations to a field that has been almost all theory. "It is essentially critical to show that black holes really exist," Broderick says. "We don't know that they do. It has become so common to talk about them. Their existence is the simplest assumption to make. We couldn't test it, so we internalized it as fact."

Black hole shadows would look like bull's-eyes in space. Surrounding each circle of darkness would be a thin ring of brilliant radiation--a spray of photons briefly caught in orbit around the black hole itself. Flaring farther out, distorted and warped by the light-bending nature of spacetime near a black hole, would be a billowing, billion-plus degree plasma heated by internal friction as its particles orbit and jostle at high speeds.

The plasma's shimmers and flares should carry answers to mysteries of how black holes consume such white-hot, flattened whirlpools of matter, known as accretion disks. If expectation meets reality, the plasma's source would be the disk's hot inner edge, the innermost stable circular orbit for matter. Inside that, atoms and particles fall irretrievably toward the point of no return: the black hole's actual edge, what physicists call the event horizon.

The sight should open scientists' eyes wide to long-discussed mysteries. What are the processes by which the twisting magnetic fields caught in such maelstroms manage to expel, in powerful jets, a portion of the shattered stars, planets, dust and gas drawn toward the black hole's grasp? Does a

black hole even behave as theory suggests? By witnessing extreme gravity at work-- from hundreds to hundreds of thousands of times stronger than gravity at Earth's surface, slowing time and warping space so that even photons can go into orbit around a black hole--humankind might see behavior that does not obey the predictions of the general theory of relativity. It would mark the first refutation of Albert Einstein's theory, and would offer guides toward more complete, truer laws of the universe.

The group has given its dream machine a name: the Event Horizon Telescope. The hope is to put it in operation some time around 2020.

"It would only cost a few tens of millions of dollars, not really so much at all," says Sheperd Doeleman of MIT's Haystack Observatory. Doeleman and 22 of his colleagues last year sent a white paper to a National Research Council committee that listed, as part of a decadal review, priorities for public astronomy funding (SN: 9/11/10, p. 10). Compared with the billions of dollars for space telescopes and the hundreds of millions for large conventional devices on the ground, the price is small change. In August, the Event Horizon Telescope was included by the review committee in a list of smaller but worthy projects. That is no guarantee federal agencies and Congress will actually provide any or all of its costs, but so far, so good.

[ILLUSTRATION OMITTED]

[ILLUSTRATION OMITTED]

One scope from many

For the money, the project promises the highest resolution in the history of astronomy. It would bring distant objects into focus 5,000 times more clearly than the Hubble Space Telescope can.

Makers of telescopes have two basic ways to get a very sharp focus and thus the ability to see small details at great distance: Make the telescope wider (or the distance greater between instruments that make up the overall device) or shorten the wavelength at which it operates. Better yet, do both.

Astronomers proposing the telescope plan to use the whole Earth as a platform. And because of a fortunate break, one specific class of telescopes already spread out widely on the planet can operate at just the right wavelengths -from 0.8 to 1.3 millimeters- between the far infrared and microwave regions. This narrow window of radiation not only can provide the focusing power needed for a telescope of such size, but is also where the environs of black holes glow the brightest. Earth's mountaintops and mesas where the observatories sit are just high enough for the select

wave-lengths to arrive before atmospheric water vapor absorbs and distorts them.

Thus a combination of factors has practically handed astronomers the ingredients needed to examine in detail the region so close to a black hole that its shadow becomes visible. "When nature gives us so many gifts, each of them with small probability, we should accept it gratefully and try to make the best of it," Loeb says.

Doeleman and the team have already published, in *Nature* in 2008, data from a rudimentary form of the telescope array, its instruments working together in a process called VLBI, very long baseline interferometry. The work confirmed that a signal at the core of the Milky Way, dubbed Sagittarius A*, marks the site of an object that packs its 4 million suns' worth of mass in such a tiny volume that conventional physics says it must be a black hole. But there wasn't enough detail to directly confirm that the object is a black hole.

For the preliminary system, the team combined signals from a 10-meter telescope dish in the White Mountains of eastern California with the 15-meter James Clerk Maxwell Telescope on Mauna Kea in Hawaii and yet another 10-meter instrument on Arizona's Mount Graham.

The next stage, to prove the object is a black hole, will come upon glimpsing directly a ring of violent churning around the shadow in the middle. To do so, Doeleman's team envisions as many as 100 metal dishes working together. Each resembles a giant, silvery satellite TV receiver. Some are individual units as much as 50 meters wide. Others are themselves in tight arrays of smaller receivers spread across high-altitude locales. In perfect sync they would, on different continents, turn for hours or even days to gather photons from the Milky Way's whirling heart.

Chief among the intended additions is ALMA, the Atacama Large Millimeter Array, with 64 dishes, each 12 meters across, now being deployed in the high Atacama Desert in Chile. One of the world's great new observatories, backed by an international consortium, ALMA would provide a strong signal to act as orchestra director for blending data from other, distant instruments. Also on the list are a 50-meter instrument in Mexico, a 30-meter dish in Spain, a set of six 15-meter detectors in the French Alps, additional French and German installations in the Atacama Desert, a 10-meter job at the U.S. South Pole Station, plus others. To fill in gaps, further stations may be promoted in Africa, New Zealand or even the Himalayas.

New equipment must be installed at each dish or array to handle the flood of data. Just one observation session by each station would produce one

gigabyte of data per second, or roughly about 22 terabytes each day. In three years the group expects to have seven stations taking in more than 700 terabytes in a five-day campaign, almost 10 times the amount of information stored in the Library of Congress' digital holdings. With the Chilean ALMA array on line, the data requirements will explode to 6,000 terabytes per campaign.

No imaginable link from remote mountaintops permits live telemetry of such a torrent. Astronomers will physically pull eight-pack cartridges of disk drives from the data recorders. "We'll mail them," says Doeleman. "You can't beat the bandwidth of a 747 packed with hard drives." Aircraft will take the drives to Boston's Logan Airport for shipment on to the Haystack Observatory for processing.

To take the signals from multiple instruments, each changing its distance from the source as the Earth rotates, and blend those signals as though they all were hitting a single receiver will take exquisite timing. Hydrogen maser clocks at each station will place timing ticks on the disk drives with a precision that loses or gains less than a tenth of a billionth of a second per day.

At the other end of the data stream will be the black hole itself.

The Milky Way's heart

Sgr A* (pronounced Sadge A-star) has, if theory is correct, an event horizon about 24 million kilometers in diameter--small enough to fit inside Mercury's orbit of the sun. Some 26,000 light-years away, the black hole's spot in the sky is about 20 microarcseconds across, about one part in 10 billion of a circle, or about the apparent size as seen from Earth of one of the golf balls Alan Shepard whacked and left on the moon in 1971. And the innermost stable circular orbit around the black hole, the brightly glowing edge of the accretion disk, will be about three times wider.

The focusing power of the telescope: about 20 microarcseconds. That may seem a bit coarse to make out much detail, but the telescope's designers are counting on a big break from general relativity. Light will not come out straight from Sgr A*'s accretion disk but will bend as the powerful gravity warps time and space. Thus while the black dot, the "silhouette" the telescope array will see, is real enough, astronomers don't expect much of the light from near it to reach Earth in a straight line. Most that gets here will have arisen just behind the black hole, swing wide around it, and then bend toward Earth. The result is a gravitational lens. The optical illusion will make the black hole silhouette appear more than twice as big as it actually is.

[ILLUSTRATION OMITTED]

One specific payoff of seeing Sgr A*'s accretion disk should be a more precise measure of the black hole's spin, which can have profound relativistic effects on the geometry of space and the flow of time in the immediate neighborhood. Already, astronomers know that light and other radiation output from Sgr A* can vary rapidly, indicating outbursts and flares of energy release, presumably as knots of matter work their way to the interior of the accretion disk. The spin of a black hole, by twisting nearby space in a process called frame dragging, alters how closely matter can stay in stable orbit. By revealing those orbits, the Event Horizon Telescope can tell what the black hole's spin, or angular momentum, is. With zero spin, the closest stable orbit should have a period of about half an hour--while if the black hole has its maximum permitted spin, hot spots could race around it in as few as four minutes.

Many other black holes are nearer than Sgr A*. But all are leftovers of collapsed, individual stars and are far too tiny--perhaps 30 kilometers across--for even the new telescope to see. Far beyond the Milky Way, however, a monstrous black hole seems ripe for inspection. It is in the heart of the M87 galaxy, a blob of stars more than 50 million light-years away--about 2,000 times farther than Sgr A*. M87's core ejects a powerful beam of matter and radiation, a jet that extends for thousands of light-years. It can be seen going in only one direction, like a rocket that seems to have shoved the entire black hole itself slightly away from dead center. The spectacle makes it a natural laboratory for studying the full panoply of black hole physics. A primary hope is to get a look at how some of the material and energy approaching its equator turns 90 degrees and jets out of the system's pole at near light speed.

Astronomers in the 1990s calculated from the speeds of gas clouds near M87's core that it has a mass of about 3 billion suns, 750 times that of Sgr A*. That was already enough to make it among the most massive black holes known. Then last year Karl Gebhardt of the University of Texas at Austin and a German colleague took into account the effects of unseen dark matter surrounding the galaxy. The team reported in June 2009 in Pasadena at a meeting of the American Astronomical Society that the mass of M87's core is more likely to be a whopping 6.4 billion suns, well over 1,000 times that of SgrA*.

[ILLUSTRATION OMITTED]

The event horizon diameter of the blackhole in the middle of M87 would be correspondingly larger, too--perhaps twice Pluto's farthest distance from the sun. Knots of material orbiting Sgr A* are likely to circle it every hour or less. By contrast, visible changes around gigantic M87's black hole

will probably take days to weeks to transpire, permitting more leisurely, detailed study.

Einstein to the test

Some scientists are already angling for time on the new instrument. Among them are astrophysicist Dimitrios Psaltis and graduate student Tim Johannsen, both of the University of Arizona in Tucson. They want to watch photons--particles of light--that go into orbit around black holes and then eventually spray away into space, scattering off material falling toward the event horizon. The exact shape of the ring of light created around the black hole's shadow should allow a check on one of the odder implications of Einstein's general theory of relativity: the no-hair theorem. And the ring's appearance may tell science that once again Einstein got it right--or not.

The no-hair theorem states that a black hole can be entirely described in the outside universe, no matter what has gone into it, by its mass and the accumulated angular momentum, or spin, of all it has absorbed. (Technically, it may also have electric charge, but physicists see no way for large black holes to accumulate significant net charge from galactic gas and dust.) "No hair" means nothing else, whether material or force field, sticks out beyond the event horizon. And spin and mass imply a specific distortion of space and time--in turn defining what the radius of the light ring around the black hole should be and how the ring's appearance will be distorted to outside view.

If the ring looks exactly as Einstein's theory says it should--almost perfectly circular when one corrects for the warping of dimensions near a black hole, and influenced only by the mass and the spin of the black hole--then general relativity will have continued its string of triumphs. If not, says Psaltis, "we will have exciting things to think about."

Asked if he really wants to disprove Einstein, he paused. "General relativity has passed all tests before with flying colors. But only in weak fields, like near the sun. At some level, everyone believes Einstein must not be correct. His theory says that inside the black hole, everything collapses to nothing, to zero. Other physical theory," he said, referring to quantum mechanics, "says this cannot be correct. Something is clearly wrong. Something must give way.

"At a black hole, the fields are like nothing anywhere else. It is the breaking point for physics as we know it." *

Explore more:

* See a special Hubble feature on black holes:
http://hubblesite.org/explore_astronomy/black_holes

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Record - 7

DIALOG(R)

Close encounter fascinates media: small space rocks often pass within radius of moon's orbit,

Cowen, Ron,

Science News, v178, n8, p9(1),

Saturday, October 9, 2010

TEXT:

The only thing that was particularly unusual about two asteroids that zipped past Earth September 8, astronomers say, was that anybody noticed them.

Such approaches inside the moon's orbit--one asteroid passed within 79,000 kilometers of Earth--happen several times a week, scientists calculate. Yet some media outlets reacted as if it were a brush with Armageddon. "Quite frankly, I don't know why they're making such a fuss about it," says astronomer Brian Marsden of the Harvard-Smithsonian Center for Astrophysics in Cambridge, Mass. "This is essentially nothing."

[ILLUSTRATION OMITTED]

Astronomers first spotted the asteroids three days before the close encounter, using the Catalina Sky Survey telescope near Tucson, which scans the skies for near-Earth objects. The larger asteroid was estimated to be 10 to 20 meters in diameter, and the smaller 6 to 14 meters across. But subsequent observations by Richard Binzel and Francesca DeMeo of MIT using NASA's Infrared Telescope Facility in Hawaii indicated that the objects were only about half that size.

The discovery of the two space rocks demonstrates that programs like the Catalina survey, designed to find larger near-Earth asteroids with the potential to cause devastating collisions, can also find smaller bodies, Marsden notes.

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Wolbach Library: CfA in the News ~ Week ending 31 October 2010

1. **Research on science reported by M.J. Holman et al**, Science Letter, p2629, Tuesday, November 2, 2010
2. **Scientists, politicians take the threat of an electromagnetic pulse very seriously**, DAN VERGANO, Gannett News Service, pARC, Wednesday, October 27, 2010
3. **Scientists claim to have 'seen' dark matter**, UPI Science News, Wednesday, October 27, 2010
4. **One burst and the world goes dark**, Dan Vergano, USA Today (USA), p1D, Wednesday, October 27, 2010
5. Colorado Editorial Roundup, The Associated Press, AP Alert - Political, Tuesday, October 26, 2010

Record - 1

DIALOG(R)

Research on science reported by M.J. Holman et al,
Science Letter, p2629,
Tuesday, November 2, 2010

TEXT:

"The Kepler spacecraft is monitoring more than 150,000 stars for evidence of planets transiting those stars. We report the detection of two Saturn-size planets that transit the same Sun-like star, based on 7 months of Kepler observations," scientists writing in the journal Science report (see also).

"Their 19.2- and 38.9-day periods are presently increasing and decreasing at respective average rates of 4 and 39 minutes per orbit; in addition, the transit times of the inner body display an alternating variation of smaller amplitude. These signatures are characteristic of gravitational interaction of two planets near a 2:1 orbital resonance. Six radial-velocity observations show that these two planets are the most massive objects orbiting close to the star and substantially improve the estimates of their masses," wrote M.J. Holman and colleagues.

The researchers concluded: "After removing the signal of the two confirmed giant planets, we identified an additional transiting super-Earth-size planet candidate with a period of 1.6 days."

Holman and colleagues published their study in Science (Kepler-9: A System of Multiple Planets Transiting a Sun-Like Star, Confirmed by Timing

Variations. Science, 2010;330(6000):51-54).

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

The publisher of the journal Science can be contacted at: American Association Advancement Science, 1200 New York Avenue, NW, Washington, DC 20005, USA.

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Record - 2

DIALOG(R)

Scientists, politicians take the threat of an electromagnetic pulse very seriously,

DAN VERGANO,

Gannett News Service, pARC,

Wednesday, October 27, 2010

TEXT:

By DAN VERGANO

USA TODAY

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 (EMP) 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 center 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. (NERC) 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.

Simple physics, big worry

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 streetlights 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 induced currents in Quebec's power grid that knocked out power for 6 million people in Canada and the United States 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.

The terror effect

In the nuclear scenario, the detonation of an atomic 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.

Gingrich last year cited the EMP Commission report in warning, "One weapon of this kind that went off over Omaha would eliminate most of the electrical production in the United States."

But some take issue with that.

"You would really need something the size of a Soviet H-bomb to have effects that cross many states," Butt says. The massive Starfish Prime blast, he notes, was at least 70 times more powerful than the atomic bomb detonated over Hiroshima in 1945, and it may have blown out streetlights but it left the grid in Hawaii intact.

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, Butt says. "It would be suicide."

Super solar storm

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.

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

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

"We are almost guaranteed a very large solar storm at some point, but we are talking about a risk over decades," Butt says. Three power grids gird the continental U.S. - one crossing 39 Eastern states, one for 11 Western states and one for Texas.

Solutions?

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."

Although the physics underlying the geomagnetic and nuclear pulses are

fundamentally the same, they have different solutions. A geomagnetic storm essentially produces a long-building surge dangerous to power lines and large transformers. A nuclear blast produces three waves of pulses.

Limiting the risk from the geomagnetic-storm-type threat involves stockpiling large transformers and installing dampers, essentially lightning rods, to dump surges into the ground from the grid. Even if such steps cost billions, the numbers come out looking reasonable compared with the \$119 billion that a 2005 Electric Power Research Institute report estimated was the total nationwide cost of normal blackouts every year.

"EMP is one of a small number of threats that can hold our society at risk of catastrophic consequences," Graham testified to a congressional committee last year, endorsing such mitigation steps.

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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.

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Record - 3

DIALOG(R)

Scientist claim to have 'seen' dark matter,

UPI Science News,

Wednesday, October 27, 2010

TEXT:

Dark matter, theorized by astrophysicists but never detected, seen or observed, may have been spotted, if two U.S. researchers' data is confirmed.

Dark matter is thought to make up much of the universe, but scientists only have theories about what it really is, and can only even infer its existence by measuring its gravitational tug on the normal matter they can see.

Dan Hooper of the Fermi National Accelerator Laboratory in Batavia, Ill., and Lisa Goodenough, a graduate student at New York University, have analyzed observations of the center of our Milky Way galaxy and say they've found signs of the annihilation of dark matter particles in powerful cosmic explosions.

A signal of gamma-rays at the very center of the galaxy was found to be brighter than expected, and Hooper and Goodenough ultimately concluded it must be caused by dark matter particles packed in so densely they are destroying each other and releasing energy in the form of light.

"Nothing we tried besides dark matter came anywhere close to being able to accommodate the features of the observation," Hooper told SPACE.com. "It's always hard to be sure there isn't something you just haven't thought of. But I've talked to a lot of experts and so far I haven't heard anything that was a plausible alternative."

Dark matter was first suggested in the 1930s, when studies of the velocities of galaxies and stars suggested the universe contained much more mass than what could be observed.

Now scientists calculate dark matter makes up roughly 80 percent of all matter, with "regular" atomic matter contributing a puny 20 percent.

Some scientists they are skeptical dark matter has been found.

"It's a complicated task to interpret what Dan and Lisa are seeing," said Doug Finkbeiner, a researcher at the Harvard-Smithsonian Center for Astrophysics in Cambridge, Mass. "I do not find it persuasive, but that doesn't mean it is wrong."

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Record - 4

DIALOG(R)

One burst and the world goes dark,

Dan Vergano,

USA Today (USA), p1D,

Wednesday, October 27, 2010

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 (EMP) 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 center 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. (NERC) 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.

Simple physics, big worry

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 streetlights 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 induced currents in Quebec's power grid that knocked out power for 6 million people in Canada and the USA 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.

The terror effect

In the nuclear scenario, the detonation of an atomic 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.

Gingrich last year cited the EMP Commission report in warning, "One weapon of this kind that went off over Omaha would eliminate most of the electrical production in the United States."

But some take issue with that.

"You would really need something the size of a Soviet H-bomb to have effects that cross many states," Butt says. The massive Starfish Prime blast, he notes, was at least 70 times more powerful than the atomic bomb detonated over Hiroshima in 1945, and it may have blown out streetlights but it left the grid in Hawaii intact.

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, Butt says. "It would be suicide."

Super solar storm

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.

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

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

"We are almost guaranteed a very large solar storm at some point, but we are talking about a risk over decades," Butt says. Three power grids gird the continental U.S. -- one crossing 39 Eastern states, one for 11 Western states and one for Texas.

Solutions?

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."

Although the physics underlying the geomagnetic and nuclear pulses are fundamentally the same, they have different solutions. A geomagnetic storm essentially produces a long-building surge dangerous to power lines and large transformers. A nuclear blast produces three waves of pulses.

Limiting the risk from the geomagnetic-storm-type threat involves stockpiling large transformers and installing dampers, essentially lightning rods, to dump surges into the ground from the grid. Even if such steps cost billions, the numbers come out looking reasonable compared with the \$119 billion that a 2005 Electric Power Research Institute report estimated was the total nationwide cost of normal blackouts every year.

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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.

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Record - 5

DIALOG(R)

Colorado Editorial Roundup,
The Associated Press,
AP Alert – Political,
Tuesday, October 26, 2010

TEXT:

A sampling of recent editorials from Colorado newspapers:

STATE:

The (Colorado Springs) Gazette, Oct. 25, on why Senate candidate Ken Buck is right about global warming:

Statewide media on Oct. 22 described Ken Buck's campaign in a scramble to fix yet another supposed gaffe, in which the Republican candidate for the U.S. Senate had once again said something horrifically outrageous.

The latest pseudo scandal involves Buck praising Republican Sen. James Inhofe, of Oklahoma, as "the first person to stand up and say this global warming" is a hoax.

Buck's opponent, appointed Sen. Michael Bennet _ who cares nothing about Colorado Springs _ jumped on the statement as if Buck had renounced baseball and apple pie.

"Ken Buck's extreme stance on climate change is a threat to Colorado's economy and could prove cataclysmic for our national security," said Bennet spokesman Trevor Kincaid.

Really? What threatens the economy and national security is the unscientific crusade to promote a theory that humans are warming the planet and must be stopped. Global warming fear mongers, such as Bennet, would break this country with expensive and futile efforts to control the Mother Nature with massive new carbon taxes that would cripple production and curtail our country's ability to afford security.

But don't take The Gazette's word for it. Instead, hear the great Harold Lewis, emeritus professor of physics at the University of California-Santa Barbara, who resigned this month from the American Physical Society after 67 years of loyal membership. His resignation letter said this:

"It is of course, the global warming scam, with the (literally) trillions of dollars driving it, that has corrupted so many scientists, and has carried APS before it like a rogue wave. It is the greatest and most successful pseudoscientific fraud I have seen in my long life as a physicist."

Or, hear astronomer Sallie Baliunas, at the Harvard-Smithsonian Center for Astrophysics: The "recent warming trend in the surface temperature record cannot be caused by the increase of human-made greenhouse gases in the air."

Or, listen to Czech Republic President Vaclav Klaus, who calls the United Nations-led global warming scare "propagandist and not dignified." The list of political leaders and leading scientists willing to out anthropogenic global warming as a redistribution scam is highly distinguished and growing.

Meanwhile, global warming alarmists _ from Al Gore to the Hollywood glitterati set _ are consuming fossil fuels with reckless abandon. Director James Cameron wants to burden California with higher taxes to stop global warming, telling the Los Angeles times "we're going to have to live with less." Yet, Cameron owns three sprawling mansions with no windmills or solar panels. He tools around in a JetRanger helicopter, a Corvette, three Harleys, a Ducati, a Ford GT, a Humvee, a yacht and a fleet of recreational submarines. But he tells us to live with less. (See video outing Cameron as a "hypocrite")

Thank you, future Sen. Buck, for shielding us from the scam that says humans must pay for warming the globe.

Editorial: <http://www.gazette.com/opinion/ken-106950-buck-statewide.html>

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Wolbach Library: CfA in the News ~ Week ending 7 November 2010

1. **Studies from D.M. Kipping et al provide new data on astronomy**, Science Letter, p3853, Tuesday, November 9, 2010
2. **Studies by E. Osullivan and co-authors describe new findings in astronomy**, Science Letter, p3739, Tuesday, November 9, 2010
3. **Research reports on spectroscopy from L.S. Rothman and colleagues provide new insights**, Science Letter, p3040, Tuesday, November 9, 2010
4. **New astronomy research from C.A. Gottlieb and co-researchers described**, Science Letter, p923, Tuesday, November 9, 2010
5. **Findings from D. Narayanan and co-authors broaden understanding of astronomy**, Science Letter, p557, Tuesday, November 9, 2010
6. **SCIENTISTS FIND NEW GALAXIES THROUGH COSMIC ALIGNMENT**, US Federal News, Saturday, November 6, 2010
7. **The National Aeronautics and Space Administration (NASA) - Conference call briefing**, Washington Daybook, Friday, November 5, 2010
8. **Herschel's Hidden Talent: Digging Up Magnified Galaxies**, National Aeronautics and Space Administration Documents, Thursday, November 4, 2010
9. **NASA'S FERMI FINDS GIANT, PREVIOUSLY UNSEEN STRUCTURE IN OUR GALAXY**, US Federal News, Thursday, November 4, 2010
10. **Cosmic Curiosity Reveals Ghostly Glow of Dead Quasar**, M2 PressWIRE, Thursday, November 4, 2010

Record - 1

DIALOG(R)

Studies from D.M. Kipping et al provide new data on astronomy,
Science Letter, p3853,
Tuesday, November 9, 2010

TEXT:

According to a study from the United States, "In this work, we investigate the accuracy of various approximate expressions for the transit duration of

a detached binary against the exact solution, found through solving a quartic equation. Additionally, a new concise approximation is derived, which offers more accurate results than those currently in the literature."

"Numerical simulations are performed to test the accuracy of the various expressions. We find that our proposed expression yields a > 200 per cent improvement in accuracy relative to the most previously employed expression. We derive a new set of equations for retrieving the light-curve parameters and consider the effect of falsely using circular expressions for eccentric orbits, with particularly important consequences for transit surveys. The new expression also allows us to propose a new light-curve fitting parameter set, which minimizes the mutual correlations and thus improves computational efficiency," wrote D.M. Kipping and colleagues (see also).

The researchers concluded: "The equation is also readily differentiated to provide analytic expressions for the transit duration variation due to secular variations in the system parameters, for example due to apsidal precession induced by perturbing planets."

Kipping and colleagues published their study in Monthly Notices of the Royal Astronomical Society (Investigations of approximate expressions for the transit duration. Monthly Notices of the Royal Astronomical Society, 2010;407(1):301-313).

For more information, contact D.M. Kipping, Harvard Smithsonian Center Astrophysics, 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)

Studies by E. Osullivan and co-authors describe new findings in astronomy,
Science Letter, p3739,
Tuesday, November 9, 2010

TEXT:

"Using observations from the Chandra X-ray Observatory and Giant Metrewave Radio Telescope, we examine the interaction between the intracluster medium and central radio source in the poor cluster AWM 4. In the Chandra

observation a small cool core or galactic corona is resolved coincident with the radio core. This corona is capable of fuelling the active nucleus, but must be inefficiently heated by jet interactions or conduction, possibly precluding a feedback relationship between the radio source and cluster," investigators in the United States report (see also).

"A lack of clearly detected X-ray cavities suggests that the radio lobes are only partially filled by relativistic plasma. We estimate a filling factor of ≈ 0.21 (3 Sigma upper limit < 0.42) for the better constrained east lobe. We consider the particle population in the jets and lobes, and find that the standard equipartition assumptions predict pressures and ages which agree poorly with X-ray estimates. Including an electron population extending to low Lorentz factors either reduces ($\gamma(\text{min}) = 100$) or removes ($\gamma(\text{min}) = 10$) the pressure imbalance between the lobes and their environment. Pressure balance can also be achieved by entrainment of thermal gas, probably in the first few kiloparsecs of the radio jets," wrote E. Osullivan and colleagues.

The researchers concluded: "We estimate the mechanical power output of the radio galaxy, and find it to be marginally capable of balancing radiative cooling."

Osullivan and colleagues published their study in Monthly Notices of the Royal Astronomical Society (A deep Chandra observation of the poor cluster AWM 4-I. Properties of the central radio galaxy and its effects on the intracluster medium. Monthly Notices of the Royal Astronomical Society, 2010;407(1):321-338).

For additional information, contact E. Osullivan, 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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Record - 3

DIALOG(R)

Research reports on spectroscopy from L.S. Rothman and colleagues provide new insights,

Science Letter, p3040,

Tuesday, November 9, 2010

TEXT:

"A new molecular spectroscopic database for high-temperature modeling of the spectra of molecules in the gas phase is described," scientists in the United States report (see also).

"This database, called HITEMP, is analogous to the HITRAN database but encompasses many more bands and transitions than HITRAN for the absorbers H₂O, CO₂, CO, NO, and OH. HITEMP provides users with a powerful tool for a great many applications: astrophysics, planetary and stellar atmospheres, industrial processes, surveillance, non-local thermodynamic equilibrium problems, and investigating molecular interactions, to name a few," wrote L.S. Rothman and colleagues.

The researchers concluded: "The sources and implementation of the spectroscopic parameters incorporated into HITEMP are discussed."

Rothman and colleagues published their study in the Journal of Quantitative Spectroscopy & Radiative Transfer (HITEMP, the high-temperature molecular spectroscopic database. Journal of Quantitative Spectroscopy & Radiative Transfer, 2010;111(15 Sp. Iss):2139-2150).

For additional information, contact L.S. Rothman, Harvard Smithsonian Center Astrophysics, Atom & Molecular Physics Division, 60 Garden St., Cambridge, MA 02138, USA.

The publisher's contact information for the Journal of Quantitative Spectroscopy & Radiative Transfer is: Pergamon-Elsevier Science Ltd., the Boulevard, Langford Lane, Kidlington, Oxford OX5 1GB, England.

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Record - 4

DIALOG(R)

New astronomy research from C.A. Gottlieb and co-researchers described,
Science Letter, p923,
Tuesday, November 9, 2010

TEXT:

According to a study from the United States, "Rotational spectra of the linear carbon chain radical C₆H in two low-lying excited vibrational states were observed both at millimeter wavelengths in a low-pressure glow discharge and at centimeter wavelengths in a supersonic molecular beam. Two series of harmonically related lines with rotational constants within 0.3% of the (2)Pi ground state were assigned to the (2)Sigma and (2)Delta vibronic components of an excited bending vibrational level."

"Measurements of the intensities of the lines in the glow discharge indicate that the (2)Sigma component lies very close to ground, but the (2)Delta component is much higher in energy. The standard Hamiltonian for an isolated (2)Delta state with five spectroscopic constants reproduces the observed rotational spectrum, but several high-order distortion terms in the spin-rotation interaction are needed to reproduce the spectrum of the 2S component in C6H and C6D," wrote C.A. Gottlieb and colleagues (see also).

The researchers concluded: "The derived spectroscopic constants allow astronomers to calculate the rotational spectra of the (2)Sigma and (2)Delta states up to 260 GHz to within 0.1 km s(-1) or better in equivalent radial velocity."

Gottlieb and colleagues published their study in *Astrophysical Journal Supplement Series (Vibrationally Excited C6h. Astrophysical Journal Supplement Series, 2010;189(2):261-269)*.

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

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

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Record - 5

DIALOG(R

Findings from D. Narayanan and co-authors broaden understanding of Astronomy,

Science Letter, p557,

Tuesday, November 9, 2010

TEXT:

According to a study from the United States, "We present a physical model for the origin of z similar to 2 dust-obscured galaxies (DOGs), a class of high-redshift ultraluminous infrared galaxies (ULIRGs) selected at 24 mu m which are particularly optically faint (F-24 mu m/F-R > 1000). By combining N-body/smoothed particle hydrodynamic simulations of high-redshift galaxy evolution with 3D polychromatic dust radiative transfer models, we find that luminous DOGs (with F-24 greater than or similar to 0.3mJy at z similar to 2) are well modelled as extreme gas-rich mergers in massive (similar to 5 x 10(12)-10(13) M-circle dot) haloes, with elevated star

formation rates (SFR; similar to $500\text{-}1000 M(\text{circle dot})\text{yr}(-1)$) and/or significant active galactic nuclei (AGN) growth (M_{BH} greater than or similar to $0.5 M(\text{circle dot}) \text{yr}(-1)$), whereas less luminous DOGs are more diverse in nature."

"At final coalescence, merger-driven DOGs transition from being starburst dominated to AGN dominated, evolving from a 'bump' to a power-law (PL) shaped mid-IR (Infrared Array Camera, IRAC) spectral energy distribution (SED). After the DOG phase, the galaxy settles back to exhibiting a 'bump' SED with bluer colours and lower SFRs. While canonically PL galaxies are associated with being AGN dominated, we find that the PL mid-IR SED can owe both to direct AGN contribution and to a heavily dust obscured stellar bump at times that the galaxy is starburst dominated. Thus, PL galaxies can be either starburst or AGN dominated. Less luminous DOGs can be well-represented either by mergers or by massive (M_{baryon} similar to $5 \times 10^{11} M(\text{circle dot})$) secularly evolving gas-rich disc galaxies (with SFR similar to $50 M(\text{circle dot}) \text{yr}(-1)$). By utilizing similar models as those employed in the submillimetre galaxy (SMG) formation study of Narayanan et al., we investigate the connection between DOGs and SMGs. We find that the most heavily star-forming merger-driven DOGs can be selected as submillimetre galaxies, while both merger-driven and secularly evolving DOGs typically satisfy the BzK selection criteria. The model SEDs from the simulated galaxies match observed data reasonably well, though Mrk 231 and Arp 220 templates provide worse matches. Our models provide testable predictions of the physical masses, dust temperatures, CO linewidths and location on the MBH- M_{bulge} relation of DOGs," wrote D. Narayanan and colleagues (see also).

The researchers concluded: "Finally, we provide public SED templates derived from these simulations."

Narayanan and colleagues published the results of their research in Monthly Notices of the Royal Astronomical Society (A physical model for z similar to 2 dust-obscured galaxies. Monthly Notices of the Royal Astronomical Society, 2010;407(3):1701-1720).

For additional information, contact D. Narayanan, 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

SCIENTISTS FIND NEW GALAXIES THROUGH COSMIC ALIGNMENT,

US Federal News,

Saturday, November 6, 2010

TEXT:

OAKLAND, Calif., Nov. 4 -- The president of the University of California issued the following press release:

UC Irvine astronomers, along with scientists across the globe, are discovering hundreds of new galaxies through brighter galaxies in front of them that deflect their faint light back to the massive Herschel telescope. This effect, identified by Albert Einstein a century ago, is known as cosmic gravitational lensing.

"I was surprised to learn that Herschel is so good at finding these cosmic lenses," said UC Irvine professor of physics and astronomy Asantha Cooray, lead U.S. author of a paper about the discovery in the Nov. 5 issue of the journal Science. "We took a map of the sky out there, and it turned out the brightest spots are all gravitationally magnified galaxies. It's a whole new class of galaxies from when the universe was very young."

The Herschel Space Observatory, a European Space Agency mission with significant NASA contributions, is the largest telescope in space and - to the surprise of astronomers worldwide - has proven adept at locating galactic lenses that reveal magnified galaxies. It's capable of detecting longer-wavelength light than the human eye can - light in the far-infrared portion of the electromagnetic spectrum, which is exactly the type emitted by galaxies lined up behind the ones in the foreground.

"It's just this cosmic alignment," said UC Irvine associate professor of physics and astronomy Betsy Barton. "These two galaxies have nothing to do with each other. They're very far apart, and we're very far from both of them. The telescope just happened to be in a place where these two things are aligned."

When such a lineup occurs, it creates a cosmic magnifying lens, with a massive galaxy or cluster of galaxies bending light from the more distant galaxy into a warped and enlarged image. Sometimes, light from the farther galaxy is so distorted that it appears as a ring - called an Einstein ring because he first predicted the phenomenon. The effect is similar to what happens when you look through the bottom of a glass bottle or into a funhouse mirror.

The new galaxies are in the far reaches of outer space and are being viewed at a time when the universe was only 2 billion to 4 billion years old, less

than a third of its current age. Young and bursting with new stars, the galaxies have dust so thick they cannot be seen at all with visible-light telescopes. Herschel can detect the faint warmth of the dust, however, because it glows at far-infrared and submillimeter wavelengths. With these galaxies magnified, astronomers can dig deep into their dusty reaches to learn more about how the universe was created.

"It's a hugely important component in our understanding of when stars formed and what size galaxies were when that happened," said Barton.

The Science paper - whose lead author is Mattia Negrello of Britain's Open University - reports that five new galaxies were found, but astronomers suspect they've just scratched the surface. "We can probably pick out hundreds of new lensed galaxies in the Herschel data," said Paul Goldsmith, the U.S. project scientist for Herschel at NASA's Jet Propulsion Laboratory in Pasadena. Cooray, in fact, estimates that 200 more have been discovered since the article went to press, all awaiting confirmation by ground-based telescopes.

Numerous telescopes around the world helped verify the initial findings, including the National Radio Astronomy Observatory's Green Bank Telescope in West Virginia and three telescopes in Hawaii at the W.M. Keck Observatory, the California Institute of Technology's Submillimeter Observatory and the Smithsonian Astrophysical Observatory's Submillimeter Array. 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

The National Aeronautics and Space Administration (NASA) - Conference call Briefing,

Washington Daybook,
Friday, November 5, 2010

TEXT:

20101109 - The National Aeronautics and Space Administration (NASA)

TIME: Advisory

EVENT: The National Aeronautics and Space Administration (NASA) holds a conference call briefing, beginning at 2:30 p.m., to discuss a new discovery by the Fermi Gamma-ray Space Telescope.

PARTICIPANTS: Jon Morse, director of NASA's Astrophysics Division; Julie McEnery, Fermi project scientist at NASA's Goddard Space Flight Center; Doug Finkbeinger, associate professor of astronomy at Harvard-Smithsonian Center for Astrophysics; Simona Murgia, Fermi research associate at SLAC National Accelerator Laboratory; and David Spergel, astrophysicist at Princeton University

DATE: November 9, 2010

LOCATION: None given

CONTACT: Trent Perrotto, 202-358-0321, trent.j.perrotto@nasa.gov; <http://www.nasa.gov> [Note: For call-in information, RSVP to Trent Perrotto.]

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Record - 8

DIALOG(R)

Herschel's Hidden Talent: Digging Up Magnified Galaxies,
National Aeronautics and Space Administration Documents,
Thursday, November 4, 2010

TEXT:

MEDIA RELATIONS OFFICE JET PROPULSION LABORATORY CALIFORNIA INSTITUTE OF TECHNOLOGY NATIONAL AERONAUTICS AND SPACE ADMINISTRATION PASADENA, CALIF. 91109. TELEPHONE 818-354-5011 <http://www.jpl.nasa.gov>

NEWS RELEASE: 2010-372 - - - - Nov. 4, 2010

HERSCHEL'S HIDDEN TALENT: DIGGING UP MAGNIFIED GALAXIES

The full version of this story with accompanying images is at:
<http://www.jpl.nasa.gov/news/news.cfm?release=2010-372&cid=release2010-372>

PASADENA, Calif. -- It turns out the Herschel Space Observatory has a trick up its sleeve. The telescope, a European Space Agency mission with important NASA contributions, has proven to be excellent at finding magnified, faraway galaxies. Like little kids probing patches of dirt for insects, astronomers can use these new cosmic magnifying lenses to study galaxies that are hidden in dust.

"I was surprised to learn that Herschel is so good at finding these cosmic

lenses," said Asantha Cooray of the University of California, Irvine. "Locating new lenses is an arduous task that involves slogging through tons of data. With Herschel, we can find a lot of them much more efficiently." Cooray is a co-author of a paper about the discovery, appearing in the Nov. 5 issue of the journal *Science*. The lead author is Mattia Negrello of the Open University in the United Kingdom.

A cosmic magnifying lens occurs when a massive galaxy or cluster of galaxies bends light from a more distant galaxy into a warped and magnified image. Sometimes, a galaxy is so warped that it appears as a ring -- an object known as an Einstein ring after Albert Einstein who first predicted the phenomenon, referred to as gravitational lensing. The effect is similar to what happens when you look through the bottom of a soda bottle or into a funhouse mirror.

These lenses are incredibly powerful tools for studying the properties of distant galaxies as well as the mysterious stuff -- dark matter and dark energy -- that makes up a whopping 96 percent of our universe (see <http://www.jpl.nasa.gov/news/news.cfm?release=2010-272>).

"With these lenses, we can do cosmology and study galaxies that are too distant and faint to be seen otherwise," said Cooray.

Cooray and a host of international researchers made the initial discovery using Herschel. Launched in May 2009, this space mission is designed to see longer-wavelength light than that we see with our eyes -- light in the far-infrared and submillimeter portion of the electromagnetic spectrum. Scanning Herschel images of thousands of galaxies, the researchers noticed five never-before-seen objects that jumped out as exceptionally bright.

At that time, the galaxies were suspected of being magnified by cosmic lenses, but careful and extensive follow-up observations were required. Numerous ground-based telescopes around the world participated in the campaign, including the National Radio Astronomy Observatory's Green Bank Telescope in West Virginia, and three telescopes in Hawaii: the W.M. Keck Observatory, the California Institute of Technology's Submillimeter Observatory, and the Smithsonian Astrophysical Observatory's Submillimeter Array.

The results showed that all five of the bright galaxies were indeed being magnified by foreground galaxies. The galaxies are really far away -- they are being viewed at a time when the universe was only two to four billion years old, less than a third of its current age.

The Herschel astronomers suspect that they are just scratching the surface of a much larger population of magnified galaxies to be uncovered. The images studied so far make up just two percent of the entire planned survey, a program called the Herschel Astrophysical Terahertz Large Area

Survey, or Herschel-ATLAS.

"The fact that this Herschel team saw five lensed galaxies is very exciting," said Paul Goldsmith, the U.S. project scientist for Herschel at NASA's Jet Propulsion Laboratory, Pasadena, Calif. "This means that we can probably pick out hundreds of new lensed galaxies in the Herschel data."

The five galaxies are young and bursting with dusty, new stars. The dust is so thick, the galaxies cannot be seen at all with visible-light telescopes. Herschel can see the faint warmth of the dust, however, because it glows at far-infrared and submillimeter wavelengths. Because the galaxies are being magnified, astronomers can now dig deeper into these dusty, exotic places and learn more about what makes them tick.

Herschel is a European Space Agency cornerstone mission, with science instruments provided by consortia of European institutes and with important participation by NASA. NASA's Herschel Project Office is based at NASA's Jet Propulsion Laboratory. JPL contributed mission-enabling technology for two of Herschel's three science instruments. The NASA Herschel Science Center, part of the Infrared Processing and Analysis Center at the California Institute of Technology in Pasadena, supports the U.S. astronomical community. Caltech manages JPL for NASA.

More information and images are online at <http://www.herschel.caltech.edu>, <http://www.nasa.gov/herschel> and <http://www.esa.int/SPECIALS/Herschel/index.html>.

Whitney Clavin 818-354-4673 Jet Propulsion Laboratory, Pasadena, Calif.
whitney.clavin@jpl.nasa.gov

-end-

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Record - 9

DIALOG(R)

NASA'S FERMI FINDS GIANT, PREVIOUSLY UNSEEN STRUCTURE IN OUR GALAXY,

US Federal News,

Thursday, November 4, 2010

TEXT:

WASHINGTON, Nov. 2 -- NASA issued the following media advisory:

NASA will hold a media teleconference at 2:30 p.m. EST on Tuesday, Nov. 9,

to discuss a new discovery by the Fermi Gamma-ray Space Telescope. Gamma rays are the highest-energy form of light. The soon-to-be published findings include the discovery of enormous but previously unrecognized "gamma-ray bubbles" centered in the Milky Way.

Teleconference panelists are:

* Jon Morse, director, Astrophysics Division, NASA Headquarters in Washington

* Julie McEnery, Fermi project scientist, NASA's Goddard Space Flight Center in Greenbelt, Md.

* Doug Finkbeiner, associate professor of astronomy, Harvard-Smithsonian Center for Astrophysics in Cambridge, Mass.

* Simona Murgia, Fermi research associate, SLAC National Accelerator Laboratory in Menlo Park, Calif.

*David Spergel, astrophysicist, Princeton University, Princeton, N.J.

For dial-in information, journalists should e-mail their name, media affiliation and telephone number to Trent Perrotto at trent.j.perrotto@nasa.gov.

Audio of the teleconference will be streamed live on NASA's website at:

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

For more information about NASA's Fermi Gamma-ray Space Telescope, 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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Record - 10

DIALOG(R)

: **Cosmic Curiosity Reveals Ghostly Glow of Dead Quasar,**

M2 PressWIRE,

Thursday, November 4, 2010

TEXT:

New Haven, Conn. - While sorting through hundreds of galaxy images as part of the Galaxy Zoo citizen science project two years ago, Dutch schoolteacher and volunteer astronomer Hanny van Arkel stumbled upon a strange-looking object that baffled professional astronomers. Two years later, a team led by Yale University researchers has discovered that the unique object represents a snapshot in time that reveals surprising clues about the life cycle of black holes.

In a new study, the team has confirmed that the unusual object, known as Hanny's Voorwerp (Hanny's "object" in Dutch), is a large cloud of glowing gas illuminated by the light from a quasar—an extremely energetic galaxy with a supermassive black hole at its center. The twist, described online in the *Astrophysical Journal Letters*, is that the quasar lighting up the gas has since burned out almost entirely, even though the light it emitted in the past continues to travel through space, illuminating the gas cloud and producing a sort of "light echo" of the dead quasar.

"This system really is like the Rosetta Stone of quasars," said Yale astronomer Kevin Schawinski, a co-founder of Galaxy Zoo and lead author of the study. "The amazing thing is that if it wasn't for the Voorwerp being illuminated nearby, the galaxy never would have piqued anyone's interest."

The team calculated that the light from the dead quasar, which is the nearest known galaxy to have hosted a quasar, took up to 70,000 years to travel through space and illuminate the Voorwerp—meaning the quasar must have shut down sometime within the past 70,000 years.

Until now, it was assumed that supermassive black holes took millions of years to die down after reaching their peak energy output. However, the Voorwerp suggests that the supermassive black holes that fuel quasars shut down much more quickly than previously thought. "This has huge implications for our understanding of how galaxies and black holes co-evolve," Schawinski said.

"The time scale on which quasars shut down their prodigious energy output is almost entirely unknown," said Meg Urry, director of the Yale Center for Astronomy & Astrophysics and a co-author of the paper. "That's why the Voorwerp is such an intriguing—and potentially critical—case study for understanding the end of black hole growth in quasars."

Although the galaxy no longer shines brightly in X-ray light as a quasar, it is still radiating at radio wavelengths. Whether this radio jet played a role in shutting down the central black hole is just one of several possibilities Schawinski and the team will investigate next.

"We've solved the mystery of the Voorwerp," he said. "But this discovery

has raised a whole bunch of new questions."

Other authors of the paper include Shanil Virani, Priyamvada Natarajan, Paolo Coppi (all of Yale University); Daniel Evans (Massachusetts Institute of Technology, Harvard-Smithsonian Center for Astrophysics and Elon University); William Keel and Anna Manning (University of Alabama and Kitt Peak National Observatory); Chris Lintott (University of Oxford and Adler Planetarium); Sugata Kaviraj (University of Oxford and Imperial College London); Steven Bamford (University of Nottingham); Gyula Jozsa (Netherlands Institute for Radio Astronomy and Argelander-Institut für Astronomie); Michael Garrett (Netherlands Institute for Radio Astronomy, Leiden Observatory and Swinburne University of Technology); Hanny van Arkel (Netherlands Institute for Radio Astronomy); Pamela Gay (Southern Illinois University Edwardsville); and Lucy Fortson (University of Minnesota).

Citation: Kevin Schawinski et al 2010 ApJ 724 L30 DOI:
10.1088/2041-8205/724/1/L30

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Wolbach Library: CfA in the News ~ Week ending 14 November 2010

1. **IN MEMORIAM John P. Huchra, cosmologo estadounidense**, Diario El Pais (Spain), 1a Ed. Madrid ed, p51, Sunday, November 14, 2010
2. **Nasa scientists spot mystery giant 'space bubbles'**, Indo-Asian News Service, Friday, November 12, 2010
3. **Huge energy bubbles found at galaxy's core; Astronomers had hypothesized about such structures, but their size was totally unexpected**, Jean-Louis Santini, Vancouver Sun (Canada), Final ed, pB1, Thursday, November 11, 2010
4. **'Hubble' bubbles**, Sun, The (UK), 01 ed, Thursday, November 11, 2010
5. **Previously unseen giant structure found in galaxy.**, PTI - The Press Trust of India Ltd., Wednesday, November 10, 2010
6. **Milky Way 'bubbles' baffle astronomers searching for dark matter**, Pete Spotts Staff writer, Christian Science Monitor (USA), ALL ed, Wednesday, November 10, 2010
7. **MYSTERY 'MISSILE' -CALIFORNIA VAPOR STREAK CONFOUNDS SKY WATCHERS**, ANDY SOLTIS, New York Post, p021, Wednesday, November 10, 2010
8. **NASA'S FERMI TELESCOPE DISCOVERS GIANT STRUCTURE IN OUR GALAXY**, US Federal News, Wednesday, November 10, 2010
9. **NATION & WORLD: Astronomers discover huge energy bubbles**, Additional reporting by Ken Dilanian, Tribune Washington Bureau, Chicago Tribune, Chicagoland Final ed, p23, Wednesday, November 10, 2010
10. **Huge energy bubbles found at centre of galaxy**, The New York Times, Hamilton Spectator, v2010111014800132, First ed, pA16, Wednesday, November 10, 2010
11. **Astronomers find huge energy bubbles beyond our galaxy**, Thomas Maugh, Waterloo Region Record, v2010111014800796, First ed, pA6, Wednesday, November 10, 2010
12. **Galaxy bracketed by big bubbles**, Dan Vergano, USA Today (USA), p5A, Wednesday, November 10, 2010
13. **Bubbles Of Energy Are Found In Galaxy**, DENNIS OVERBYE, New York Times (NY), Late Edition - Final ed, p18, Wednesday, November 10, 2010
14. **Milky Way found to be blowing massive, high-energy bubbles**, Thomas H. Maugh II, Los Angeles Times, Home Edition ed, p6, Wednesday, November 10, 2010

15. **Gamma ray mystery at heart of Milky Way**, UPI Science News, Tuesday, November 9, 2010

Record - 1

DIALOG(R)

IN MEMORIAM John P. Huchra, cosmologo estadounidense,

Diario El Pais (Spain), 1a Ed. Madrid ed, p51,

Sunday, November 14, 2010

TEXT:

VICENT J. MARTINEZ

VIRGINIA TRIMBLE

Cualquiera que se encontrara a John Huchra alguna vez -ante un telescopio, una clase o un comite- recordara siempre su enorme energia y su buen humor. El vacio que ha dejado entre la comunidad de cosmologos no resultara facil de llenar.

John Peter Huchra nacio en Jersey City, Nueva Jersey (Estados Unidos), el 23 de diciembre de 1948. Se graduo en fisica por el Massachusetts Institute of Technology en 1970 y obtuvo su doctorado en el California Institute of Technology en 1976 bajo la direccion de W. L. W. Sargent. Mas tarde se traslado como posdoctorado a Harvard, de donde ya nunca se marchó, oscilando entre la Universidad, el Harvard-Smithsonian Center for Astrophysics (CfA) y la direccion del Observatorio Fred Whipple en Arizona, para acabar su carrera como profesor en la catedra Robert O. & Holly Thomis Doyle de Cosmologia.

Fue asesor del rector en politica de investigacion, pero dimitio hace cinco anos cuando tuvo su primer infarto. Su muerte el pasado 8 de octubre tras un segundo ataque cardiaco fue subita, pero no del todo inesperada.

John Huchra trabajo con muchos astrónomos y en diferentes proyectos, pero entre sus contribuciones mas destacadas cabe mencionar, sin duda, la realizacion en la decada de los ochenta de cartografiados de galaxias en los que, ademas de la posicion de cada galaxia en el cielo, se media su desplazamiento al rojo, y, a partir de el, su distancia (aplicando la ley de Hubble). De esta manera, Huchra y sus colaboradores presentaron a la comunidad cientifica los primeros catalogos tridimensionales suficientemente profundos de la distribucion de galaxias, que fueron cruciales para entender la estructura a gran escala del universo, con las galaxias distribuidas en cumulos, filamentos y paredes, y grandes vacios entre ellos -una distribucion semejante al resultado de espolvorear talco sobre burbujas de jabon-. Esta topologia es una de las mas importantes

evidencias sobre las que se apoya el modelo cosmologico actual, con un universo dominado por materia y energia oscuras.

El articulo que Valerie de Lapparent, Margaret Geller y John Huchra presentaron en 1986 en The Astrophysical Journal Letters (titulado Una rebanada del universo) causo un impacto muy importante en la comunidad cientifica. Mostraban estructuras cosmicas de un tamano mucho mas grande de lo esperado. De hecho, la rebanada de unos 680 millones de anos luz de profundidad estaba dominada por filamentos, cumulos y vacios. Curiosamente aparecia la imagen de un hombrecillo de palos, que en realidad no era mas que el cumulo de Coma, muy distorsionado por efecto de las velocidades peculiares de las galaxias que forman parte de el, un efecto que se conoce como dedo de Dios. En aquel momento se esperaba que la distribucion de galaxias fuese mucho mas uniforme, y superestructuras como la Gran muralla, que Huchra y su equipo habian descubierto, impresionaron a la comunidad cientifica.

En 1987, estos resultados fueron presentados por John, Margaret y Valerie en el simposio de la Union Astronomica Internacional en Balatonfured (Hungria) que tenia por titulo Estructuras a Gran Escala del Universo. Entre los cientificos invitados estaba el recientemente fallecido Benoit Mandelbrot, ya que las estructuras cosmicas ponian en evidencia el caracter fractal de la distribucion de galaxias en un cierto rango de escalas. Mas tarde se veria que cartografiados mas profundos, como el Sloan Digital Sky Survey, muestran de forma inequivoca la transicion a la homogeneidad, rompiendo el regimen fractal.

John Huchra llevo a cabo otros importantes trabajos de investigacion en diferentes aspectos de la cosmologia moderna. Cabe destacar su contribucion en la determinacion del ritmo de expansion cosmica (la constante de Hubble) o el descubrimiento de lentes gravitatorias como la que lleva su nombre y que es un ejemplo caracteristico de Cruz de Einstein. Ademias, ejercio diferentes responsabilidades en organizaciones cientificas, como la presidencia de la American Astronomical Society.

El ultimo correo electronico que nos envio, dos dias antes de su muerte, planteaba la cuestion de quien utilizo por primera vez la expresion "materia oscura" hacia 1922. "Opik?" sugirio John. "No, Kapteyn", respondio Vicent Martinez. La cuestion subyacente es en que medida un cientifico o sus colegas o su familia necesitan defender su legado. El legado de John Huchra no necesita defensa.

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Record - 2

DIALOG(R)

Nasa scientists spot mystery giant 'space bubbles',

Indo-Asian News Service,

Friday, November 12, 2010

TEXT:

London, Nov. 12 -- They stretch across more than half of the sky and are as large as the Milky Way - but nobody knows how they got there. NASA scientists are left scratching their heads after discovering two huge bubbles of gamma rays on either side of our galaxy.

The bubbles were found by NASA's Fermi Gamma-Ray Telescope, which scans the sky every three hours for high energy light.

They extend from the constellation Virgo to the constellation Grus and are among the largest such structures ever found -- it would take a beam of light, travelling at 186,282 miles per second, 50,000 years to get from the edge of one to the edge of the other, reports the Daily Mail.

The discovery has reminded experts that however much we know about the galaxy, it is always full of surprises, according to a NASA statement.

But they have also tried their best to explain how they got here - one theory is that they have been fuelled by a wave of star births and deaths at the centre of the Milky Way.

Other researchers have suggested it might be connected with the huge black hole which sits at the centre of the galaxy.

"This result is very exciting," said Fermi scientist Simona Murgia, with the SLAC National Accelerator Lab in California.

"These features could reveal unexpected and very important physical processes in our galaxy that until now we knew nothing about."

David Spergel, astrophysicist at Princeton University who was not involved in the work, added: "Wow. And we think we know a lot about our own galaxy."

The bubbles contain the energy equivalent to 100,000 supernova explosions, leading to NASA ruling out dark matter, which makes up a quarter of the universe.

One theory being explored is that the supermassive black hole at the centre of the Milky Way may have had some kind of outburst.

"You have to ask where could energy like that come from," said astronomer Doug Finkbeiner from the Harvard-Smithsonian Centre for Astrophysics, US. 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)

Huge energy bubbles found at galaxy's core; Astronomers had hypothesized about such structures, but their size was totally unexpected,

Jean-Louis Santini,
Vancouver Sun (Canada), Final ed, pB1,
Thursday, November 11, 2010

TEXT:

WASHINGTON - Surprised American astronomers have discovered two huge, mysterious gamma ray-emitting bubbles at the centre of the Milky Way Galaxy to which our own solar system belongs.

Masked by the fog of gamma rays that appears throughout space, the energy bubbles form a feature extending 25,000 light-years above and below the plane of the galaxy, like a squat hourglass, and could be the remnant of a supersized black hole eruption or the outflows from a burst of a star formation, astronomers said.

"We don't fully understand their nature or origin," said Doug Finkbeiner, an astronomer at the Harvard-Smithsonian Center for Astrophysics in Cambridge, Massachusetts, who along with Harvard graduate students Meng Su and Tracy Slatyer made the discovery while analyzing data from NASA's Fermi Large Area Telescope.

Launched into Earth orbit in 2008, the international Fermi project is the most sensitive and highest-resolution gamma ray detector ever devised. It scans the entire sky every three hours.

"My first response when I saw these figures was 'Wow!'" astronomer David Spergel of Princeton University said. Spergel, who was not involved in the research, said 'we think we know a lot about our own galaxy' and yet the bubbles, which are almost as big as the galaxy, were totally unexpected.

"It shows, once again, that the universe is full of surprises," said Jon Morse, director of astrophysics at NASA headquarters.

The structure spans more than half of the visible sky, from the constellation Virgo to the constellation Grus, and it may be millions of years old, the astronomers said in a paper published Wednesday in the *Astrophysical Journal*.

Researchers do not yet know what produced the bubbles, but the fact they appear to have relatively sharp edges suggests that they were produced in a single event.

Finkbeiner said that would have required the rapid release of energy equivalent to about 100,000 supernovae, or exploding stars. Gamma rays are the highest-energy form of light.

"You have to ask where could energy like that come from," said Finkbeiner.

Among the 1,500 sources of gamma rays Fermi has mapped so far, nothing resembles the bubble-shaped structures.

Hints of their existence appeared years ago in X-ray surveys and in maps of the cosmic microwave background radiation stemming from the Big Bang explosion.

"We had a hypothesis before Fermi launched that there should be some gamma ray emission in this part of the sky. We were thinking something a bit more modest, maybe something within 10 or 20 or 30 degrees of the centre, not these giant structures reaching all the way up to 50 degrees," Finkbeiner said.

One possibility is that there was a burst of star formation in the centre of the galaxy producing massive, short-lived stars that exploded and ejected a great deal of gas and dust over a few millions of years. Another possibility is that the black hole at the centre of the Milky Way shot out a stream of particles over a much shorter time scale, perhaps 10,000 to 100,000 years.

There's no evidence the Milky Way's black hole, which is about 400 million times more massive than our Sun, has jets, but astronomers suspect it might have in the past.

"We know it didn't get to be that big by sitting there quietly all the time. It certainly has had big accretion events in the past, where material falls on it and then some of that material comes back out as high-energy particles blasted out in the form of a jet," Finkbeiner said.

"We've never really seen very good evidence of it. This might be the first

evidence for a major outburst of the black hole at the centre of the galaxy. When it's going full-blast ... it would not actually take an enormous amount of time -- maybe 10,000 or 100,000 years -- for it to produce enough energy to create these structures,' he said.

and Los Angeles Times

We know [the Milky Way's black hole] didn't get to be that big by sitting there quietly all the time. It certainly has had big accretion events in the past, where material falls on it and then some of that material comes back out as high-energy particles blasted out in the form of a jet.

doug finkbeiner astronomer,

harvard-smithsonian centre for astrophysics

Colour Photo: NASA Goddard Space Flight Center/AFP/Getty Images / Illustration shows what the newly discovered gamma-ray bubbles might look like, if we could see them. They extend 50,000 light-years, or roughly half of the Milky Way's diameter.;

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Record - 4

DIALOG(R)

'Hubble' bubbles,

Sun, The (UK), 01 ed,

Thursday, November 11, 2010

TEXT:

GIANT bubbles have been discovered in our galaxy by a super Nasa telescope.

The structures are so big it would take 25,000 light-years to cross them.

They stretch from the north to the south of the centre of the Milky Way.

Space scientists are baffled by the previously unseen bubbles.

They were spotted by Doug Finkbeiner, of the Harvard-Smithsonian Center for Astrophysics in Cambridge, Massachusetts, using Nasa's Fermi Gamma-Ray Telescope.

The astronomer admitted yesterday: "We don't fully understand their nature or origin."

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Record - 5

DIALOG(R)

Previously unseen giant structure found in galaxy.

PTI - The Press Trust of India Ltd.

Wednesday, November 10, 2010

TEXT:

Previously unseen giant structure found in galaxy

Washington, November 10, 2010 (PTI) -- Astronomers have discovered a previously unseen structure centred in the Milky Way -- a finding likened in terms of scale to the discovery of a new continent on Earth.

The scientists, who found the giant structure using NASA's Fermi Gamma-ray Space Telescope, believe it could be the remnant of an eruption from a supersized black hole at the centre of our galaxy.

Doug Finkbeiner, an astronomer at Harvard-Smithsonian Centre for Astrophysics (CfA) in Cambridge, Massachusetts, who first recognised the feature, said: "What we see are two gamma-ray-emitting bubbles that extend 25,000 light-years north and south of the galactic centre." "We don't fully understand their nature or origin," he was quoted as saying by a joint CfA and NASA release.

According to the scientists, the structure is believed to be millions of years old. At more than 100 degrees across, it spans more than half of the sky, from the constellation Virgo to the constellation Grus.

A paper on the findings will appear in an upcoming issue of The Astrophysical Journal.

Finkbeiner and Harvard graduate students Meng Su and Tracy Slatyer revealed the bubbles by processing publicly available data from Fermi's Large Area Telescope (LAT) -- the most sensitive and highest-resolution gamma-ray detector ever orbited.

Gamma rays are the highest-energy form of light and the structures eluded previous astronomers studying gamma rays due in part to the so-called diffuse emission -- a fog of gamma rays that appears all over the sky.

The emissions are caused by particles moving near the speed of light interacting with light and interstellar gas in the Milky Way.

By using various estimates of the gamma-ray fog, the scientists were able to subtract it from the LAT data and unveiled the giant bubbles.

"The LAT team confirmed the existence of an extended structure in the direction of the inner part of the Milky Way and we're in the process of performing a deeper analysis to better understand it," said Simona Murgia, a Fermi researcher at the SLAC National Accelerator Laboratory in California.

The researchers believe that an important process for producing the galaxy's gamma-ray fog, called inverse Compton scattering, also lights up the bubbles. (More) PTI SKP AKJ

SKP 11101518

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Record - 6

DIALOG(R)

Milky Way 'bubbles' baffle astronomers searching for dark matter,

Pete Spotts Staff writer,

Christian Science Monitor (USA), ALL ed,

Wednesday, November 10, 2010

TEXT:

Who says the Milky Way doesn't know how to party?

Scientists say they have discovered two gigantic, mysterious bubbles emerging like party balloons above and below the core of the Milky Way.

The bubbles are expanding into intergalactic space at more than 2.2 million miles an hour. Each extends some 25,000 light-years beyond the galaxy's nucleus.

Astrophysicists with the Harvard-Smithsonian Center for Astrophysics in Cambridge, Mass., discovered the bubbles using NASA's Fermi Gamma-Ray Space Telescope, currently on orbit. Gamma rays represent the most energetic form of radiation along the electromagnetic spectrum, which also includes radio waves as well as visible light.

For the moment, the discovery marks a "Hey, Martha!" moment in the annals of astrophysics. Researchers don't know why the bubbles are there. Nor have they identified the violent processes involved in generating the gamma rays that betray the bubbles' presence.

"I like the Isaac Asimov quote that discoveries don't start with: Eureka! I've found it! They start with: That looks funny!" says Douglas Bookbeiner, who led the effort.

Indeed, a galaxy blowing bubbles at temperatures of around 7 million degrees Fahrenheit was not what the team had in mind when it set out taking gamma-ray measurements of the galaxy's center, Dr. Bookbeiner says.

The team initially was hunting for evidence of dark matter at the galaxy's core.

Dark matter refers to a form of matter that is thought to make up about 80 percent of all the matter in the universe. But so far it has defied efforts to observe it; it doesn't give off or scatter light.

Astronomers infer its presence by its gravitational effects on matter they can see. The theory is that where dark matter is at its most dense, its particles and mirror-opposite anti-particles will frequently collide, annihilate each other, and give off a burst of gamma rays.

Models suggest that the best place to look for this activity is in the centers of galaxies, where the density of ordinary and dark matter is greatest.

Bookbeiner says the project his team undertook was triggered by subtle signs that might betray dark matter, found in microwave radiation coming from the galactic core.

Models predicted that a fuzzy fog of gamma rays surrounding the Milky Way's center would be the tip-off to dark matter's presence.

"To our surprise, we saw this big dumbbell-shaped feature that we've called the Fermi bubbles," he says. Far from fuzzy, the features have sharp boundaries.

As the team reviewed observations of the galaxy's center that other teams made at longer, lower-energy wavelengths, they uncovered what appears to be an onion-like layering to the features a(euro)" much of the gamma-ray bubbles appear sheathed in x-rays, with a diffuse microwave haze at the base of each bubble.

These other unexplained features likely share a common origin with the bubbles, the team posits.

One possible source is the super-massive black hole at the galaxy's center. All galaxies are thought to host them. Some are more active than others

a(euro)" constantly vacuuming up stars, dust, and gas near the galaxy's center in a violent process that sends jets of charged particles vaulting at nearly the speed of light like beacons into space from each galactic pole.

The Fermi bubbles could be the echo of an outburst of such activity that ended perhaps a million years ago a(euro)" packing enough punch to give the bubbles their crisp edges.

An alternative: the galactic center, rich in gas and new stars, underwent a burst of star formation. Between large numbers of hot young stars giving off streams of charged particles in what's called stellar wind, and the explosive ends they meet as supernovae, the winds and explosions also could have provided the energy behind the Fermi bubbles.

"In other galaxies, we see that star bursts can drive enormous gas outflows," notes David Spergel, a Princeton University researcher and member of the team making the discovery.

Still, no one has seen anything quite like the Fermi bubbles, the researchers say. Other galaxies are too far away and their centers too small, and any bubble-like gamma-ray signatures too faint to be detected by telescopes lofted into orbit so far.

Ironically, while one could posit that the gamma-ray bubbles the team detected in fact signal the presence of dark matter, the bubbles appear to complicate the dark-matter search, Bookbeiner says.

"I don't think this is dark matter. In fact, it makes it harder to find dark matter, because now we have this other thing in the way. It just confuses everything," he says.

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Record - 7

DIALOG(R)

MYSTERY 'MISSILE' -CALIFORNIA VAPOR STREAK CONFOUNDSSKY WATCHERS,

ANDY SOLTIS,

New York Post, p021,

Wednesday, November 10, 2010

TEXT:

A possible missile launch that left a spectacular red vapor trail off the California coast triggered a frenzied search yesterday for explanations.

The Pentagon insisted there was no threat to national security, but no agency - including the Navy, Air Force, FAA and North American Aerospace Defense Command - could say what it was or who was behind it.

"Nobody within the Department of Defense that we've reached out to has been able to explain what this contrail is, where it came from," Pentagon spokesman Col. David Lapan said, referring to the condensation trail.

"So far, we've come up empty with any explanation." Both the US Strategic Command and the Northern Command have been asked to "count noses" to make sure they're not missing any missiles, Fox News reported.

The video of the billowing trail, made at around 5 p.m. Monday by a KCBS-TV news helicopter north of Santa Catalina Island, quickly became an Internet sensation, spawning numerous theories.

Speculation ranged from a UFO, an optical illusion and a next-generation spy satellite to a mere accident - someone in the military pushing the wrong button and sending a Tomahawk missile into the sky.

One blogger, naval analyst Raymond Pritchett, expressed alarm at the inability of US air-defense officials, nearly a day after the sighting, "to have any answers at all" about the apparent launching of "a ballistic missile 35 miles from the nation's second-largest city." Ordinarily, a sea launch would require several layers of notification to airmen and mariners and closure of airspace in the area.

The FAA said it didn't approve any commercial-space launches. Vandenberg Air Force Base said it did launch a satellite - but that was on Friday.

Former Deputy Defense Secretary Robert Ellsworth told CBS that it might have been an intercontinental ballistic missile being secretly launched for the first time in the Pacific Ocean by a US submarine. Ellsworth indicated it might have been timed to coincide with President Obama's Asian trip, to show the US military's ability to hit Pacific targets.

The FAA said it rechecked its radar scans of the area west of LA on Monday night and found no fast-moving objects.

Meanwhile, several scientists said it was almost certainly the vapor trail of a commercial aircraft. If the jet were traveling horizontally toward the KCBS helicopter, it would have appeared to be vertical because of the optical illusion of perspective, they said.

"If it's coming over the horizon, straight at you, then it rises quickly

above the horizon. You'd think it was just going vertically up," astronomer Jonathan McDowell, of the Harvard-Smithsonian Center for Astrophysics, told New Scientist magazine.

He discounted the possibility that it was a missile because no one besides the helicopter crew has reported seeing the contrail.

John Pike, a security analyst, said it could not have been a rocket, since it altered its course.

With Post Wire Services
ANYONE'S GUESS

1. A new spy satellite
2. An accident - military pushed wrong button and sent up a Tomahawk missile
3. First-ever submarine launch of long-range missile - to frighten North Korea; or North Koreans, trying to scare us
4. Airplanes vapor trail, which looks vertical, due to optical illusion
5. Aliens trying to make contact

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Record - 8

DIALOG(R)

NASA'S FERMI TELESCOPE DISCOVERS GIANT STRUCTURE IN OUR GALAXY,
US Federal News,
Wednesday, November 10, 2010

TEXT:

WASHINGTON, Nov. 9 -- NASA issued the following press release/media advisory:

NASA's Fermi Gamma-ray Space Telescope has unveiled a previously unseen structure centered in the Milky Way. The feature spans 50,000 light-years and may be the remnant of an eruption from a supersized black hole at the center of our galaxy.

"What we see are two gamma-ray-emitting bubbles that extend 25,000 light-years north and south of the galactic center," said Doug Finkbeiner,

an astronomer at the Harvard-Smithsonian Center for Astrophysics in Cambridge, Mass., who first recognized the feature. "We don't fully understand their nature or origin."

The structure spans more than half of the visible sky, from the constellation Virgo to the constellation Grus, and it may be millions of years old. A paper about the findings has been accepted for publication in *The Astrophysical Journal*.

Finkbeiner and Harvard graduate students Meng Su and Tracy Slatyer discovered the bubbles by processing publicly available data from Fermi's Large Area Telescope (LAT). The LAT is the most sensitive and highest-resolution gamma-ray detector ever launched. Gamma rays are the highest-energy form of light.

Other astronomers studying gamma rays hadn't detected the bubbles partly because of a fog of gamma rays that appears throughout the sky. The fog happens when particles moving near the speed of light interact with light and interstellar gas in the Milky Way. The LAT team constantly refines models to uncover new gamma-ray sources obscured by this so-called diffuse emission. By using various estimates of the fog, Finkbeiner and his colleagues were able to isolate it from the LAT data and unveil the giant bubbles.

Scientists now are conducting more analyses to better understand how the never-before-seen structure was formed. The bubble emissions are much more energetic than the gamma-ray fog seen elsewhere in the Milky Way. The bubbles also appear to have well-defined edges. The structure's shape and emissions suggest it was formed as a result of a large and relatively rapid energy release -- the source of which remains a mystery.

One possibility includes a particle jet from the supermassive black hole at the galactic center. In many other galaxies, astronomers see fast particle jets powered by matter falling toward a central black hole. While there is no evidence the Milky Way's black hole has such a jet today, it may have in the past. The bubbles also may have formed as a result of gas outflows from a burst of star formation, perhaps the one that produced many massive star clusters in the Milky Way's center several million years ago.

"In other galaxies, we see that starbursts can drive enormous gas outflows," said David Spergel, a scientist at Princeton University in New Jersey. "Whatever the energy source behind these huge bubbles may be, it is connected to many deep questions in astrophysics."

Hints of the bubbles appear in earlier spacecraft data. X-ray observations from the German-led Roentgen Satellite suggested subtle evidence for bubble edges close to the galactic center, or in the same orientation as the Milky

Way. NASA's Wilkinson Microwave Anisotropy Probe detected an excess of radio signals at the position of the gamma-ray bubbles.

The Fermi LAT team also revealed Tuesday the instrument's best picture of the gamma-ray sky, the result of two years of data collection.

"Fermi scans the entire sky every three hours, and as the mission continues and our exposure deepens, we see the extreme universe in progressively greater detail," said Julie McEnery, Fermi project scientist at NASA's Goddard Space Flight Center in Greenbelt, Md. NASA's Fermi is an astrophysics and particle physics partnership, 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.

"Since its launch in June 2008, Fermi repeatedly has proven itself to be a frontier facility, giving us new insights ranging from the nature of space-time to the first observations of a gamma-ray nova," said Jon Morse, Astrophysics Division director at NASA Headquarters in Washington. "These latest discoveries continue to demonstrate Fermi's outstanding performance."

For more information about Fermi, 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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Record - 9

DIALOG(R)

NATION & WORLD

From news services;

Additional reporting by Ken Dilanian, Tribune Washington Bureau, Chicago Tribune, Chicagoland Final ed, p23, Wednesday, November 10, 2010

TEXT:

WORLD

Astronomers discover huge energy bubbles

Startled astronomers said Tuesday they have discovered two massive bubbles

of gamma-ray energy extending 25,000 light-years above and below the plane of the Milky Way galaxy like a squat hourglass.

"They're big, they're sharp-edged and they contain a lot of energy," said astrophysicist Douglas Finkbeiner of the Harvard-Smithsonian Center for Astrophysics in Cambridge, Mass.

Researchers do not know what produced the bubbles, which are behind a background fog of gamma rays, but suspect they were produced in a single event. Finkbeiner said that would have required the rapid release of energy equivalent to about 100,000 supernovae, or exploding stars.

Record - 10

DIALOG(R)

Huge energy bubbles found at centre of galaxy,

The New York Times,

Hamilton Spectator, v2010111014800132, First ed, pA16,

Wednesday, November 10, 2010

TEXT:

Something big is going on at the centre of the galaxy, and astronomers are happy to say they don't know what it is.

A group of scientists working with data from NASA's Fermi Gamma-Ray Space Telescope said Tuesday they had discovered two bubbles of energy erupting from the centre of the Milky Way Galaxy. The bubbles, they said at a news conference and in a paper to be published Wednesday in The Astrophysical Journal, extend 25,000 light years up and down from each side of the galaxy and contain the energy equivalent to 100,000 supernova explosions.

"They're big," said Doug Finkbeiner of the Harvard-Smithsonian Center for Astrophysics, leader of the team that discovered them.

The source of the bubbles is a mystery. One possibility is that they are fuelled by a wave of star births and deaths at the centre of the galaxy.

Another option is a gigantic belch from the black hole known to reside at the centre of the Milky Way. What it is apparently not is dark matter, the mysterious something that astronomers say makes up one-quarter of the universe and holds galaxies together.

"And we think we know a lot about our own galaxy," said David Spergel an astrophysicist at Princeton. Jon Morse, head of astrophysics at NASA headquarters, said: "This shows again that the universe is full of surprises."

One of the most surprised was Finkbeiner. A year ago, he was part of a

group led by Gregory Dobler of the Kavli Institute for Theoretical Physics in Santa Barbara, Calif., that said it had discerned the existence of a mysterious fog of high-energy particles buzzing around the centre of the Milky Way. The particles manifested themselves as a haze of extra energy after all the known sources of gamma rays - the most energetic form of electromagnetic radiation - had been subtracted from Fermi data that had been made public.

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Record - 11

DIALOG(R)

Astronomers find huge energy bubbles beyond our galaxy,

Thomas Maugh,

Waterloo Region Record, v2010111014800796, First ed, pA6,

Wednesday, November 10, 2010

TEXT:

Startled astronomers have discovered two massive bubbles of gamma-ray energy extending 25,000 light-years above and below the plane of the Milky Way galaxy like a squat hourglass.

"They're big, they're sharp-edged and they contain a lot of energy," astrophysicist Douglas Finkbeiner of the Harvard-Smithsonian Center for Astrophysics in Cambridge, Mass., said in a news conference Tuesday.

Finkbeiner led a team that used data from NASA's two-year-old orbiting Fermi Gamma-ray Space Telescope to discover the bubbles hiding behind a background fog of gamma rays. That fog occurs when particles moving at or near the speed of light interact with interstellar gas.

"My first response when I saw these figures was 'Wow!' " astronomer David Spergel of Princeton University said at the news conference. Spergel, who was not involved in the research, said, "We think we know a lot about our own galaxy" and yet the bubbles, which are almost as big as the galaxy, were totally unexpected.

Researchers do not yet know what produced the bubbles, but the fact that they appear to have relatively sharp edges suggests they were produced in a single event. Finkbeiner said that would have required the rapid release of energy equivalent to about 100,000 supernovae, or exploding stars.

One possibility is that there was a burst of star formation in the centre of the galaxy producing massive, short-lived stars that exploded and ejected a great deal of gas and dust over a few millions of years.

Another possibility is that the black hole at the centre of the galaxy - which has a mass about four million times that of the sun - shot out a stream of particles over a much shorter time scale, perhaps 10,000 to 100,000 years.

While there is no evidence that the black hole has such a jet today, it may have had one in the past. Similar jets have been observed in other galaxies. Starbursts have also been seen driving enormous gas outflows in other galaxies.

"Whatever the energy source behind these huge bubbles may be, it is connected to many deep questions in astrophysics," Spergel said.

The report will be published today in the *Astrophysical Journal*.

McClatchy-Tribune

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Record - 12

DIALOG(R)

Galaxy bracketed by big bubbles,

Dan Vergano,

USA Today (USA), p5A,

Wednesday, November 10, 2010

TEXT:

Unseen until now, new images released by NASA astronomers Tuesday show the Milky Way galaxy sandwiched by colossal high-energy bubbles, extending from the top and bottom like cosmic-scale eggs.

Discovered by the space agency's \$500 million Fermi space telescope, the bubbles stretch across half of the galaxy's expanse, until now obscured from detection by the "fog" of gamma rays that normally clutter space.

"They are big, they're sharp-edged, and they contain a lot of energy," says astrophysicist Douglas Finkbeiner of the Harvard-Smithsonian Center for Astrophysics in Cambridge, Mass. The twin gamma-ray-emitting bubbles each stretch 25,000 light-years from the center of the galaxy's top and bottom (a light-year is about 5.9 trillion miles).

Each bubble emits the energy of about 100,000 exploding supernova stars, Finkbeiner said at a NASA briefing. Most likely, the bubbles erupted from the center of the galaxy as the result of a massive round of star formation and stellar explosions within the past few million years, he says.

Alternatively, the bubbles may have resulted from jets of superheated gas spun off poles of the jumbo black hole, about 4 million times heftier than the sun, known to reside at the center of the Milky Way.

In an upcoming *Astrophysical Journal* study, Finkbeiner and colleagues describe how they stripped away the interference of standard gamma-ray emissions -- the most energetic kind of radioactive particles typically created in blasts from exploding stars -- to reveal the lobes of the twin bubble structures.

A German satellite had hinted at the structures in some X-ray emission signatures, but astrophysicists had not expected to see something so large in Fermi's gamma-ray observations.

"Wow. We think that we know a lot about our own galaxy, and what we see here are these enormous bubbles," Princeton astrophysicist David Spergel says. Galaxies are often disk-shaped, where the gravity of the center pulls in clouds of gas. Perhaps those gas clouds are ejected back to deep space, Spergel suggests, by the kind of blasts that created these massive gamma-ray bubbles. "This finding will be challenging astrophysicists for years."

"A very nice piece of work, these are enormous bubbles and, scientifically, a big puzzle," says Stanford's Roger Blandford, who was not part of the Fermi team.

Earth is not at risk from the gamma rays emitted by the bubbles, Finkbeiner adds. "This isn't the kind of thing that kills the dinosaurs."

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Record - 13

DIALOG(R)

Bubbles Of Energy Are Found In Galaxy,

DENNIS OVERBYE,

New York Times (NY), Late Edition - Final ed, p18,

Wednesday, November 10, 2010

TEXT:

Something big is going on at the center of the galaxy, and astronomers are happy to say they don't know what it is.

A group of scientists working with data from NASA's Fermi Gamma-Ray Space

Telescope said Tuesday that they had discovered two bubbles of energy erupting from the center of the Milky Way galaxy. The bubbles, they said at a news conference and in a paper to be published Wednesday in *The Astrophysical Journal*, extend 25,000 light years up and down from each side of the galaxy and contain the energy equivalent to 100,000 supernova explosions.

"They're big," said Doug Finkbeiner of the Harvard-Smithsonian Center for Astrophysics, leader of the team that discovered them.

The source of the bubbles is a mystery. One possibility is that they are fueled by a wave of star births and deaths at the center of the galaxy. Another option is a gigantic belch from the black hole known to reside, like Jabba the Hutt, at the center of the Milky Way. What it is apparently not is dark matter, the mysterious something that astronomers say makes up a quarter of the universe and holds galaxies together.

"Wow," said David Spergel, an astrophysicist at Princeton who was not involved in the work.

"And we think we know a lot about our own galaxy," Dr. Spergel added, noting that the bubbles were almost as big as the galaxy and yet unsuspected until now.

Jon Morse, head of astrophysics at NASA headquarters, said, "This shows again that the universe is full of surprises."

One of the most surprised was Dr. Finkbeiner. A year ago he was part of a group led by Gregory Dobler of the Kavli Institute for Theoretical Physics in Santa Barbara, Calif., that said it had discerned the existence of a mysterious fog of high-energy particles buzzing around the center of the Milky Way. The particles manifested themselves as a haze of extra energy after all the known sources of gamma rays -- the most energetic form of electromagnetic radiation -- had been subtracted from Fermi data that had recently been made public.

At the time, Dr. Finkbeiner and his colleagues speculated that the haze was produced by dark matter. The center of the galaxy is home to all manner of wild and woolly high-energy phenomena, including a gigantic black hole and violently spinning pulsars, but cosmological theories also suggest that dark matter would be concentrated there. Collisions of dark matter particles, the theory goes, could produce showers of gamma rays.

But in the follow-up analysis, the haze -- besides being bigger than Dr. Finkbeiner and his colleagues had thought -- turned out to have sharp boundaries, like, well, a bubble. Dark matter, according to the prevailing theory, should be more diffuse.

"Dark matter has been there billions of years," Dr. Finkbeiner explained.
"If something has been going on for billions of years, you wouldn't expect a sharp edge."

He and the other scientists said this did not mean that dark matter was not there clogging the center of the galaxy, but that it would be harder to see.

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Record - 14

DIALOG(R)

Milky Way found to be blowing massive, high-energy bubbles,

Thomas H. Maugh II,
Los Angeles Times, Home Edition ed, p6,
Wednesday, November 10, 2010

TEXT:

Startled astronomers said Tuesday they had discovered two massive bubbles of gamma-ray energy extending 25,000 light-years above and below the plane of the Milky Way galaxy like a squat hourglass.

"They're big, they're sharp-edged and they contain a lot of energy," astrophysicist Douglas Finkbeiner of the Harvard-Smithsonian Center for Astrophysics in Cambridge, Mass., said in a news conference. Finkbeiner led a team that used data from NASA's 2-year-old orbiting Fermi Gamma-ray Space Telescope to discover the bubbles hiding behind a fog of gamma rays.

That fog occurs when particles moving at or near the speed of light interact with interstellar gas.

"My first response when I saw these figures was, 'Wow!' " astronomer David Spergel of Princeton University said at the news conference. Spergel, who was not involved in the research, added that "we think we know a lot about our own galaxy," and yet the bubbles, which are almost as big as the galaxy itself, were totally unexpected.

Researchers do not yet know what produced the bubbles, but the fact that they appear to have relatively sharp edges suggests that they were produced in a single event. Finkbeiner said that would have required the rapid release of energy equivalent to about 100,000 supernovae, or exploding stars.

One possibility is that there was a burst of star formation in the center

of the galaxy producing massive, short-lived stars that exploded and ejected a great deal of gas and dust over a few million years.

Another possibility is that the black hole at the center of the galaxy -- which has a mass about 4 million times that of the sun -- shot out a stream of particles over a much shorter time scale, perhaps 10,000 to 100,000 years.

Though there is no evidence that the black hole has such a jet today, it may have had one in the past. Similar jets have been observed in other galaxies. Starbursts have also been seen driving enormous gas outflows in other galaxies.

"Whatever the energy source behind these huge bubbles may be, it is connected to many deep questions in astrophysics," Spergel said.

The report will be published Wednesday in the *Astrophysical Journal*.

--

thomas.maugh @latimes.com

PHOTO: 'WOW!' This NASA illustration depicts the twin bubbles of gamma rays protruding from the Milky Way. They suggest a colossal event in our galaxy's past, though scientists are unsure what that may have been.

PHOTOGRAPHER:NASA

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Record - 15

DIALOG(R)

Gamma ray mystery at heart of Milky Way,

UPI Science News,

Tuesday, November 9, 2010

TEXT:

A NASA telescope has found a structure in the Milky Way that may be a remnant of an eruption in a black hole at the center of our galaxy, U.S. researchers say.

The Fermi Gamma-ray Space Telescope detected the structure that spans 50,000 light years, covers half the visible sky and may be millions of years old, a NASA release said Tuesday.

"What we see are two gamma-ray-emitting bubbles that extend 25,000 light-years north and south of the galactic center," says Doug Finkbeiner, an astronomer at the Harvard-Smithsonian Center for Astrophysics in Cambridge, Mass.

"We don't fully understand their nature or origin," he says. The structure's shape and emissions suggest it was formed as a result of a large and relatively rapid energy release, the source of which remains a mystery.

"In other galaxies, we see that star bursts can drive enormous gas outflows," David Spergel, a scientist at Princeton University in New Jersey, says. "Whatever the energy source behind these huge bubbles may be, it is connected to many deep questions in astrophysics."

Scientists say they are conducting more analyses to better understand how the never-before-seen structure was formed.

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Wolbach Library: CfA in the News ~ Week ending 28 November 2010

1. **INSIDE THE \$9 MILLION RENOVATION TO THE SCIENCE MUSEUM'S PLANETARIUM, AND WHY IT COULD BRING IN A NEW GENERATION OF VISITORS**, Boston Globe (MA), p13, Saturday, November 27, 2010
2. **Brian Marsden**, Times, The (UK), 01 ed, Friday, November 26, 2010
3. in the NEWS: **WITNESSING THE BIRTH OF BLACK HOLE**, REUTERS, Kingston Whig-Standard (Canada), Final ed, p25, Thursday, November 25, 2010
4. **Star Gazer**, Montreal Gazette (Canada), Final ed, pC10, Thursday, November 25, 2010
5. **Stargazer warned of 'doom'**, Courier Mail (Australia), 1 - First with the news ed, p76, Thursday, November 25, 2010
6. **Huge energy bubbles found in Milky Way**, Buffalo News (NY), Final ed, pG6, Sunday, November 21, 2010
7. **Astronomer Marsden dies**, Wire Reports, Tulsa World, Final ed, pA22, Sunday, November 21, 2010
8. **Using Technology to Support STEM Reading**, Schneps, Matthew H; O'Keeffe, Jamie K; Heffner-Wong, Amanda; Sonnert, Gerhard, Journal of Special Education Technology, v25, n3, p21, Thursday, July 1, 2010

Record - 1

DIALOG(R)

INSIDE THE \$9 MILLION RENOVATION TO THE SCIENCE MUSEUM'S PLANETARIUM, AND WHY IT COULD BRING IN A NEW GENERATION OF VISITORS,
Boston Globe (MA), p13,
Saturday, November 27, 2010

TEXT:

Look up at the night sky and feast on more than 9,000 stars, twinkling in stunning clarity. But then seconds later, the sky reverts back to what it looked like 10,000 years ago. Then watch as the tiny dots that represent the planets suddenly mushroom, allowing you to float so closely above them that you see their surfaces.

Then it's time to hit the heavens. After lift-off, the planets disappear in the rear-view mirror. So does our solar system as we move to the edge of the Milky Way, and on beyond our galaxy. As we travel further and further

out, cascades of blinking green dots, each one a galaxy, flood the sky. Then huge, near-solid swaths of galaxies appear in an overwhelming array of different colors

After years of offering visitors to its Charles Hayden Planetarium a static view of space focused mostly on stars, planets, and constellations, an entirely new, and more interactive, experience is scheduled to open at the Museum of Science on Feb. 13. The stars of the new \$9 million creation are a powerful projector, the Zeiss Starmaster, which will show the night sky, and two Sony digital projectors that can simulate space travel. "We've got the Cadillac now," says Darryl Davis, planetarium systems coordinator.

To buy the Cadillac, the museum used \$3 million from the Charles Hayden Foundation, named for the Boston financier who built the Hayden Planetariums in New York City and Boston, and raised the rest from private donations.

The upgrades come at an important moment in Boston for cultural organizations whose survival hinges on attracting tourists and natives alike. Competition for visitors among Boston's cultural institutions is growing more fierce by the month. The Museum of Fine Arts last week opened to the public its mammoth Art of the Americas wing. The Isabella Stewart Gardner Museum is scheduled to open an expansion in early 2012. Also coming is the Edward M. Kennedy Institute for the United States Senate adjacent to the JFK Library.

But while much of the area's cultural landscape focuses on celebrating our past, from art to politics, what separates the Museum of Science is its ability to probe the future.

Next year's opening show on the ceiling of the 57-foot planetarium dome, "Undiscovered Worlds: The Search Beyond Our Sun," is about the hunt for planets in space. That theme was hatched after Hayden staffers polled astronomers at MIT and the Harvard-Smithsonian Center for Astrophysics to see what's hot in the world of astronomy today. The answer was unequivocal: the search for exoplanets.

Some 500 have been discovered in the past 15 years alone, and scientists expect many more will be identified as time goes on. Just earlier this month, the first new planet from a galaxy outside the Milky Way was identified (and it is 20 percent larger than Jupiter). As the number grows, so too does the possibility of finding the elusive habitable planet

"That's the ultimate question - are there other civilizations out there," says David Charbonneau, an astronomer at the Harvard-Smithsonian Center in Cambridge, whom the museum consulted for the project.

Also hot is the pursuit of dark matter and dark energy, which together represent 95 percent of the universe. Scientists don't know what either one is, but they do know that dark energy is accelerating the expansion of the universe. Most recently, a black hole found in its infancy made news. With its new digital technology, the planetarium can just as easily shoot viewers into the cosmos or help them examine a strand of DNA. Charbonneau, for one, says, "Let's go into someone's blood stream." Construction on the planetarium began back in January, and before long, the only thing left of the Hayden, which opened in 1958, was its concrete outside wall. Talk about extreme makeovers

"This was a gutting job," says Paul Fontaine, the museum's vice president of education. "We've dreamed of a new facility for nearly five years now. Our consumers are pretty sophisticated technology consumers today. It became clear that young people weren't as inspired by a planet show as their parents were. We were driving a 40-year-old car. We bought spare parts off of eBay."

Mark Petersen, whose Loch Ness Productions creates digital, print, and audio media for planetarium theaters and museum exhibits, also follows the planetarium market. According to him, there are about 1,600 planetariums in the United States today. While there are no statistics available on the number of people visiting planetariums, Peterson says that an average of 40 new planetarium theaters have opened each of the last 10 years. On the other hand, others have closed.

"What's happening now is other planetarium theaters that have been scraping by for decades, nursing the film gear and surviving on flaccid budgets, also find themselves urgently having to get with the times - and funds to renovate aren't always a priority, so they face closure," he says. "It's simply Darwinian: adapt or die. No trending there, just life."

The future of planetariums will involve far more of the interactivity that already exists in them. David Weinrich, incoming president of the International Planetarium Society, says he helped build the first public planetarium in West Africa, which opened in Ghana in early 2009. The first program there, he explains, was run by a person sitting with a laptop at the Hayden Planetarium in New York, who narrated the show and took questions from the audience in Ghana over the Internet

The unfinished scene at the Boston planetarium speaks to a quantum leap in audience experience: new dome, new theater-in-the-round seating, new sound system, new lighting, and at the heart of it all, new projectors that illustrate the science of space as it's never been seen before in Boston.

The custom-made Starmaster sits in the center of the circular room, hidden for now under a white sheet. It is one of only two such models in this country. The steel and aluminum projector is actually a ball 30 inches in

diameter mounted more than eight feet high, and has 12 small lenses located all over it. (Museum staffers refer to it as "the death star.") It resembles something out of "The War of the Worlds" when it rises even higher on its metal legs.

The two powerful Sony digital projectors, each 4 by 2 feet, are mounted directly across from each other to present seamless full-dome images. A test room with a 10-foot dome was created in the bowels of the museum to perfect programs that will later appear upstairs.

The Hayden uses a software package it bought from Sky-Skan, a company based in Nashua. There are five databases built into the package such as the Digital Universe, Protein Data, and Global Weather. Sky-Scan updates its package when needed, such as the discovery of a new star, and planetarium staff can add whatever material it wants as well

All planetariums have access to the same databases, says Charbonneau. "The edge," he says, "is the software to process data and repackage it into a show."

In the past, Charbonneau says, the show at the Museum of Science was "a static star field that rotated overhead." But those days will be gone come February and a new, more modern, experience will emerge. Says Charbonneau: "It has this 'Where would you like to go?' interactive feeling."

Sam Allis can be reached at allis@globe.com.

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Record - 2

DIALOG (R)
Brian Marsden,
Times, The (UK), 01 ed,
Friday, November 26, 2010

TEXT:

Brian Marsden was a leading British astronomer and an eminent specialist on the collection of data on the positions of the smaller celestial objects, such as asteroids and comets. With his collaborators he pored through thousands of astronomical observations every day, to confirm reports of new comets, asteroids and supernovas.

They then published the International Astronomical Union (IAU) Circular,

recognised as the official list of celestial discoveries.

In the words of Charles Alcock, director of the Harvard-Smithsonian Centre for Astrophysics, Marsden "was one of the most influential comet investigators of the 20th century". He was perhaps best known for his prediction of the return of Swift-Tuttle, the comet associated with the spectacular annual shower of the Perseid meteors, so-called because the point they appear to come from lies in the constellation Perseus.

Swift-Tuttle, the comet with the longest orbital period (the time taken for a comet to make one complete orbit about the Sun) of all the comets whose returns have been successfully predicted, had been discovered in 1862, and the conventional wisdom was that it would return around 1981. Marsden strongly suspected, however, that the 1862 comet was identical with one seen in 1737, and this assumption allowed him to predict that Swift-Tuttle would not return until late 1992, 11 years later than previously thought. His prediction proved to be correct.

Marsden was fascinated by the appearance of a group of comets that passed close to the Sun. Known as members of the Kreutz group, after a German astronomer who studied them in the late 19th century, the discovery of three more of these Sun-grazing comets in the mid-20th century led Marsden to undertake a detailed examination of how the individual comets may have evolved from each other.

In 1998 Marsden became involved in controversy when he suggested to a New York Times journalist that a newly discovered asteroid, two kilometers across, might collide with the Earth in 2028. The asteroid, called 1997 XF11, was, however, soon found not to be a threat and Marsden later explained that he had said there would have been a collision "only under highly unusual circumstances". The episode initiated a lively debate about the way astronomers should best inform the public about possible threats of such collisions.

He was again in the news when he played a key role in the demotion of Pluto from the status of major to minor planet in 2006. Marsden was hugely entertained by the idea that Pluto was "retired" as a planet at the same time that he retired as director of the Minor Planet Centre.

Brian Geoffrey Marsden was born in 1937 in Cambridge and educated at the Perse School. His father, Thomas, was the senior mathematics teacher at a local high school. But it was his mother, Eileen, who sparked her son's interest in astronomy. Aged 5, he returned home from school one day and found her sitting in the garden watching an eclipse of the Sun. They watched it together but what most impressed him, however, was not that the eclipse could be observed but that the event had been predicted in advance.

The fact that successful predictions of celestial happenings could be made eventually led him to become an astronomer.

While still a schoolboy, he became an expert in calculating the positions of the planets and the orbits of newly discovered comets. At that time, only a few other people could make these laborious calculations.

He went to New College, Oxford, to study mathematics and by the time he graduated, he had already developed something of an international reputation for the computation of orbits of comets. In 1959 he went as a graduate student to Yale University to study celestial mechanics. He was awarded his PhD in 1965 for a dissertation on the orbits of Jupiter's satellites.

In 1965 he took up a post at the Smithsonian Astrophysical Observatory, an institution affiliated with Harvard University, and one of the most flourishing centres of celestial research. In the same year he became head of the Central Bureau for Astronomical Telegrams, a research clearinghouse at the observatory. In 1978 Marsden also became head of the Minor Planet Center. He retired in 2006 as director emeritus.

Between 1976 and 1978 Marsden was chairman of the American Astronomical Society Division on Dynamical Astronomy, and between 1976 and 1979 president of the International Astronomical Union Commission on the Positions and Motions of Minor Planets, Comets, and Satellites.

He received a number of awards, among them: the Van Biesbroeck Award of the University of Arizona, for services to astronomy (1989); the Brouwer Award of the American Astronomical Society, for research in dynamical astronomy (1995); and the Royal Astronomical Society Award, for Service to Astronomy and Geophysics (2006). He was made a member of the Norwegian Academy of Science and Letters.

Marsden discovered, with N. S. Chernykh, asteroid 37556 Svyaztie. The Asteroid 1877 Marsden is named after him.

He died in hospital in Burlington, Massachusetts, and is survived by his wife Nancy, whom he married in 1964, and by a daughter and a son.

Brian Marsden, astronomer, was born on August 5, 1937. He died of bone marrow disease on November 18, 2010, aged 73

He played a key role in the demotion of Pluto to a minor planet

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Record - 3

DIALOG(R)
in the NEWS,
REUTERS,
Kingston Whig-Standard (Canada), Final ed, p25,
Thursday, November 25, 2010

TEXT:
WITNESSING THE BIRTH OF BLACK HOLE

An exploding star spotted by amateur astronomer Gus Johnson of Maryland in 1979 appears to be a newborn black hole, according to a U.S. and European joint study.

"If our interpretation is correct, this is the nearest example where the birth of a black hole has been observed," Daniel Patnaude of the Harvard-Smithsonian Center for Astrophysics in Massachusetts, who helped lead the study, said.

Analysis of X-rays emanating from the star support the idea that the object is a black hole and that it is either being fed by material falling back from an initial supernova, or perhaps from a twin star, the astronomers said. More details can be seen at <http://chandra.harvard.edu>.

LAPTOP USE MAY HURT FERTILITY

Using a laptop computer as the name suggests may not be good for male reproductive health, according to a study. And there is little that can be done about it, aside from using the laptop on a desk, said Yelim Sheynkin, a urologist at the State University of New York at Stony Brook who led the study published in Fertility and Sterility. Researchers found that the men's testicle temperature had risen by up to 2.5 C after one hour of use. Earlier research has shown that warming the scrotum even more than one degree Celsius is enough to damage sperm.

"Within 10 or 15 minutes their scrotal temperature is already above what we consider safe, but they don't feel it," said Sheynkin.

BIG FISH MAY SURVIVE DIE-OFF

Bleak scientific findings that over-fishing will empty the oceans of big fish and leave just small creatures such as jellyfish or plankton seem based on flawed data, according to a study in the journal Nature.

Researchers examining marine life data from an influential 1998 study say that the measurements gave inaccurate readings from the Gulf of Thailand to seas off Alaska.

"What we see now is that everything is going to be reduced but we still have predators and prey and everything in between,' lead author Trevor Branch, assistant professor of aquatic and fishery sciences at the University of Washington in Seattle, told Reuters.

DEAD SEA HOLDS CLIMATE SECRETS?

From a barge floating above the deepest point on Earth, a research team hopes to drill through half a million years of history to uncover secrets of climate change and natural disasters.

"The sediments of the Dead Sea are the best climate and earthquake recorders for the entire Middle East,' said Zvi Ben-Avraham of the Israel Academy of Sciences.

Like trees have rings, the sea bed adds two layers of sediment every year. The team will analyse 500,000 years of geological history, deciphering patterns in ancient rainfall, floods, droughts and earthquakes and use them to help understand the future, said Ben-Avraham.

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Record - 4

DIALOG(R)

Star Gazer,

Montreal Gazette (Canada), Final ed, pC10,
Thursday, November 25, 2010

TEXT:

Photo: HARVARD-SMITHSONIAN CENTRE FOR ASTROPHYSICS IN CAMBRIDGE, MASS. / ASTRONOMER This handout image shows Brian Geoffrey Marsden. Marsden, a British astronomer born in Cambridge, England, died Nov. 18, 2010, at age 73 following a prolonged illness. He was a Senior Astronomer at the Smithsonian Astrophysical Observatory and Director Emeritus of the Minor Planet Centre.;

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Record - 5

DIALOG(R)

Stargazer warned of 'doom'

Courier Mail (Australia), 1 - First with the news ed, p76

Thursday, November 25, 2010

TEXT:

Brian Geoffrey Marsden Astronomer Born: August 5, 1937, Cambridge, England

Died: November 18, 2010, Cambridge NOT everyone would be pleased to be dubbed a "cheery herald of fear" by the media, but Brian Marsden did not mind

He was used to occasional barbs from the fourth estate every time he or one of his colleagues blithely predicted that the end was nigh, care of some new comet or asteroid that appeared to be on a collision course with Earth

His brush with infamy, when The New York Times labelled him a "herald of fear", came in 1998 when he sparked worldwide headlines after announcing that comet 1997 XF11, a monstrous 2km wide blob of ancient rock and ice, might possibly slam straight into Earth in the year 2028

His later calculations thankfully ruled out a catastrophic crossing of paths any time soon, a brighter forecast that attracted almost as many headlines

The incident led him to persuade other astronomers that it might be a good idea if, in future, bold predictions were avoided until precise calculations could be made about a comet's trajectory

Still, the brouhaha gave a credibility boost to the Hollywood films Deep Impact and Armageddon

Dr Marsden recently attracted headlines after his push to have Pluto busted down from planet to planetoid. This also made him quite unpopular

However, after he demonstrated that there were other rocky objects in roughly the same orbit as Pluto, and of roughly the same size, the International Astronomical Union decided in 2006 that Pluto be demoted to a minor or dwarf planet

Dr Marsden was a veteran director of the Harvard-Smithsonian Centre's Minor Planet Centre, which records new comets and asteroids, and served as its director emeritus from 2006 until his death

He was also director, from 1968 to 1999, of the Central Bureau for Astronomical Telegrams, which reports on new supernovas and objects likely

to pass close to Earth

He was credited with discovering his own asteroid, 37556 Svyaztie, in 1982 with colleague N.S. Chernykh, and his life's work was recognised with the naming of another celestial object in his honour - asteroid 1877 Marsden

As well as tracking asteroids and comets, often using minimal observations, Dr Marsden spent much time re-discovering "lost" ones

Because their orbits are wobbly and difficult to calculate even when tracked for some time, countless such objects have been spotted in the past, never to be seen again

One of Dr Marsden's specialties was using complex equations to work out where they have ended up, confirming his calculations with direct observations

He was also able to "backtrack" orbits and thereby show when comets and asteroids were first discovered, and who found them

One of his most famous such re-discoveries involved comet Swift-Tuttle. It had not been seen since the 1800s but Dr Marsden correctly predicted it would reappear in 1992

His unusual career choice was influenced by his father Thomas, a mathematician, and in particular by his mother Eileen whom he saw watching a solar eclipse one day when he was a child

Apparently what impressed him was not so much the sight of the eclipse, but his mother informing him that astronomers had predicted when it would happen

By the time he was 11 he was calculating the position of planets, and by the end of high school he was already a junior member of the Royal Astronomical Society

Such was his progress in his field that he was already an international name among colleagues by the time he finished university

One of the pivotal moments in his career came after he moved from Yale University in the US to the Smithsonian Astrophysical Observatory in Massachusetts in 1965

At the time its director was Fred Whipple, the first to realise comets were "dirty snowballs" made of ice and rubble. Whipple's discovery that ice shot off comets in powerful jets of gas enabled Dr Marsden to more accurately work out their finer movements through space

Dr Marsden is survived by Nancy Lou Zissell, their daughter Cynthia and son Jonathan, as well as three grandchildren.

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Record - 6

DIALOG(R)

Huge energy bubbles found in Milky Way,
Buffalo News (NY), Final ed, pG6,
Sunday, November 21, 2010

TEXT:

Startled astronomers have discovered two massive bubbles of gamma-ray energy extending 25,000 light-years above and below the plane of the Milky Way galaxy like a squat hourglass.

"They're big, they're sharp-edged and they contain a lot of energy," said astrophysicist Douglas Finkbeiner of the Harvard-Smithsonian Center for Astrophysics in Cambridge, Mass. Finkbeiner led a team that used data from NASA's 2-year-old orbiting Fermi Gamma-ray Space Telescope to discover the bubbles hiding behind a background fog of gamma rays. That fog occurs when particles moving at or near the speed of light interact with interstellar gas.

Researchers do not yet know what produced the bubbles, but the fact that they appear to have relatively sharp edges suggests that they were produced in a single event. Finkbeiner said that would have required the rapid release of energy equivalent to about 100,000 supernovae, or exploding stars.

One possibility is that there was a burst of star formation in the center of the galaxy producing massive, short-lived stars that exploded and ejected a great deal of gas and dust over a few millions of years.

Another possibility is that the black hole at the center of the galaxy shot out a stream of particles over a much shorter time scale, perhaps 10,000 to 100,000 years.

-- Los Angeles Times

Human skin cells turned into blood cells

Canadian scientists have turned human skin cells directly into blood cells, the first time one kind of mature human cell has been converted into

another, according to a study published in Nature.

The transformation was completed without first rewinding the skin cells into the flexible pluripotent stem cells that have most frequently been used to grow tissues. By skipping the pluripotent step, the researchers believe they have skirted the risk that the replacement cells might form dangerous tumors.

The team created blood progenitor cells -- the mother cells that multiply to produce other blood cells -- as well as mature blood cells, according to the report. Both types of cells could be useful in medical treatments, said study leader Mick Bhatia, a stem cell scientist at McMaster University in Hamilton, Ontario.

"There is a great need for alternative sources of human blood," Bhatia said. "Since this source would come from a patient's own skin, there would be no concern of rejection of the transplanted cells."

The scientists used a trial-and-error approach to figure out which genes needed to be activated to reprogram the cells into blood cells. Then they looked for the right combination of growth factors -- blood proteins that promote development of the new cells -- to coax the process along. They found that they needed to turn on a single gene in the skin cells, and that the cells needed to bathe in precisely calibrated combinations of four to six growth factors.

-- Los Angeles Times

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Record - 7

DIALOG(R)

Astronomer Marsden dies,

Wire Reports,

Tulsa World, Final ed, pA22,

Sunday, November 21, 2010

TEXT:

Astronomer Brian G. Marsden, a comet and asteroid tracker who stood sentinel to protect the Earth from collisions with interplanetary rocks and other remnants of the solar system's creation, died Thursday of cancer at Lahey Hospital in Burlington, Mass. He was 73.

Director emeritus of the Minor Planet Center at the Harvard-Smithsonian

Center for Astrophysics in Cambridge, Mass., Marsden was perhaps best known for his 1998 announcement that an asteroid known as 1997 XF11 might strike the Earth in 2028, causing untold damage. The announcement sparked additional studies that quickly showed that such an impact was unlikely. Marsden, once called "a cheery herald of fear" by The New York Times, also played a key role in the demotion of Pluto from major to minor planetary status, which also gained him a certain amount of infamy.

"Brian was one of the most influential comet investigators of the 20th century, and definitely one of the most colorful," astronomer Charles Alcock, director of the Harvard-Smithsonian center, said in a statement. Marsden said he made the announcement about 1997 XF11 as a "last-ditch effort" to encourage the acquisition of further observations to refine calculations of the object's orbit, and that is indeed what transpired. Photos from 1990 emerged the next day and new calculations showed that the object was highly unlikely to strike the Earth.

Critics, however, suspected that Marsden made the announcement in an effort to secure more funding for the search for interplanetary objects that could potentially strike the Earth and that, too, has happened.

Marsden also was interested in the discovery of what he called "transneptunian" objects and his colleagues called "objects in the Kuiper Belt," the region extending from the orbit of Neptune to the edge of the solar system.

When the first of these objects was discovered in 1992, Marsden countered that these were not the first because Pluto - albeit somewhat larger - had to be considered one of these objects and it had been discovered in 1930. He became a firm advocate of "demoting" Pluto.

The discovery of Eris, a dwarf planet similar in size to Pluto in 2005, led to the inevitable demotion of Pluto to dwarf planet status in 2006. Marsden was quite entertained by the fact that Pluto was "retired" as a planet on the same day that he retired as director of the Minor Planet Center.

The feat Marsden was most proud of was his prediction of the return of Comet Swift-Tuttle, which is associated with the Perseid meteor shower that occurs each August. Most astronomers thought that the comet, which had been discovered in 1862, would make its reappearance in 1981.

Marsden, however, suspected that it was identical with one seen in 1737. That meant it would not reappear until late 1992. He was correct.

Swift-Tuttle has the longest orbital period of all the comets whose returns have been successfully predicted.

Brian Geoffrey Marsden was born Aug. 5, 1937, in Cambridge, England. His interest in astronomy was sparked by his mother Eileen when he returned home from primary school on a Thursday in 1942 and found her in the backyard watching an eclipse of the sun through a candle-smoked glass - a practice now highly discouraged. What most impressed him was not that it was occurring but that it had been predicted.

While still in high school, he began making calculations of the orbits of the planets and their moons - using tables of seven-place logarithms. As an

undergraduate at New College at the University of Oxford, he convinced the British Astronomical Association to lend him a mechanical calculating machine, which increased his productivity.

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Record - 8

DIALOG(R)

Using Technology to Support STEM Reading,

Schneps, Matthew H;

O'Keeffe, Jamie K;

Heffner-Wong, Amanda;

Sonnert, Gerhard

Journal of Special Education Technology, v25, n3, p21,

Thursday, July 1, 2010

TEXT:

HEADNOTE

Tasks in science, technology, engineering, and mathematics (STEM) are unusually varied because they target phenomena occurring in diverse domains and call upon a wide range of abilities to perform them. The fact that STEM tasks cover such a broad spectrum of abilities makes these fields uncharacteristically inclusive: Individuals with disabilities may perform well in STEM even if they face impairments in other academic domains. Despite this fact, people with executive function disorders face numerous challenges carrying out functions critically important for STEM, which often preclude the unique contributions that they could potentially make to these fields. For people with dyslexia, reading is an obvious challenge. In a typical college-level chemistry course, for example, students are assigned texts containing close to 1,000 pages, calling for the mastery of more than 300 specialized terms. Reading STEM content can be especially challenging because the text cannot be glossed over, but instead must be read closely, with attention to detail. Here, we describe how a technique we call Span-Limiting Tactile Reinforcement (SLTR) can help students with reading disabilities manage attention and working memory demands typically invoked in the close reading of text. SLTR facilitates close reading by reformatting the text into a single newsprint-like column with only a few words per line. The column of text is presented through a masking window in which the text is advanced manually as it is read. We implemented SLTR using STEM content on the Apple iPhone/iPod Touch and carried out experiments with eight college students with dyslexia and eight typical readers. Here, we present findings demonstrating the potential of this

approach.

Science, technology, engineering, and mathematics place stringent demands on working memory and attention that pose special challenges for students with disabilities pursuing studies in these fields. Many of these tasks, such as reading, require focused attention and a systematic visual search. For example, finding an atomic weight on the periodic table of elements, computing a multi-digit product by longhand, or looking up a number in a table of binomial probabilities all require focused visual attention and working memory. When attending to information at the center of the visual field (e.g., solving a complicated multiplication problem by hand), mechanisms of attention act to shut out visual distractions by reducing perceptual sensitivity to information that lies away from the fixation point (Plainis, Murray, & Chauhan, 2001; Schwartz et al., 2005). As the problem is analyzed, the gaze jumps from one fixation point to another, once every "250-500 ms, requiring information obtained in the center of the visual field to be suspended in working memory so that it can be used in the subsequent stages of the problem.

People with disabilities such as add/adhd, dyslexia, or autism spectrum disorders typically face impairments in attention and working memory that can make such processes difficult (Willcutt, Pennington, Olson, Chhabildas, & Hulslander, 2005). Dyslexia, for example, is linked to visual attention deficits that make it difficult for individuals to ignore distracting information in the peripheral visual field (Bednarek et al., 2004). Students with dyslexia also find it difficult to process and hold visual or aural information such as a digit string or unfamiliar term in working memory (Vasic, Lohr, Steinbrink, Martin, & Wolf, 2007). Taken together, such impairments create challenges for these students when performing some STEM tasks.

While people with learning disabilities are perhaps the most susceptible to such challenges in STEM, they are not the only ones affected by executive function deficits. Students with disabilities of all sorts, whether blind, deaf, or physically challenged, often must contend with elevated cognitive loads associated with their disability. For example, they may need to deal with discomfort or pain, maintain balance, keep mental counts, or be aware of environmental cues - all of which can easily overload their capacity for working memory and attention. Therefore, even though a person who is, say, blind or wheelchair bound may not be diagnosed with attention or working memory deficits, this person may nevertheless experience similar symptoms due to the physical and environmental constraints he or she also must manage. Thus, the range of people dealing with heightened attention and working memory demands may be much broader than suggested by typical disability diagnoses.

Surprisingly, although executive function deficits can hinder a student's ability for STEM, these same deficits can be helpful in certain STEM contexts. This seeming contradiction can be understood simply as follows: Abilities for attention allow a person to inhibit peripheral distractions, thereby facilitating focused tasks, such as reading, that occupy the center of the visual field. However, these same abilities act to diminish peripheral sensitivity, which is a key capacity in certain global visual tasks, such as the ability to learn the general layout of a graph or image. Therefore, a person with typical abilities for attention may be less sensitive to global environmental features outside the central visual field when compared with a person who is disabled. As if on a seesaw, abilities for focused attention counterbalance disabilities for holistic perception, and vice versa (Schneps, Rose, & Fischer, 2007).

In the broad learning contexts of STEM, a person with an executive function deficit often can display potentially useful strengths resulting from the disability. The attention deficits associated with ADD/ADHD and dyslexia, which lead to visual distractibility, often are counterbalanced by strengths for peripheral sensitivity (Facoetti & Molteni, 2001; Geiger et al, 2008; Geiger & Lettvin, 1987). These capacities for peripheral sensitivity can be advantageous in some contexts important to STEM. Dyslexia is not the only disability associated with advantages for STEM, however. The hyper-focused attention associated with autism spectrum disorders is at the opposite extreme from the focusing disability associated with ADd/adhd and dyslexia. Yet, it can facilitate visual search and enhance abilities to note detail (Barnes et al., 2008; Plaisted, O'Riordan, & Baron-Cohen, 1998; Remington, Swettenham, Campbell, & Coleman, 2009; Smith & Milne, 2009). Perhaps as a consequence, people with tendencies for autism were observed to be overrepresented in STEM (Baron-Cohen, Wheelwright, Skinner, Martin, & Clubley, 2001).

In general, a number of authors have argued that several of the giants in the history of physics, such as Bohr, Maxwell, and Einstein, were among those with cognitive disabilities, suggesting that the revolutionary insights these individuals have brought to their work in STEM may be attributable to unusual ways of thinking associated with their disabilities (Shaywitz & Shaywitz, 2005; West, 1999; Witelson, Kigar, & Harvey, 1999). Whether or not these historical figures had learning disabilities is a matter of debate, but there is no question that numerous contemporary leaders in STEM fields - such as Baruj Benacerraf, who won the Nobel Prize in Medicine in 1980, and Carol Greider, who won the Nobel Prize in Medicine in 2009-perform at exceptional levels in STEM fields despite learning disabilities (Fink, 2006; Nuzzo, 2005).

Using Technology to Circumvent Barriers that Inhibit STEM Learning

The foregoing discussion raises a serious challenge for STEM fields. STEM has the capacity to be broadly inclusive in its scope by valuing the unique contributions of individuals typically underrepresented in these fields. As previously described, these individuals may excel in certain tasks associated with these fields. However, the academic rigor of professional pathways to STEM often acts as a major barrier for them. How can these fields support individuals with executive function disabilities who, despite typically poor performance in school, bring special aptitudes that are important to research? While the answer to this question is multifaceted and complex, we suggest that technology might be one way to partially ameliorate these concerns.

Computer technologies can provide mechanisms to help focus attention and buffer working memory, thereby minimizing demands placed on these executive resources in various applications. Among the tools currently in use for this purpose are screen blockers used to reduce distracting visual content and FM microphone systems to help students minimize auditory distractions in spoken lectures (Purdy, Smart, Baily, & Sharma, 2009). Computers can assist working memory by providing search capabilities, such as those offered by Google Desktop or Apple Spotlight, that allow students to search content on their computers using cut and paste techniques. These search tools also allow approximate keywords (rather than exact matches) that rapidly retrieve details that would otherwise place high demands on working memory abilities. In addition to attention and working memory supports, assistive technology helps people with executive function deficits manage the demands of reading, spelling, and organizing writing. These tools are now a part of all standard commercial word processing programs such as Microsoft Word or Apple Pages, including advanced text-to-speech and speech-to-text capabilities (e.g., Nuance Dragon or MacSpeech Dictate).

For people with dyslexia especially, reading is an obvious challenge. In a typical college-level chemistry course, for example, students are assigned texts containing close to 1,000 pages, calling for a mastery of more than 300 specialized terms. Reading STEM content can be especially challenging because the text cannot be glossed over; it necessitates reading closely, word-for-word. This need for close reading, and for narrowly specific mastery of vocabulary, distinguishes reading required for STEM from reading in many other contexts. Although many interventions have been proposed to support people with reading disabilities, few have considered special requirements pertaining to STEM (for a review of interventions, see Lovett et al., 2000).

Attention Training

Attention is observed to respond to training (Tamm et al., 2008), and methodologies for attention training (ATT) have been proposed to help students manage task demands that call for control over the allocation of

attention. A number of authors, including Sinotte and Coelho (2007) and Lorusso, Facoetti, Paganoni, Pezzani, and Molteni (2006), have explored the possibility that ATT could help children improve their reading ability, which has prompted research investigating applications of ATT for dyslexia. Geiger and Lettvin (1987) conducted one such early experiment investigating the efficacy of ATT for reading. They used high-speed tachistoscopic techniques to briefly (-10 ms) flash a pair of letters simultaneously at the center of fixation and in the periphery. Participants were asked to identify the letter pairs, and the accuracy of their response was recorded. The researchers found that the participants' ability to accurately name the letter pairs rapidly declined as the separation between the letters was increased. For typical readers, the ability to accurately name the letter pairs diminished to chance levels when the span was greater than 8 degrees. However, this perceptual span was observed to be greater in people with dyslexia; participants with dyslexia were able to name the letter pairs accurately on average 5 degrees further to the periphery compared to those who were typical readers. One participant in particular, a 25-year-old man with severe dyslexia, was especially sensitive to the peripheral stimuli. He was able to name the letter pairs 20 degrees into the periphery, almost a factor of three further into the periphery than typical readers. Such findings suggest that dyslexia may be associated with enhanced peripheral sensitivity that in turn may lead to distractibility and visual confusion during reading.

Geiger and Lettvin (1987) devised an intervention regimen for the person with severe dyslexia that included reading practice using a paper attention mask, together with eye-hand coordination tasks such as painting and drawing. Eye-hand training was considered important in their regimen because of evidence suggesting that visual strategies are learned through the development of spatial information gained from other senses (Held & Bauer, 1967). The reading practice involved the use of a visual attention mask made by cutting a window in an ordinary sheet of paper. The window admitted only eight or nine letters of text when placed over a printed page. A mark was made about 35mm to the left of the window, and the participant was asked to fixate on this mark as he scanned the window over text to read. This fixation mark was positioned so that the participant read using the portion of his visual field, slightly toward the periphery, measured to be most sensitive in tachistoscopic tests. After three weeks of unsupervised practice, the man with severe dyslexia was able to measurably reduce the width of his peripheral span, so that it was now comparable to those observed in other participants with dyslexia. Furthermore, this individual, who previously read at a third grade level, was now able to read at levels closer to the tenth grade.

Encouraged by Geiger and Lettvin's initial demonstration as well as an extensive series of follow-up studies supporting their initial findings

(e.g., Geiger & Lettvin, 1987; Lorusso et al., 2004), Lorusso, Facchetti, Paganoni, Pezzani, and Molteni (2006) carried out subsequent studies, including those using a computerized intervention incorporating ATT called FlashWord (Masutto Sc Fabbro, 1995). This computerized intervention trained children with dyslexia to attend to words in the left or right peripheral visual field, according to each child's profile defining his or her individual subtype within dyslexia, as measured by classification schemes based on those developed by Bakker (1990). FlashWord combines ATT with hemisphere-specific word training by flashing words for 100-250 ms in the left or right peripheral visual field. After four months of treatment, Lorusso et al. (2006) reported significant improvements in reading accuracy, memory, and phonemic skills in children who received the hemisphere-specific tachistoscopic ATT treatment, compared with more traditional reading-focused training regimens typically used in Italy for the treatment of dyslexia (which focused mainly on training of phonological and perceptual skills).

Computerized Interventions to Support Reading

While visual training interventions incorporating attention training appear to be promising, such programs are as yet years away from wholesale implementation in schools. Among the programs currently in use, effectiveness varies widely from individual to individual and from program to program. Therefore, just because an individual is enrolled in such a program, there is no guarantee that the child will achieve reading mastery at the level required to learn challenging STEM content. Furthermore, not all children who stand to benefit from such interventions avail themselves of these programs. Many individuals with identified reading challenges decline interventions for various reasons such as stigma, while others may experience difficulties in reading but are nevertheless unidentified and untreated. Consequently, while training programs may be helpful for many children, they alone are not sufficient, and computer-based tools designed to help children cope with reading can be helpful for many. Among these are accessibility tools designed for people with low vision, such as text-to-speech conversion engines that are built into many commonly available word processors and text readers. Other computer-based interventions include integrated environments for reading and writing. These are intended to support people with learning disabilities. Examples include systems produced by Kurzweil and Read & Write. Another way in which computers can help support those who struggle to read is to alter the formatting of text to ameliorate issues with oculomotor control. People with executive function deficits frequently have difficulty maintaining fixation and exhibit abnormal patterns of oculomotor control that make it difficult to direct their gaze and remain on task while reading (Eden, Stein, Wood, & Wood, 1994). People with dyslexia sometimes mention that text seems to jump around, perhaps a subjective statement of

the difficulties they experience with oculomotor control. Difficulties with fixation exacerbate problems with working memory, disrupting the ability to keep ideas online as text is read and parsed (Loe, Feldman, Yasui, & Luna, 2009). Furthermore, those who have difficulties with working memory and attention are easily distracted by imagery or text on the page, or by sounds and other extraneous stimuli that further interfere with processes required for close reading in STEM.

One computer-based intervention that addresses issues with oculomotor control is Rapid Serial Visual Word Presentation (rsvp). RSVP flashes words one at a time in quick succession at a fixed location on the screen, obviating the need to guide the gaze along a line of text. RSVP has been used in experimental contexts to present text in event-related potential (ERP) studies of children with dyslexia, and it also has been considered a possible solution to screen size limitations posed by devices such as cell phones or PDAs (Paul, Bott, Wienbruch, & Elbert, 2006; Rahman & Muter, 1999; Russell & Chaparro, 2002). While RSVP still requires the ability to hold fixation, it minimizes the need to accurately track the gaze along a line of text by presenting words serially at a fixed location on the screen. However, a known drawback of RSVP is that it places very high demands on working memory. The lexical content of words, serially flashed at a fixed rate, must be held in working memory in order to parse entire sentences (Nieuwenstein & Potter, 2006). Furthermore, RSVP is susceptible to lapses in attention, since distractions that disrupt focus on the word stream will impede understanding. Thus, while RSVP addresses issues of oculomotor control, it also places high demands on working memory and attention, which may be particularly problematic for the readers we hope to support.

Span-Limiting Tactile Reinforcement (SLTR) in STEM Reading

Schneps, Rose, and Fischer (2007) point out that because people with cognitive disabilities can (under the right circumstances) outperform people otherwise considered unimpaired, the generally held definition of disability may need to be reconsidered. In particular, these authors define a parameter they call Periphery-to-Center Ratio (PCR) that groups individuals according to their relative abilities to make use of information in the peripheral visual field versus the central field. People with dyslexia are characterized as high PCR, as they tend to use visual strategies biased toward the periphery (Geiger & Lettvin, 1987). While interventions to support people with disabilities typically are designed to offset weaknesses, the perspective proposed by Schneps et al. (2007) advocates an alternate model for intervention that builds on the strengths of individuals with disabilities. Here, we suggest it may be helpful to distinguish explicitly between two nonexclusive types of intervention and support:

Type I. Interventions designed to ameliorate a deficit; to counteract a specific challenge or need.

Type II. Interventions that enhance a talent; that build on unique assets offered by those who are disabled.

Supporting the distinction being made here between Type I and Type II supports, Baum, Cooper, and Neu (2001) and Mann (2006) point to the need to strike a balance in creating interventions intended for gifted/ learning disabled students who exhibit strengths in areas such as spatial learning. These authors call for programs of intervention that both ameliorate deficits and enhance talents, a mix of what we describe as Type I and Type II supports, respectively (e.g., Burgstahler & Chang, 2009).

We additionally qualify our description by introducing the concept of strong Type II interventions: interventions that build on strengths resulting from the disability (that individuals who are unimpaired may lack). For example, a Type II intervention may help students who use a wheelchair build on their experience to better understand the physics of inclined planes. We would distinguish this from a strong Type II intervention that might help people with dyslexia become better aware, and take advantage, of visual strategies associated with their high PCR capabilities for peripheral vision. The reading intervention proposed by Geiger and Lettvin (1987) that uses a fixation offset to encourage people with dyslexia to read using the peripheral portions of their visual field would be considered an example of a strong Type II intervention. It helps individuals with dyslexia capitalize on a strength resulting from their disability that typical readers often lack.

Span-Limiting Tactile Reinforcement (SLTR) is an alternative to the RSVP method that incorporates a strong Type II intervention. In SLTR, text is reformatted to form a single column, similar to a column of newsprint, that is approximately three words across. A viewing window with a width that equals the width of the column admits a few lines of text and blocks the rest (see Figure 1, upper right). Readers are encouraged to keep their gaze at the top of the viewing window, reading the uppermost line and then advancing the column of text as they go. They advance the text with a finger, which provides tactile reinforcement that helps punctuate their progress through a paragraph of text.

SLTR builds on the RSVP approach to reduce peripheral distractibility by limiting the amount of text presented at any given time. However, while the serial presentation of text in RSVP increases demands on working memory and attention (by demanding a steady focus on a forced flow of text), SLTR addresses this drawback by allowing readers to control the pace at which

information is assimilated. Furthermore, while RSVP presents words one at a time, SLTR displays a group of about three words per line (and a portion of surrounding text), to allow readers with dyslexia to capitalize on the associated high-PCR bias. This strong Type II component of the intervention builds on advantages for peripheral processing linked to dyslexia. Lastly, SLTR incorporates tactile reinforcement to provide additional sensory input believed to aid in comprehension (e.g., Campbell, Helf, & Cooke, 2008).

In summary, SLTR incorporates the following design principles:

1. Present text in a span-limiting window. Presenting text in a window that is only three words across limits the attention load required to parse the text, and at the same time relaxes demands on abilities for fixation. In providing grouping of about three words per line, readers with dyslexia are able to quickly parse a segment of a sentence, taking advantage of abilities for peripheral processing associated with their disability. The narrow window further acts to reduce distractibility and also functions to direct the reader's gaze, to ameliorate difficulties with eye movement control.
2. Allow manual advance of text. Text is read by manually advancing the column of text within the viewing window. In this way, readers can control the rate at which text is advanced in order to match their capacities for working memory and attention. Furthermore, demands on oculomotor control are greatly reduced as readers manually advance text with a finger (rather than scanning down the text with the eyes). Lastly, the manual advance function reduces attentional demands by helping readers keep their place as they read. The line of text at the top of the window moves on only when the column is manually advanced, thereby minimizing distractions that might otherwise dislocate the fixation point, as well as serving as a marker that prevents readers from losing their place.
3. Use kinesthetic reinforcement. Students are encouraged to read by leaving their gaze fixed near the top of the window and advancing the text one line at a time via a jockey wheel (or some other device). This finger action provides tactile-kinesthetic reinforcement that punctuates each short phrase while reading. This tactile-kinesthetic reinforcement is thought to promote comprehension - similar to approaches incorporated in reading interventions designed for people with dyslexia, such as Orton-Gillingham and Wilson Reading (Campbell et al., 2008; Joshi, Dahlgren, & Boulware-Gooden, 2002).

When taken together, we expect these design principles to be especially beneficial to readers with executive function deficits. Specifically, we hypothesize that students with dyslexia will demonstrate greater gains in STEM content knowledge when using SLTR, as opposed to conventional reading

on paper. While SLTR may be beneficial for all readers, we speculate that these gains will be more pronounced among students with dyslexia.

A pilot experiment was undertaken to determine the efficacy of the SLTR implementation by examining results in college students with dyslexia as well as college students with no known reading impairments. The pilot implementation of the SLTR design built on capabilities of the Apple iPod Touch. Here, the reflow feature in the Adobe PDF standard was used to strip passages of STEM text of their formatting. The text was then redisplayed as a single newsprint-like column that could be manually scrolled up and down using the device.

Method

Participants

Eight undergraduates diagnosed with dyslexia (from Landmark College, a preparatory college for students with learning disabilities) and eight undergraduates with no prior history of learning disabilities (from Harvard University and the University of Massachusetts, Boston) participated in the pilot study.

Materials

A multiple-choice test was used to probe chemistry content knowledge before and after students read passages from the textbook, *Chemistry: The Central Science* (Brown & LeMay, Jr., 1988). Students read this text using both SLTR and traditional paper methods. To preclude a possible learning effect through repetition, a different text passage was read using each technique. Text A consisted of 443 words, approximately 70 of which were STEM-specific terms. Text B consisted of 429 words, approximately 45 of which were STEM-specific terms. (The average readability level for this material was 8.9 on a Flesch-Kincaid Reading Age scale.)

Gains in content knowledge were measured in a pre-/ posttest design. Before reading the chemistry textbook passage, each participant was given a 14-item paper-and-pencil test (on which the maximum score was 14 and the lowest was zero). These test items were adapted directly from exercises provided in the textbook, accompanying the specific text passages read by the students. An example of a test question follows (the correct choice is the final one in the list).

Which best describes a liquid (choose the best answer):

[white square] It does not have a fixed volume or shape.

[white square] It can be compressed to fit a small container.

[white square] It takes the volume and shape of its container.

[white square] It has a definite volume but no specific shape.

After reading portions of the text, students were retested using a similar instrument. The postreading questions additionally contained an item comparing their qualitative experience with paper vs. SLTR reading, along with four other self-assessment questions about their overall academic experience. For example:

Choose one:

[white square] I strongly prefer reading on the iPod.

[white square] I prefer reading on the iPod.

[white square] I prefer reading on paper.

[white square] I strongly prefer reading on paper.

Procedure

Text for the pilot was uploaded from the textbook to an Apple iPod Touch, and a commercially available iPhone/ iPod application, called GoodReader (Selukoff, 2009), was used to display the text (see Figure 1, upper right). A reflow setting in the GoodReader application was used to reformat the text so that it was presented in a narrow window, using Georgia 32-point font that displayed approximately three words per line. The text was black against a green-yellow background.

The pilot experiment compared reading via SLTR on the iPod to reading on paper. Both tasks began with a brief training session involving reading a block of practice text presented in the particular method format. The practice text was the same for each method; the text consisted of three paragraphs comprising 233 words, describing general advice for studying chemistry. For the iPod task, the training session additionally included an initial 70word tutorial on the SLTR method. For both tasks, readers were allowed to read the tutorial and practice text at their own pace, and were encouraged to ask questions about the particular method before proceeding with the task. The time taken for each practice session was typically less than 10 minutes.

The previously described multiple-choice test was used to probe participants' baseline chemistry knowledge before reading. After the pretest, participants read corresponding content (Text A or Text B) taken from the textbook and then took the test again (posttest). Each student

read Text A followed by Text B, and each student used both iPod and paper. The design was balanced in regard to the sequence of reading methods to take potential sequence effects, such as learning or boredom, into account. Among the participants with disabilities and those in the control group, a randomly selected half of the group did the iPod reading first (on Text A) and then the traditional reading (on Text B), whereas the other half did the opposite. The task was not timed; readers were allowed to read at their own pace. Typically, an entire session, including the signing of consent forms and training in the reading method, ran approximately one hour per participant.

Analysis

We used a mixed method design. In the quantitative part of analyzing the test-retest performance under the two different reading methods, repeated measures ANOVA was used, which was implemented through PROC MIXED in the 9.2 release of the SAS statistical package (SAS Institute, 2008). The target alpha level was 0.05 (two-tailed). The independent variables of interest were the between-subjects variable group (dyslexia vs. control), the within-subjects variable method (iPod vs. traditional), as well as their interaction. Two control variables were text (Text A vs. Text B, which also identifies testing order) and method sequence (iPod first vs. iPod second). The sequence variable played no role and was dropped. Students scored higher, on average, on Text A than on Text B. This was particularly noteworthy for the students in the control group who, on the pretest, averaged 13.1 (out of 14) points, so that there was a potential ceiling effect on their gains on Text A. (This was less of a problem for the other combinations: control group Text B pretest mean =9.4; dyslexia group Text A pretest mean =11.1; dyslexia group Text B pretest mean = 6.5.) Consequently, the gain for Text B was larger by 1.1, which was marginally significant ($p=0.07$). In addition to this quantitative analysis, we also asked the participants to respond to qualitative questions about their reading experience with each method.

Results

The outcome variable was the gain in content knowledge, as measured by the difference in pre- and posttest scores. The grand mean of the gains after reading was 1.3, indicating that the participants, on average, answered 1.3 more questions correctly after reading. The standard deviation of the gains was 2.2.

The main effects model showed that the gain did not differ between the dyslexia and control samples. As expected, the main effect for reading by iPod was positive (0.9). In terms of effect size, this would be a substantial gain, corresponding to 41% of the standard deviation of the

dependent variable, but did not quite reach significance in this small study ($p = 0.10$). The interaction model showed no significant interaction effect between method (iPod vs. traditional) and group (dyslexia vs. control). However, whereas the advantage of iPod reading over traditional reading in terms of gains was relatively smaller for the dyslexia group (1.8 vs. 1.1), the iPod method had a surprisingly larger advantage for the control group (1.9 vs. 0.6).

Discussion

Reading on an iPod using SLTR technology was observed to be superior to conventional reading on paper for those with dyslexia; however, the small scale of this study and the resulting lack of statistical power precluded significance. A greater (though also nonsignificant) advantage of iPod reading was observed in the typical readers than among those with learning disabilities. We attribute this to the possibility that the benefits of iPod reading in the dyslexia group were masked by rigid reading strategies and/or previous accommodations that these students had become accustomed to while reading on paper. The Landmark students took as much as five times longer to read on paper than did the control group, and they did so using a variety of strategies (e.g., following text with a finger while speaking the words aloud). Had our pilot experiment included measures of reading time, the advantage of iPod reading over traditional reading may well have been significant in the dyslexia group, even in this modest pilot study.

The fact that the iPod intervention produced any gains in the dyslexia group seems especially remarkable when one considers that the students with dyslexia received extensive training in the strategies that they used for reading on paper but less than an hour of training using SLTR. In contrast, the control group students, who were skilled at reading on paper and who did not use any accommodative techniques, showed even larger gains using the SLTR technique. This suggests that the SLTR technique may be highly effective in supporting close reading among students who face challenges in reading yet have not received any formal training in reading strategies. SLTR provides built-in supports (e.g., spanlimiting viewing window) that function in similar ways to the reading strategies observed in the dyslexia group (e.g., following text with a finger). Therefore, a struggling reader who has not yet developed successful reading strategies may find SLTR to be more beneficial than a struggling reader who has developed elaborate, paperbased reading strategies. Whereas this small pilot study could not establish that the participants with dyslexia did better when reading on the iPod than when reading on paper at the conventional statistical significance level, it produced strong evidence that they did not do worse. The fact that the students with dyslexia experienced no significant loss in comprehension using the SLTR technique - despite having only minutes of training in SLTR and years of training in paper-based strategies - points

to the tremendous promise of this technique.

While talented readers often view reading as pleasurable and enjoyable, people with dyslexia sometimes report feelings of trepidation when faced with the prospects of reading large blocks of text. This automatic negative emotional response exacerbates their challenges in reading. Given that SLTR greatly limits the amount of text displayed, we thought that it might also serve to reduce the negative effects associated with reading. In response to our qualitative questions about the students' reading experience with each method, most students with dyslexia (four out of five who responded) found the iPod preferable, while the reverse (one out of five) was true for those without dyslexia. Thus, while the typical readers did not see an advantage to the SLTR technique, the readers with dyslexia found the experience beneficial. One student with dyslexia wrote, "it was less doming [daunting] reading in small amonuts and was easier not to get over wellmede [overwhelmed]."

Postulated Advantages of SLTR

We speculate that one reason the SLTR technique may be especially effective for those with dyslexia is that the method is better matched to their peripheral span, which, as observed by Geiger and Lettvin (1987), is typically greater in dyslexia. While various processes ordinarily conspire to limit the span of reading in typical readers, for any number of reasons this span may be effectively larger in people with dyslexia. This larger reading span leads to visual confusion and difficulty parsing words presented in a sentence. We suggest that SLTR may help by (a) reducing confusion from words to the tight of the fixation point, and (b) offering a limited multiword segment of text that can be parsed using their broader perceptual span without a need to shift their gaze. In effect, the SLTR technique allows readers with dyslexia to use their broader peripheral span to "gulp in" chunks of text, three words at a time, and process each chunk before manually advancing to the next line.

Another reason SLTR may be advantageous is that it serves to minimize reading errors associated with the production of regressive saccades and backtracking associated with dyslexia (Biscaldi, Gezeck, & Stuhr, 1998; Rayner, 1998). When using SLTR, readers fix their gaze near the top of the viewing window, and then manually advance the text by hand - as opposed to visually scanning along a row of text. This physical act of sliding the text upward with a finger may, in itself, act as tactile-kinesthetic reinforcement that punctuates the sentence fragment being processed. In addition, the SLTR technique allows readers to move the text while the eyes remain stationary, rather than the other way around. Accordingly, this reading technique may ameliorate the effects of any impairment in abilities for eye movement control, such as those associated with dyslexia (Eden et

al., 1994).

Lastly, given that the text only moves when manually advanced, this technique is expected to be relatively insensitive to distractions that cause readers to lose their place. If distracted, readers can simply return their gaze to the top of the window to continue where they left off. The viewing window acts as a finger that consistently points to the place in the text. Thus, the SLTR approach greatly reduces the demand for attention, which is believed to be impaired in people with dyslexia (Facoetti et al., 2010).

Proposed Future Implementations of SLTR

A serious drawback of the current implementation of SLTR on the Apple iPhone/iPod Touch is that, because the window provides a restricted view of the text, the technique cannot be used to skim easily through a paper to build an overview of the content. The Harvard University Bureau of Study Counsel (HUBSC) offers a long-standing course designed for Harvard undergraduates, first taught in the 1940s and updated continuously ever since, that promotes techniques for effective reading and study practice. The reading course teaches, among other approaches, strategies that incorporate active thinking about the intent of the author revealed through the structure of the document. Students are taught to skim works for headings, key phrases, figure captions, and other clues that elucidate overall structure and meaning of the text. Students also are encouraged to make written notes of key ideas, paraphrased in their own words. HUBSC finds that these techniques allow students to read large volumes of text quickly with high rates of comprehension when compared to more timeconsuming methods based on word-by-word reading. Unfortunately, our current implementation of SLTR is not commensurate with the over-viewing techniques advocated by HUBSC.

An alternate implementation of SLTR might incorporate a dual window display presented either on a computer screen or on a tablet device such as the Apple iPad. A mockup of such a device is present in Figure 1 (see left side). Here, a large window displays a PDF image of the text that can be scrolled, zoomed, and scanned, as with any PDF reader, to allow for a rapid overview of structure and content. SLTR would be implemented in a smaller side window that displays the same content in a reflow format, as in the current implementation. The text displayed in the small SLTR window would be linked to the file in the larger window via a navigation marker (see Figure 1, left side). The navigation marker could be moved at will in the larger file to locate the SLTR window where needed. As in the current implementation, text in the SLTR window would be advanced using a finger swipe or a jockey wheel. The proposed hybrid approach allows readers to shift seamlessly between the two reading methods: exploring the broader layout of the document in the larger PDF window and carefully close reading

difficult passages using the side window for SLTR.

Conclusions

The study of STEM can be challenging for students because it often requires careful close reading of difficult content, a process especially challenging for those with executive function deficits. We tested an implementation of the SLTR approach using commercially available software on the Apple iPhone/iPod Touch. We demonstrated that this technique can be mastered with only a few minutes of instruction and practice, and yet, even with limited exposure, it may be at least as effective for promoting comprehension among college students with dyslexia as other highly practiced compensatory methods. Furthermore, we found that, in students who are unimpaired, the SLTR approach is more effective for close reading STEM content than reading similar material on paper. We postulate that SLTR is effective because it reduces demands on working memory and attention, limits the need for oculomotor control, and uses tactile reinforcement to foster retention.

Although these results are encouraging, we emphasize that this is a small study. Further work is needed to test the effects of potential biases due to the novelty of this technique as well as to explore long-term considerations such as its effects on retention. Future experiments would use eye tracking to investigate the hypothesis that SLTR minimizes the need for eye movement control, which is currently postulated to be an important strength of this method. A future implementation also would test the feasibility of SLTR as an adjunct to screenbased PDF readers, which would allow students to benefit from the close reading support of SLTR as well as the overview and skimming techniques afforded by the PDF reader display. Screen-based implementations of hybrid SLTR systems could use a mouse with a jockey wheel to navigate through large volumes of text. An implementation on touch-based tablet devices such as the Apple iPad may be especially effective for this purpose. Furthermore, current implementations of commercially available eReaders for small screen devices (e.g., Apple iBooks, Barnes & Noble eReader, or Amazon Kindle for iPhone) could readily be modified to incorporate SLTR techniques to expand their utility for those who struggle to read and thus make eBooks more broadly accessible.

We conclude that the SLTR approach has shown promise as a highly effective technological application for supporting students who struggle to read in STEM. SLTR may be especially useful for those who struggle with reading but who have not yet developed effective compensatory reading strategies (whether due to a lack of formal training, a lack of formal diagnosis, or various other reasons). This research illustrates how technology can be used to support people with learning disabilities, especially in contexts that are important to STEM, where the content demands a challenging level

of detail and comprehension. The demands for close reading in STEM can be overwhelming for students with learning disabilities. Therefore, technologies such as SLTR can help ensure that these students do not become discouraged by STEM reading demands so that they may participate at the highest levels in these exciting and challenging pursuits.

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6. **New findings reported from L. Lanz and co-authors describe advances in astronomy**, Science Letter, p661, Tuesday, December 7, 2010
7. **Discovery Triples Number of Stars in Universe**, Fars News Agency (Iran), Sunday, December 5, 2010
8. **Starry, starry night may be a lot starrier**, Seth Borenstein, The Associated Press, Hamilton Spectator, v2010120414975581, First ed, pWR4, Saturday, December 4, 2010
9. **Newly found super-Earth could be a waterworld: scientists.**, PTI - The Press Trust of India Ltd., Friday, December 3, 2010
10. **New 'super-earth' 40 light years away might have water**, Indo-Asian News Service, Friday, December 3, 2010
11. **mighty microbes expand idea of life in universe**, DENNIS OVERBYE, Virginia Pilot and Ledger-Star (Norfolk, VA), VP - The Virginian-Pilot ed, p12, Friday, December 3, 2010
12. **Microbe Finds Arsenic Tasty; Redefines Life**, DENNIS OVERBYE, New York Times (NY), Late Edition - Final ed, p1, Friday, December 3, 2010
13. **Waterworld lets off steam**, Gold Coast Bulletin (Australia), B - Main ed, p17, Friday, December 3, 2010
14. **Microbe questions**, DENNIS OVERBYE, International Herald Tribune, p8, Friday, December 3, 2010
15. **Star recount reframes**, KENNETH CHANG, International Herald Tribune, p6, Friday, December 3, 2010

16. **Discovery triples universe star tally - Astronomical error boosts chances of alien life on another Earth**, Amina Khan, Courier Mail (Australia), 1 - First with the news ed, p18, Friday, December 3, 2010
17. **NEW ESTIMATE TRIPLES STAR COUNT**, Sun Sentinel, Fort Lauderdale, FL, Broward Metro ed, p18A {BYLINE} - Amina Khan, Tribune Newspapers, Thursday, December 2, 2010
18. **New estimate of universe's stars is 3 times higher**, Los Angeles Times, St. Paul Pioneer Press (MN), St. Paul ed, pB6, Thursday, December 2, 2010
19. **First super-Earth atmosphere analyzed; Shrouded in steam or hydrogen clouds**, Vancouver Province (Canada), Final ed, pC16, Thursday, December 2, 2010
20. **Scientists find massive cache of stars; Discovery of red dwarfs triples number of stars in the universe**, Ottawa Citizen (Canada), Final ed, pA13, Thursday, December 2, 2010
21. **How many stars in universe? Census indicates triple what we thought**, Amina Khan - LOS ANGELES TIMES, Buffalo News (NY), Final ed, pA6, Thursday, December 2, 2010
22. **Starry starry starry night: Star count may triple**, Daily News Egypt, Thursday, December 2, 2010
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24. **BlackLight Power, Inc. Announces Production of Electricity from a New Form of Hydrogen**, Emerging Markets Business Information News (EMBIN), Thursday, December 2, 2010
25. **NASA's super-Earth characterization could help find life on other planets**, ANI, Asian News International, Thursday, December 2, 2010
26. **THREEFOLD AS MANY STARS EXIST IN UNIVERSE?**, AMINA KHAN, LOS ANGELES TIMES, Pittsburgh Post-Gazette (PA), SOONER ed, pA-3, Thursday, December 2, 2010
27. **You think Hollywood has a lot of stars ... science news**, SETH BORENSTEIN, Virginia Pilot and Ledger-Star (Norfolk, VA), VP - The Virginian-Pilot ed, p6, Thursday, December 2, 2010
28. **How many stars? More than thought**, Amina Khan, Los Angeles Times, Home Edition ed, p13, Thursday, December 2, 2010
29. **Twinkle, Twinkle, Perhaps Times Three**, KENNETH CHANG, New York Times (NY), Late Edition - Final ed, p19, Thursday, December 2, 2010
30. **Scientific milestone as new 'Earth' is discovered**, Western Mail (UK), First ed, p16, Thursday, December 2, 2010

31. **Full steam ahead on planet GJ1214b**, Irish Times, Weekly ed, p20, Thursday, December 2, 2010
32. **La NASA descubre atmosfera en una "superTierra"**, EFE Mundo, Thursday, December 2, 2010
33. **Scientists analyse a 'super-earth'**, New Zealand Press Association, Thursday, December 2, 2010
34. **Study suggests universe could have triple the number of stars we thought**, SETH BORENSTEIN, Canadian Press, Wednesday, December 1, 2010
35. **'Milestone' in bid to sniff atmosphere of a 'super Earth' light-years away**, Pete Spotts Staff writer, Christian Science Monitor (USA), ALL ed, Wednesday, December 1, 2010
36. **Universe might hold three times more stars than previously thought**, Pete Spotts - Staff writer, Christian Science Monitor (USA), ALL ed, Wednesday, December 1, 2010
37. **Astronomers note 'super-Earth' atmosphere**, UPI Science News, Wednesday, December 1, 2010
38. **NASA Aids First Characterization Of Super-Earth Atmosphere**, National Aeronautics and Space Administration Documents, Wednesday, December 1, 2010
39. **Starry, starry night: Star count may triple**, SETH BORENSTEIN, AP Alert - Science, Wednesday, December 1, 2010
40. **Universe may have more stars than thought**, UPI Science News, Wednesday, December 1, 2010
41. **Astronomos analizan atmosfera de lejana estrella similar a la Tierra**, dpa International Services in Spanish Wednesday, December 1, 2010
42. **BLACKLIGHT POWER ANNOUNCES PROD'N OF ELECTRICITY FROM HYDROGEN**, Asia Pulse, Tuesday, November 30, 2010
43. **Brian Marsden: Comet tracker on guard for Earth**, Thomas H. Maugh II, Calgary Herald (Canada), Final ed, pC7, Sunday, November 28, 2010

Record - 1

DIALOG(R

Studies from Y.N. Su et al add new findings in the area of astronomy, Science Letter, p2084,

Tuesday, December 7, 2010

TEXT:

"We present a study of the structure and dynamics of quiescent filament channels observed by Hinode/XRT and STEREO/EUVI at the solar minimum 23/24 from 2006 November to 2008 December. For 12 channels identified on the solar disk (Group I channels), we find that the morphology of the structure on the two sides of the channel is asymmetric in both X-rays and EUV: the eastern side has curved features while the western side has straight features," scientists in the United States report (see also).

"We interpret the results in terms of a magnetic flux rope model. The asymmetry in the morphology is due to the variation in axial flux of the flux rope along the channel, which causes the field lines from one polarity to turn into the flux rope (curved feature), while the field lines from the other polarity are connected to very distant sources (straight). For most of the 68 channels identified by cavities at the east and west limbs (Group II channels), the asymmetry cannot be clearly identified, which is likely due to the fact that the axial flux may be relatively constant along such channels. Corresponding cavities are identified only for 5 of the 12 Group I channels, while Group II channels are identified for all of the 68 cavity pairs. The studied filament channels are often observed as dark channels in X-rays and EUV. Sheared loops within Group I channels are often seen in X-rays, but are rarely seen in Group II channels as shown in the X-ray Telescope daily synoptic observations," wrote Y.N. Su and colleagues.

The researchers concluded: "A survey of the dynamics of studied filament channels shows that filament eruptions occur at an average rate of 1.4 filament eruptions per channel per solar rotation."

Su and colleagues published their study in *Astrophysical Journal* (Structure And Dynamics Of Quiescent Filament Channels Observed By Hinode/xrt And Stereo/euvi. *Astrophysical Journal*, 2010;721(1):901-910).

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

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Record - 2

DIALOG(R)

Studies from O. Cohen et al provide new data on astronomy,

Science Letter, p1983,
Tuesday, December 7, 2010

TEXT:

"We perform a numerical simulation of the corona of the young, rapidly rotating K0 dwarf AB Doradus using a global magnetohydrodynamic (MHD) model. The model is driven by a surface map of the radial magnetic field constructed using Zeeman-Doppler Imaging," researchers in the United States report (see also).

"We find that the global structure of the stellar corona is dominated by strong azimuthal tangling of the magnetic field due to the rapid rotation. The MHD solution enables us to calculate realistic Alfvén surfaces, and we can therefore estimate the stellar mass loss rate and angular momentum loss rate without making undue theoretical simplifications. We consider three cases, parameterized by the base density of the corona, that span the range of possible solutions for the system. We find that overall the mass and angular momentum loss rates are higher than in the solar case; the mass loss rates are 10-500 times higher, and the angular momentum loss rate can be up to 3×10^4 higher than present-day solar values. Our simulations show that this model can be used to constrain the wide parameter space of stellar systems," wrote O. Cohen and colleagues.

The researchers concluded: "It also shows that an MHD approach can provide more information about the physical system over the commonly used potential field extrapolation."

Cohen and colleagues published their study in *Astrophysical Journal* (The Coronal Structure Of Ab Doradus. *Astrophysical Journal*, 2010;721(1):80-89).

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

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Record - 3

DIALOG(R)

Research results from Z.Y. Li and co-authors update knowledge of astronomy,
Science Letter, p1553
Tuesday, December 7, 2010

TEXT:

According to recent research from the United States, "We present a study of discrete X-ray sources in and around the bulge-dominated, massive Sa galaxy, Sombrero (M104), based on new and archival Chandra observations with a total exposure of similar to 200 ks. With a detection limit of L-X approximate to 10^{37} erg s⁻¹ and a field of view covering a galactocentric radius of similar to 30 kpc (11.'5), 383 sources are detected."

"Cross-correlation with Spitler et al.'s catalog of Sombrero globular clusters (GCs) identified from HST/ACS observations reveals 41 X-ray sources in GCs, presumably low-mass X-ray binaries (LMXBs). Metal-rich GCs are found to have a higher probability of hosting these LMXBs, a trend similar to that found in elliptical galaxies. On the other hand, the four most luminous GC LMXBs, with apparently super-Eddington luminosities for an accreting neutron star, are found in metal-poor GCs. We quantify the differential luminosity functions (LFs) for both the detected GC and field LMXBs, whose power-law indices (similar to 1.1 for the GC-LF and similar to 1.6 for field-LF) are consistent with previous studies for elliptical galaxies. With precise sky positions of the GCs without a detected X-ray source, we further quantify, through a fluctuation analysis, the GC-LF at fainter luminosities down to 10^{35} erg s⁻¹. The derived index rules out a faint-end slope flatter than 1.1 at a 2 sigma significance, contrary to recent findings in several elliptical galaxies and the bulge of M31. On the other hand, the 2-6 keV unresolved emission places a tight constraint on the field LF, implying a flattened index of similar to 1.0 below 10^{37} erg s⁻¹. We also detect 101 sources in the halo of Sombrero. The presence of these sources cannot be interpreted as galactic LMXBs whose spatial distribution empirically follows the starlight. Their number is also higher than the expected number of cosmic active galactic nuclei (52 ± 11 [σ s]) whose surface density is constrained by deep X-ray surveys," wrote Z.Y. Li and colleagues (see also).

The researchers concluded: "We suggest that either the cosmic X-ray background is unusually high in the direction of Sombrero, or a distinct population of X-ray sources is present in the halo of Sombrero."

Li and colleagues published their study in *Astrophysical Journal* (X-ray Emission From The Sombrero Galaxy: Discrete Sources. *Astrophysical Journal*, 2010;721(2):1368-1382).

For additional information, contact Z.Y. Li, 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.

Record - 4

DIALOG(R)

Research on astronomy reported by M. Brodwin et al,
Science Letter, p1434,
Tuesday, December 7, 2010

TEXT:

"We report the spectroscopic confirmation of SPT-CL J0546-5345 at $\langle z \rangle = 1.067$. To date this is the most distant cluster to be spectroscopically confirmed from the 2008 South Pole Telescope (SPT) catalog, and indeed the first $z > 1$ cluster discovered by the Sunyaev-Zel'dovich Effect (SZE)," scientists writing in the Astrophysical Journal report (see also).

"We identify 21 secure spectroscopic members within 0.9 Mpc of the SPT cluster position, 18 of which are quiescent, early-type galaxies. From these quiescent galaxies we obtain a velocity dispersion of $1179-(+232)(167) \text{ km s}^{-1}$, ranking SPT-CL J0546-5345 as the most dynamically massive cluster yet discovered at $z > 1$. Assuming that SPT-CL J0546-5345 is virialized, this implies a dynamical mass of $M_{200} = 1.0(-0.4)(+0.6) \times 10^{15} M_{\odot}$, in agreement with the X-ray and SZE mass measurements. Combining masses from several independent measures leads to a best-estimate mass of $M_{200} = (7.95 \pm 0.92) \times 10^{14} M_{\odot}$," wrote M. Brodwin and colleagues.

The researchers concluded: "The spectroscopic confirmation of SPT-CL J0546-5345, discovered in the wide-angle, mass-selected SPT cluster survey, marks the onset of the high-redshift SZE-selected galaxy cluster era."

Brodwin and colleagues published their study in Astrophysical Journal (SPT-CL J0546-5345: A MASSIVE $z > 1$ GALAXY CLUSTER SELECTED VIA THE SUNYAEV-ZEL'DOVICH EFFECT WITH THE SOUTH POLE TELESCOPE. Astrophysical Journal, 2010;721(1):90-97).

Additional information can be obtained by contacting M. Brodwin, 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.

Record - 5

DIALOG(R)

Research from K.K. Reeves and co-researchers in the area of astronomy,
Described,
Science Letter, p1266,
Tuesday, December 7, 2010

TEXT:

"We investigate coronal energy flow during a simulated coronal mass ejection (CME). We model the CME in the context of the global corona using a 2.5D numerical MHD code in spherical coordinates that includes coronal heating, thermal conduction, and radiative cooling in the energy equation," scientists in the United States report (see also).

"The simulation domain extends from 1 to 20 Rs. To our knowledge, this is the first attempt to apply detailed energy diagnostics in a flare/CME simulation when these important terms are considered in the context of the MHD equations. We find that the energy conservation properties of the code are quite good, conserving energy to within 4% for the entire simulation (more than 6 days of real time). We examine the energy release in the current sheet as the eruption takes place, and find, as expected, that the Poynting flux is the dominant carrier of energy into the current sheet. However, there is a significant flow of energy out of the sides of the current sheet into the upstream region due to thermal conduction along field lines and viscous drag. This energy outflow is spatially partitioned into three separate components, namely, the energy flux flowing out the sides of the current sheet, the energy flowing out the lower tip of the current sheet, and the energy flowing out the upper tip of the current sheet. The energy flow through the lower tip of the current sheet is the energy available for heating of the flare loops. We examine the simulated flare emissions and energetics due to the modeled CME and find reasonable agreement with flare loop morphologies and energy partitioning in observed solar eruptions," wrote K.K. Reeves and colleagues.

The researchers concluded: "The simulation also provides an explanation for coronal dimming during eruptions and predicts that the structures surrounding the current sheet are visible in X-ray observations."

Reeves and colleagues published their study in *Astrophysical Journal* (Current Sheet Energetics, Flare Emissions, And Energy Partition In A Simulated Solar Eruption. *Astrophysical Journal*, 2010;721(2):1547-1558).

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

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Record - 6

DIALOG(R)

**New findings reported from L. Lanz and co-authors describe advances in
Astronomy,**

Science Letter, p661,

Tuesday, December 7, 2010

TEXT:

According to a study from the United States, "Combined Spitzer, Chandra, XMM-Newton, and VLA observations of the giant radio galaxy NGC 1316 (Fornax A) show a radio jet and X-ray cavities from active galactic nucleus (AGN) outbursts most likely triggered by a merger with a late-type galaxy at least 0.4 Gyr ago. We detect a weak nucleus with a spectral energy distribution typical of a low-luminosity AGN with a bolometric luminosity of 2.4×10^{42} erg s⁻¹."

"We examine the Spitzer IRAC and MIPS images of NGC 1316. We find that the dust emission is strongest in regions with little or no radio emission and that the particularly large infrared luminosity relative to the galaxy's K-band luminosity implies an external origin for the dust. The inferred dust mass implies that the merger spiral galaxy had a stellar mass of $(1-6) \times 10^{10} M_{\odot}$ and a gas mass of $(2-4) \times 10^9 M_{\odot}$. X-ray cavities in the Chandra and XMM-Newton images likely result from the expansion of relativistic plasma ejected by the AGN. The soft (0.5-2.0 keV) Chandra images show a small similar to 15" (1.6 kpc) cavity coincident with the radio jet, while the XMM-Newton image shows two large X-ray cavities lying 320" (34.8 kpc) east and west of the nucleus, each approximately 230" (25 kpc) in radius. Current radio observations do not show emission within these cavities. The radio lobes lie at radii of 14'.3 (93.3 kpc) and 15'.6 (101 kpc), more distant from the nucleus than the detected X-ray cavities. The relative morphology of the large scale 1.4 GHz and X-ray emission suggests they were products of two distinct outbursts, an earlier one creating the radio lobes and a later one producing the X-ray cavities. Alternatively, if a single outburst created both the X-ray cavities and the radio lobes, this would require that the radio morphology is not fully defined by the 1.4 GHz emission. For the more likely two outbursts scenarios, we use the buoyancy rise times to estimate an age for the more recent outburst that created the X-ray cavities of 0.1 Gyr and the PV work done by the expanding plasma that created the X-ray cavities to

estimate the outburst's energy to be 10^{58} erg," wrote L. Lanz and colleagues (see also).

The researchers concluded: "The present size and location of the radio lobes imply that the outburst that created them happened similar to 0.4 Gyr ago and released similar to 5×10^{58} erg."

Lanz and colleagues published their study in *Astrophysical Journal* (Constraining The Outburst Properties Of The Smbh In Fornax A Through X-ray, Infrared, And Radio Observations. *Astrophysical Journal*, 2010;721(2):1702-1713).

For more information, contact L. Lanz, 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 - 7

DIALOG(R)

Discovery Triples Number of Stars in Universe,

Fars News Agency (Iran),

Sunday, December 5, 2010

TEXT:

Because red dwarfs are relatively small and dim compared to stars like our Sun, astronomers hadn't been able to detect them in galaxies other than our own Milky Way and its nearest neighbors before now. As such, they did not know how much of the total stellar population of the universe is made up of red dwarfs. Now astronomers have used powerful instruments on the Keck Observatory in Hawaii to detect the faint signature of red dwarfs in eight massive, relatively nearby galaxies called elliptical galaxies, which are located between about 50 million and 300 million light years away. They discovered that the red dwarfs, which are only between 10 and 20 percent as massive as the Sun, were much more bountiful than expected. "No one knew how many of these stars there were," said Pieter van Dokkum, a Yale University astronomer who led the research. "Different theoretical models predicted a wide range of possibilities, so this answers a longstanding question about just how abundant these stars are." The team discovered that there are about 20 times more red dwarfs in elliptical galaxies than in the Milky Way, said Charlie Conroy of the Harvard-Smithsonian Center for Astrophysics, who was also involved in the research. "We usually assume

other galaxies look like our own. But this suggests other conditions are possible in other galaxies," Conroy said. "So this discovery could have a major impact on our understanding of galaxy formation and evolution." For instance, Conroy said, galaxies might contain less dark matter -- a mysterious substance that has mass but cannot be directly observed -- than previous measurements of their masses might have indicated. Instead, the abundant red dwarfs could contribute more mass than realized. In addition to boosting the total number of stars in the universe, the discovery also increases the number of planets orbiting those stars, which in turn elevates the number of planets that might harbor life, van Dokkum said. In fact, a recently discovered exoplanet that astronomers believe could potentially support life orbits a red dwarf star, called Gliese 581. "There are possibly trillions of Earths orbiting these stars," van Dokkum said, adding that the red dwarfs they discovered, which are typically more than 10 billion years old, have been around long enough for complex life to evolve. "It's one reason why people are interested in this type of star."

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Record - 8

DIALOG(R)

Starry, starry night may be a lot starrier,

Seth Borenstein The Associated Press,
Hamilton Spectator, v2010120414975581, First ed, pWR4,
Saturday, December 4, 2010

TEXT:

WASHINGTON - The night sky may be a lot starrier than we thought.

A study suggests the universe could have triple the number of stars scientists previously calculated. For those of you counting at home, the new estimate is 300,000,000,000,000,000,000,000. That's 300 sextillion.

The study questions a key assumption that astronomers often use: that most galaxies have the same properties as our Milky Way. And that's creating a bit of a stink among astronomers who want a more orderly cosmos.

It's one of two studies published online this week in the journal Nature that focus on red dwarf stars, the most common stars in the universe. The study offering the new estimate on stars is led by a Yale University astronomer. He calculates there are far more red dwarfs than previously thought, and that inflates the star count.

A second study led by a Harvard University scientist focuses on a distant "super Earth" planet and sees clues to the content of its atmosphere - the first of this kind of data for this size planet. It orbits a red dwarf.

Red dwarf stars - about a fifth the size of our sun - burn slowly and last much longer than the bigger, brighter stars, such as the sun in the centre of our solar system, said Yale astronomer Pieter van Dokkum. His study looks at how many red dwarfs are in elliptical-shaped galaxies.

When scientists had estimated previously how many stars were in the universe, they assumed that all galaxies had the same ratio of dwarf stars as in our galaxy, which is spiral-shaped. Much of our understanding of the universe is based on observations inside our Milky Way and then extrapolated to other galaxies.

But about one-third of the galaxies in the universe are not spiral, but elliptical, and van Dokkum found they aren't really made up the same way as ours.

Using the Keck telescope in Hawaii, van Dokkum and a colleague gazed into eight other distant, but elliptical, galaxies and looked at their hard-to-differentiate light signatures. The scientists calculated that elliptical galaxies have more of those dwarf stars. A lot more.

"We're seeing 10 or 20 times more stars than we expected," van Dokkum said. By his calculations, that triples the number of estimated stars from 100 sextillion to 300 sextillion.

For the past month, astronomers have been buzzing about van Dokkum's findings, and many aren't too happy about it, said astronomer Richard Ellis of the California Institute of Technology.

Van Dokkum's paper challenges the assumption of "a more orderly universe" and gives credence to "the idea that the universe is more complicated than we think," Ellis said. "It's a little alarmist."

Ellis said it is too early to tell if van Dokkum is right or wrong, but it is shaking up the field "like a cat among pigeons."

Van Dokkum agreed, saying, "Frankly, it's a big pain."

Ellis said the new study does make sense. Its biggest weakness might be its assumption that the chemical composition of dwarf stars is the same in elliptical galaxies as in the Milky Way. That might be wrong, Ellis said. Even if it is, it would mean there are only five times more red dwarf stars

in elliptical galaxies than scientists previously thought, instead of 10 or 20, van Dokkum said.

Slightly closer to home, at least in our own galaxy, one dwarf star has astronomers at Harvard taking another step in their search for life.

Their paper reports that this giant planet's atmosphere is either dense with sizzling water vapour like a souped-up steam bath, or it's full of hazy, choking hydrogen and helium clouds with a slightly blue tint. The latter is more likely, say the researchers.

While this planet is nowhere near livable - it's about 225 Celsius - characterizing its atmosphere is a big step toward understanding potentially habitable planets outside our solar system, said study chief author Jacob Bean at the Harvard Smithsonian Center for Astrophysics.

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Record - 9

DIALOG(R)

Newly found super-Earth could be a waterworld: scientists.,

PTI - The Press Trust of India Ltd.,

Friday, December 3, 2010

TEXT:

Newly found super-Earth could be a waterworld: scientists

London, December 02, 2010 (PTI) -- A 'super-Earth' discovered recently some 40 light years away could be covered with either water vapour or a thick haze, scientists have said.

The planet, which is 2.6 times bigger than Earth, has given scientists their first chance to analyse the atmosphere of a world outside the solar system.

A team of astronomers who used the European Southern Observatory's 3.6m telescope in Chile to analyse the planet's atmosphere said they have found possible evidence of water in the form of steam shrouding the planet. Alternatively, the planet, which is orbiting a star in the constellation of Ophiuchus, could have a mostly hydrogen atmosphere hidden beneath high clouds or hazes, as seen on Venus or Saturn's moon Titan, they said.

Codenamed GJ 1214b, the planet hugs its parent star at a distance of only two million kilometres -- 70 times closer than the Earth is to the Sun, the

Daily Mail reported.

That's why conditions on its surface are hot, said the astronomers who carried out their study by analysing light coming from the star as the planet passed in front of it.

The planet travels across the disc of its parent star once every 38 hours as it orbits.

Specific wavelengths of the starlight were absorbed by gases in the atmosphere, providing clues to its composition.

Before making the observations, scientists had predicted a steam atmosphere, a cloud-obscured hydrogen atmosphere, or a deep hydrogen-rich atmosphere like that of Neptune. But the measurements did not show tell-tale signs of hydrogen, thereby ruling out the third option.

Dr Jacob Bean, from the Harvard-Smithsonian Centre for Astrophysics in Massachusetts, who led the research team, said: "This is the first super-Earth to have its atmosphere analysed. We've reached a real milestone on the road toward characterising these worlds.

"Although we can't yet say exactly what that atmosphere is made of, it is an exciting step forward to be able to narrow down the options for such a distant world to either steamy or hazy.

"Follow-up observations in longer wavelength infrared light are now needed to determine which of these atmospheres exists on GJ 1214b."

The number of confirmed exoplanets reached 500 last month and more have been confirmed since.

The findings were published in the journal Nature. PTI SKP AKJ SKP 12021723

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Record - 10

DIALOG(R)

New 'super-earth' 40 light years away might have water,

Indo-Asian News Service

Friday, December 3, 2010

TEXT:

London, Dec. 3 -- A planet, which is 2.6 times bigger than Earth and

orbiting a star 40 light years away, possibly has water in the form of steam, research suggests.

The planet has given scientists their first chance to analyse the atmosphere of a world outside the solar system.

Astronomers using the European Southern Observatory's 3.6-metre telescope in Chile discovered possible evidence of water in the form of steam shrouding the planet, reports the journal Nature.

Alternatively, the planet could have a mostly hydrogen atmosphere hidden beneath high clouds or hazes, as seen on Venus or Saturn's moon Titan, according to the Daily Mail.

Jacob Bean, who led the research team, from the Harvard-Smithsonian Center for Astrophysics in Massachusetts, US, said: "This is the first super-earth to have its atmosphere analysed. We've reached a real milestone on the road toward characterising these worlds."

The planet lies in the constellation of Ophiuchus, the Serpent Bearer. Since it hugs its parent star at a distance of only two million kilometres, 70 times closer than the Earth is to the Sun - conditions on its surface are hot," Bean said.

The astronomers carried out their study by analysing light coming from the star as the planet passed in front of it. The planet travels across the disc of its parent star once every 38 hours as it orbits. 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 - 11

DIALOG(R)

mighty microbes expand idea of life in universe,

DENNIS OVERBYE,

Virginia Pilot and Ledger-Star (Norfolk, VA), VP - The Virginian-Pilot ed, p12
Friday, December 3, 2010

TEXT:

By Dennis Overbye

The New York Times

Scientists said Thursday that they had trained a bacterium to eat and grow on a diet of arsenic, in place of phosphorus - one of six elements considered essential for life - opening up the possibility that organisms could exist elsewhere in the universe or even here on Earth using biochemical powers we have not yet dared to dream about.

The bacteria, scraped from the bottom of Mono Lake in California and grown for months in a lab mixture containing arsenic, gradually swapped out atoms of phosphorus for atoms of arsenic.

Scientists said the results, if confirmed, would expand the notion of what life could be and where it could be. "There is basic mystery, when you look at life," said Dimitar Sasselov, an astronomer at the Harvard-Smithsonian Center for Astrophysics and director of an institute on the origins of life there, who was not involved in the work. "Nature only uses a restrictive set of molecules and chemical reactions out of many thousands available. This is our first glimmer that maybe there are other options."

Felisa Wolfe-Simon, a NASA astrobiology fellow at the U.S. Geological Survey in Menlo Park, Calif., who led the experiment, said, "We've cracked open the door to what is possible for life elsewhere in the universe."

"This is a microbe that has solved the problem of how to live in a different way," she added at a news conference Thursday at NASA headquarters in Washington. "What else might we find? What else might we look for?"

Wolfe-Simon and her colleagues will publish their findings today in *Science*.

Caleb Scharf, an astrobiologist at Columbia University who was not part of the research, said he was amazed. "It's like if you or I morphed into fully functioning cyborgs after being thrown into a room of electronic scrap with nothing to eat," he said.

Dr. Gerald Joyce, a chemist and molecular biologist at the Scripps Research Institute in La Jolla, Calif., said the work "shows in principle that you could have a different form of life," but noted that even these bacteria are affixed to the same tree of life as the rest of us, like the extremophiles that exist in ocean vents.

"It's a really nice story about adaptability of our life form," he said. "It gives food for thought about what might be possible in another world."

The results, if true, could have a major impact on space missions to Mars and elsewhere looking for life. The experiments on such missions are

designed to ferret out the handful of chemical elements and reactions that have been known to characterize life on Earth. The Viking landers that failed to find life on Mars in 1976, Wolfe-Simon pointed out, were designed before the discovery of tube worms and other weird life in undersea vents and the dry valleys of Antarctica revolutionized ideas about the evolution of life on Earth.

Phosphorus is one of six chemical elements that have long been thought to be essential for all life as we know it. The others are carbon, oxygen, nitrogen, hydrogen and sulfur.

While nature has been able to engineer substitutes for some of the other elements that exist in trace amounts for specialized purposes - like iron to carry oxygen - until now there has been no substitute for the basic six elements. Now, scientists say, these results will stimulate a lot of work on what other chemical replacements might be possible. The most fabled, much loved by science fiction authors but not ever established, is the substitution of silicon for carbon.

Phosphate chains form the backbone of DNA. Moreover, phosphate bonds are particularly important in a molecule known as adenosine triphosphate, the principal means by which creatures store energy.

"It's like a little battery that carries chemical energy within cells," Scharf said. So important are these "batteries," he said, that the temperature at which they break down, about 160 degrees Celsius (320 Fahrenheit), is considered the high temperature limit for life.

Arsenic sits right beneath phosphorus in the periodic table of the elements and shares many of its chemical properties. Indeed, that chemical closeness is what makes it toxic, Wolfe-Simon said, allowing it to slip easily into a cell's machinery where it then gums things up, like bad oil in a car engine.

At a conference at Arizona State about alien life in 2006, however, Wolfe-Simon suggested that an organism that could cope with arsenic might actually have incorporated arsenic instead of phosphorus into its metabolism. In a subsequent paper in *The International Journal of Astrobiology*, she and Ariel Anbar and Paul Davies, both of Arizona State University, predicted the existence of arsenic-loving life forms.

"Then Felisa found them." said Davies, who has long championed the idea of searching for "weird life" on Earth and in space, and is a co-author on the new paper.

Reasoning that such organisms were more likely to be found in environments rich in arsenic, Wolfe-Simon and her colleagues scooped up a test tube full

of mud from Mono Lake, which is salty, alkaline and heavy in arsenic, and gradually fed the microbes more and more.

Despite their tolerance for arsenic, the authors also reported, the GFAJ-1 strain grew considerably better when provided with phosphorus, so in some ways they still prefer a phosphorus diet. Joyce described the cells as "clinging to every last phosphate molecule, and really living on the edge."

He added, "I was feeling sorry for the bugs."

the bacterium

Scientists scraped the microbes, above, from the bottom of Mono Lake in California, top, and grew them in a lab in a mixture containing arsenic. The bacterium gradually swapped out atoms of phosphorus for atoms of arsenic and continued to live by using the arsenic as a nutrient. what it means

Phosphorus is believed to be vital to support life. The experiment suggests that life can exist in a wider range of conditions than previously thought, scientists say.

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Record - 12

DIALOG(R)

Microbe Finds Arsenic Tasty; Redefines Life,

DENNIS OVERBYE,

New York Times (NY), Late Edition - Final ed, p1,

Friday, December 3, 2010

TEXT:

Scientists said Thursday that they had trained a bacterium to eat and grow on a diet of arsenic, in place of phosphorus -- one of six elements considered essential for life -- opening up the possibility that organisms could exist elsewhere in the universe or even here on Earth using biochemical powers we have not yet dared to dream about.

The bacterium, scraped from the bottom of Mono Lake in California and grown for months in a lab mixture containing arsenic, gradually swapped out atoms of phosphorus in its little body for atoms of arsenic.

Scientists said the results, if confirmed, would expand the notion of what life could be and where it could be. "There is basic mystery, when you look at life," said Dimitar Sasselov, an astronomer at the

Harvard-Smithsonian Center for Astrophysics and director of an institute on the origins of life there, who was not involved in the work. "Nature only uses a restrictive set of molecules and chemical reactions out of many thousands available. This is our first glimmer that maybe there are other options."

Felisa Wolfe-Simon, a NASA astrobiology fellow at the United States Geological Survey in Menlo Park, Calif., who led the experiment, said, "This is a microbe that has solved the problem of how to live in a different way."

This story is not about Mono Lake or arsenic, she said, but about "cracking open the door and finding that what we think are fixed constants of life are not."

Dr. Wolfe-Simon and her colleagues publish their findings Friday in Science.

Caleb Scharf, an astrobiologist at Columbia University who was not part of the research, said he was amazed. "It's like if you or I morphed into fully functioning cyborgs after being thrown into a room of electronic scrap with nothing to eat," he said.

Gerald Joyce, a chemist and molecular biologist at the Scripps Research Institute in La Jolla, Calif., said the work "shows in principle that you could have a different form of life," but noted that even these bacteria are affixed to the same tree of life as the rest of us, like the extremophiles that exist in ocean vents.

"It's a really nice story about adaptability of our life form," he said. "It gives food for thought about what might be possible in another world."

The results could have a major impact on space missions to Mars and elsewhere looking for life. The experiments on such missions are designed to ferret out the handful of chemical elements and reactions that have been known to characterize life on Earth. The Viking landers that failed to find life on Mars in 1976, Dr. Wolfe-Simon pointed out, were designed before the discovery of tube worms and other weird life in undersea vents and the dry valleys of Antarctica revolutionized ideas about the evolution of life on Earth.

Dr. Sasselov said, "I would like to know, when designing experiments and instruments to look for life, whether I should be looking for same stuff as here on Earth, or whether there are other options."

"Are we going to look for some molecules we love and know here, or broaden our search?"

Phosphorus is one of six chemical elements that have long been thought to be essential for all Life As We Know It. The others are carbon, oxygen, nitrogen, hydrogen and sulfur.

While nature has been able to engineer substitutes for some of the other elements that exist in trace amounts for specialized purposes -- like iron to carry oxygen -- until now there has been no substitute for the basic six elements. Now, scientists say, these results will stimulate a lot of work on what other chemical replacements might be possible. The most fabled, much loved by science fiction authors but not ever established, is the substitution of silicon for carbon.

Phosphorus chains form the backbone of DNA and its chemical bonds, particularly in a molecule known as adenosine triphosphate, the principal means by which biological creatures store energy. "It's like a little battery that carries chemical energy within cells," said Dr. Scharf. So important are these "batteries," Dr. Scharf said, that the temperature at which they break down, about 160 Celsius (320 Fahrenheit), is considered the high-temperature limit for life.

Arsenic sits right beneath phosphorus in the periodic table of the elements and shares many of its chemical properties. Indeed, that chemical closeness is what makes it toxic, Dr. Wolfe-Simon said, allowing it to slip easily into a cell's machinery where it then gums things up, like bad oil in a car engine.

At a conference at Arizona State about alien life in 2006, however, Dr. Wolfe-Simon suggested that an organism that could cope with arsenic might actually have incorporated arsenic instead of phosphorus into its lifestyle. In a subsequent paper in *The International Journal of Astrobiology*, she and Ariel Anbar and Paul Davies, both of Arizona State University, predicted the existence of arsenic-loving life forms.

"Then Felisa found them!" said Dr. Davies, who has long championed the idea of searching for "weird life" on Earth as well as in space and is a co-author on the new paper.

Reasoning that such organisms were more likely to be found in environments already rich in arsenic, Dr. Wolfe-Simon and her colleagues scooped up a test tube full of mud from Mono Lake, which is salty, alkaline and already heavy in arsenic, and gradually fed them more and more.

Despite her prediction that such arsenic-eating organisms existed, Dr. Wolfe-Simon said that she held her breath every day that she went to the

lab, expecting to hear that the microbes had died, but they did not. "As a biochemist, this stuff doesn't make sense," she recalled thinking.

A bacterium known as strain GFAJ-1 of the Halomonadaceae family of Gammaproteobacteria, proved to grow the best of the microbes from the lake, although not without changes from their normal development. The cells grown in the arsenic came out about 60 percent larger than cells grown with phosphorus, but with large, empty internal spaces.

By labeling the arsenic with radioactivity, the researchers were able to conclude that arsenic atoms had taken up position in the microbe's DNA as well as in other molecules within it. Dr. Joyce, however, said that the experimenters had yet to provide a "smoking gun" that there was arsenic in the backbone of working DNA.

Despite this taste for arsenic, the authors also reported, the GFAJ-1 strain grew considerably better when provided with phosphorus, so in some ways they still prefer a phosphorus diet. Dr. Joyce, from his reading of the paper, concurred, pointing out that there was still some phosphorus in the bacterium even after all its force-feeding with arsenic. He described it as "clinging to every last phosphate molecule, and really living on the edge."

Dr. Joyce added, "I was feeling sorry for the bugs."

PHOTOS: Felisa Wolfe-Simon took samples from Mono Lake in California and fed a strain of bacteria arsenic. The results of her work could change the way scientists search for living beings. (PHOTOGRAPH BY HENRY BORTMAN); NORMAL BACTERIA; ARSENIC-GROWN (PHOTOGRAPHS BY SCIENCE) (A4)
GRAPHIC: Grown in Arsenic: Researchers isolated arsenic-tolerant bacteria from Mono Lake, an ancient and alkaline California lake. The bacteria were gradually starved of phosphorus, an element thought to be essential for life, and fed more and more arsenic. Over time the bacteria began to grow and multiply by replacing the phosphorus in their bodies with arsenic atoms. (Source: Science) (A4)

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Record - 13

DIALOG(R)

Waterworld lets off steam,

Gold Coast Bulletin (Australia), B - Main ed, p17,
Friday, December 3, 2010

TEXT:

A "SUPER Earth" orbiting a star 40 light years away from our own planet could be a steamy waterworld

The exoplanet, which is 2.6 times bigger than Earth, has given scientists their first chance to analyse the atmosphere of a world outside the solar system

Astronomers using the European Southern Observatory's 3.6m telescope in Chile discovered possible evidence of steam shrouding the planet

Alternatively, the planet could have a mostly hydrogen atmosphere hidden beneath high clouds or hazes, as seen on Venus or Saturn's moon Titan

Codenamed GJ 1214b, the planet lies in the constellation of Ophiuchus, the Serpent Bearer

Since it hugs its parent star at a distance of only two million kilometres - 70 times closer than Earth is to the Sun - conditions on its surface are hot

The astronomers carried out their study by analysing light coming from the star as the planet passed in front of it

Specific wavelengths of the starlight were absorbed by gases in the atmosphere, providing clues to its composition

The findings were published in the journal Nature

Before making the observations, scientists had predicted a steam atmosphere, a cloud-obscured hydrogen atmosphere, or a deep hydrogen-rich atmosphere like that of Neptune

The measurements did not show tell-tale signs of hydrogen, thereby ruling out the third option

Dr Jacob Bean, from the Harvard-Smithsonian Centre for Astrophysics in Massachusetts, US, who led the scientists, said: "This is the first super-Earth to have its atmosphere analysed. We've reached a real milestone on the road toward characterising these worlds

"Although we can't yet say exactly what that atmosphere is made of, it is an exciting step forward to be able to narrow down the options for such a distant world to either steamy or hazy."

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Record - 14

DIALOG(R)

Microbe questions,

DENNIS OVERBYE,

International Herald Tribune, p8,

Friday, December 3, 2010

TEXT:

Scientists said Thursday that they had trained a bacterium to eat and grow on a diet of arsenic, in place of phosphorus - one of six elements considered essential for life - opening up the possibility that organisms could exist elsewhere in the universe or even here on Earth using biochemical powers we have not yet dared to dream about.

The bacterium, scraped from the bottom of Mono Lake in California and grown for months in a lab mixture containing arsenic, gradually swapped out atoms of phosphorus in its little body for atoms of arsenic.

Scientists said the results, if confirmed, would expand the notion of what life could be and where it could be. "There is basic mystery, when you look at life," said Dimitar Sasselov, an astronomer at the Harvard-Smithsonian Center for Astrophysics and director of an institute on the origins of life there, who was not involved in the work. "Nature only uses a restrictive set of molecules and chemical reactions out of many thousands available. This is our first glimmer that maybe there are other options."

Felisa Wolfe-Simon, a NASA astrobiology fellow at the U.S. Geological Survey in Menlo Park, California, who led the experiment, said, "This is a microbe that has solved the problem of how to live in a different way."

The news is not about Mono Lake or arsenic, she said, but about "cracking open the door and finding that what we think are fixed constants of life are not."

Dr. Wolfe-Simon and her colleagues publish their findings Friday in Science.

Caleb Scharf, an astrobiologist at Columbia University who was not part of the research, said he was amazed. "It's like if you or I morphed into fully functioning cyborgs after being thrown into a room of electronic scrap with nothing to eat," he said.

The results could have a major impact on space missions to Mars and

elsewhere looking for life. The experiments on such missions are designed to ferret out the handful of chemical elements and reactions that have been known to characterize life on Earth. The Viking landers that failed to find life on Mars in 1976, Dr. Wolfe-Simon pointed out, were designed before the discovery of tube worms and other weird life in undersea vents and the dry valleys of Antarctica revolutionized ideas about the evolution of life on Earth.

Phosphorus is one of six chemical elements that have long been thought to be essential for life. The others are carbon, oxygen, nitrogen, hydrogen and sulfur.

While nature has been able to engineer substitutes for some of the other elements that exist in trace amounts for specialized purposes - like iron to carry oxygen - until now there has been no substitute for the basic six elements. Now, scientists say, these results will stimulate a lot of work on what other chemical replacements might be possible. The most fabled, much loved by science fiction authors but not ever established, is the substitution of silicon for carbon.

At a conference at Arizona State University about alien life in 2006, Dr. Wolfe-Simon suggested that an organism that could cope with arsenic might actually have incorporated arsenic instead of phosphorus into its lifestyle.

Reasoning that such organisms were more likely to be found in environments already rich in arsenic, Dr. Wolfe-Simon and her colleagues scooped up a test tube full of mud from Mono Lake, which is salty, alkaline and already heavy in arsenic, and gradually fed them more and more.

One bacterium strain, GFAJ-1, from the Halomonadaceae family of Gammaproteobacteria, proved to grow the best of the microbes from the lake, although not without changes from normal development. The cells grown in the arsenic came out about 60 percent larger than cells grown with phosphorus, but with large, empty internal spaces.

Despite this taste for arsenic, the authors also reported, the GFAJ-1 strain grew considerably better when provided with phosphorus, so in some ways they still prefer a phosphorus diet.

Dr. Joyce, from his reading of the paper, concurred, pointing out that there was still some phosphorus in the bacterium even after all its force-feeding with arsenic. He described it as "clinging to every last phosphate molecule, and really living on the edge."

Dr. Joyce added, "I was feeling sorry for the bugs."

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Record - 15

DIALOG(R)

Star recount reframes,

KENNETH CHANG,

International Herald Tribune, p6,

Friday, December 3, 2010

TEXT:

Scientists say the number of stars in the universe has been seriously undercounted and estimate that there could be three times as many as had been thought.

This undercounting, of cool, dim dwarf stars in certain galaxies, could throw a monkey wrench into astronomers' understanding of how galaxies formed and grew over the eons.

"It's very problematic," Pieter van Dokkum, a professor of astronomy at Yale University who reported the findings in the journal *Nature* with Charlie Conroy of the Harvard-Smithsonian Center for Astrophysics in Cambridge, Massachusetts, said Wednesday.

The conundrum is that astronomers cannot actually count the dwarf stars, which have masses less than a third of that of the Sun, in galaxies outside the Milky Way. So instead, they counted the brighter Sun-like stars and assumed that there were about 100 unseen dwarfs for each larger Sun-like star, as is the case in the Milky Way.

Yet not every galaxy looks like the Milky Way, with its spiraling pinwheel arms. Some are blobby and elliptical, and it was an untested assumption that the distribution of star sizes in elliptical galaxies is the same as in the Milky Way.

Dr. van Dokkum and Dr. Conroy took an innovative approach to counting what they could not see. Because the dwarfs are cooler, the fingerprint of certain colors they emit and absorb is different from that of larger stars. Thus, while they could not see individual stars, the astronomers could calculate the number of dwarfs required to produce the telltale color fingerprint they detected in the light coming from the whole galaxy.

And they found that in eight elliptical galaxies, the ratio of dwarf stars to Sun-like stars was 1,000 or 2,000 to 1, rather than the 100 to 1 in the Milky Way. A typical elliptical galaxy, thought to consist of about 100

billion stars, would have one trillion or more stars. Ellipticals account for about a third of all galaxies, leading to the new estimate of at least three times as many stars over all.

"We may have to abandon this notion of using the Milky Way as a template for the rest of the universe," Dr. van Dokkum said. If the findings are correct, an undercount of dwarfs would mean astronomers have underestimated the masses of galaxies, and that would mean that galaxies developed earlier and faster than currently thought.

"Which would be very interesting, actually," said Richard Ellis, a professor of astronomy at the California Institute of Technology who was not involved in the research. "It's very important that papers like this are published so that we are reminded how fragile our knowledge of the universe is."

Yet Dr. Ellis said he remained skeptical. "It's good data, and it's a sound analysis," he said, "but there are a few escape clauses."

For one, the research assumes that the stars in an elliptical galaxy are made of exactly the same stuff as those in spiral galaxies, an assumption that cannot be tested yet.

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Record - 16

DIALOG(R)

Discovery triples universe star tally - Astronomical error boosts chances of alien life on another Earth,

Amina Khan,

Courier Mail (Australia), 1 - First with the news ed, p18,
Friday, December 3, 2010

TEXT:

HERE'S a finding that may make some stargazers do a double-take through their telescopes: there may be three times as many stars in the universe as we thought

Fixing this astronomical miscalculation may force some researchers to reconsider what far-off galaxies really look like and how the stars within them came to be

"It has terrifying implications for a lot of the astronomy we do," said Caltech astronomer Richard Ellis, who was not involved in the work

Previous star counts relied on the assumption that the larger universe looked much like our own galaxy. But authors of a report published yesterday in the journal Nature say that there are many more red dwarfs - small, dim stars that can't be picked out individually when very far off - in galaxies other than in the Milky Way

The new census, based on analysis of the light signature of the galaxies using instruments at the Keck Observatory in Hawaii, pushes the total number of stars in the universe to 300 sextillion (that's 100 billion squared, multiplied by 30)

Red dwarfs are often a mere 10 per cent to 20 per cent of the mass of the Sun and hundreds of times dimmer. That makes them so faint as to be undetectable at great distances

To make up for what they couldn't see, astronomers had assumed that the proportion of red dwarfs in other galaxies would be similar to the ratio known to exist in our own, said Yale University astronomer Pieter van Dokkum, the study's lead author

Armed with recent advances that enabled them to better detect the faint signals of dim, low-mass stars, Professor van Dokkum and co-worker Charlie Conroy of the Harvard-Smithsonian Centre for Astrophysics looked at the radiation emanating from eight elliptical galaxies 50 million to 300 million light years from Earth

These galaxies have a bulging shape and typically contain relatively old stars - very different from spiral galaxies like the Milky Way, which have stars arrayed in flat, rotating discs and armlike projections where new stars are growing

The scientists looked at the light given off by these galaxies to determine what chemicals were present, and in what amounts - revealing what kinds of stars they came from

They found strong signs of sodium and iron, which are found in low-mass stars. They calculated that the strength of the sodium and iron signatures was enough to raise the red dwarf estimate within these galaxies by a factor of nine

If that calculation holds for all elliptical galaxies - which constitute one-third of all known galaxies - that would triple the universe star census

Prof Ellis said the results were not ironclad, in part because of the reliance on an assumption that red dwarfs in other galaxies have the same proportion of chemicals as red dwarfs in our own

Should future studies confirm there are so many more stars, the probability that an Earth-like planet and other forms of life exist is much higher, too.

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Record - 17

DIALOG(R)

NEW ESTIMATE TRIPLES STAR COUNT,

Sun Sentinel, Fort Lauderdale, FL, Broward Metro ed, p18A {BYLINE} - Amina Khan, Tribune Newspapers, Thursday, December 2, 2010

TEXT:

Here's a finding that may make some stargazers do a double take through their telescopes: There may be three times as many stars in the universe as we thought.

Fixing this astronomical miscalculation might force some researchers to reconsider what far-off galaxies really look like and how the stars within them came to be.

"It has terrifying implications for a lot of the astronomy we do," said California Institute of Technology astronomer Richard Ellis, who was not involved in the work.

Previous star counts relied on the assumption that the larger universe looks much like our own galaxy. But authors of a report published Wednesday in the journal Nature say there are many more red dwarfs - they are small, dim stars that can't be picked out when very far off - in certain other galaxies than in the Milky Way.

The new census, based on analysis of the light signature of the galaxies using instruments at the Keck Observatory in Hawaii, pushes the total number of stars in the universe to 300 sextillion (that's 100 billion squared, multiplied by 30).

Red dwarfs are often a mere 10 percent to 20 percent of the mass of the sun. Before recent advances, they had been so faint as to be undetectable at great distances.

To make up for what they couldn't see, astronomers for decades had assumed that the proportion of red dwarfs in other galaxies would be similar to the

ratio known to exist in our own, said Yale astronomer Pieter van Dokkum, the study's lead author.

Armed with recent advances that enabled them to better detect the faint signals of dim, low-mass stars, van Dokkum and co-worker Charlie Conroy of the Harvard-Smithsonian Center for Astrophysics looked at the radiation emanating from eight elliptical galaxies between 50 million and 300 million light years from Earth. These types of galaxies have a bulging shape and typically contain relatively old stars - very different from spiral galaxies like the Milky Way, which have stars arrayed in flat, rotating disks and armlike projections where new stars are growing.

If any galaxy would look different from ours on the inside, it would be these elliptical types, van Dokkum and Conroy figured.

The scientists looked at the light given off by these galaxies to determine what chemicals were present, and in what amounts - revealing what kinds of stars they came from. They found strong signs of sodium and iron, which are typically found in feeble, low-mass stars. They calculated that the strength of the sodium and iron signatures was enough to raise the red dwarf estimate within these galaxies by a factor of nine.

If that calculation holds for all elliptical galaxies - which constitute one-third of all known galaxies - that would triple the star census of the universe.

- Amina Khan, Tribune Newspapers

PHOTO: Previous star counts relied on the assumption that the larger universe looks much like our own galaxy. But a report published Wednesday says there are many more red dwarfs - small, dim stars that can't be picked out when very far off - in certain other galaxies than in the Milky Way.
NASA photo

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Record - 18

DIALOG(R)

New estimate of universe's stars is 3 times higher,
Los Angeles Times,
St. Paul Pioneer Press (MN), St. Paul ed, pB6,
Thursday, December 2, 2010

TEXT:

LOS ANGELES -- Here's a finding that may make some stargazers do a double-take through their telescopes: There may be three times as many stars in the universe as we thought. Fixing this astronomical miscalculation may force some researchers to reconsider what far-off galaxies really look like and how the stars within them came to be.

"It has terrifying implications for a lot of the astronomy we do," said Caltech astronomer Richard Ellis, who was not involved in the work.

For example: The young universe may have had different proportions of stars than it does today. Stars and galaxies may grow differently than scientists believed. There may be slightly less dark matter in the centers of these galaxies than had been predicted.

And with so many more stars available, the probability that an Earth-like planet -- and other forms of life -- exists in distant parts of space is much higher, too.

Previous star counts relied on the assumption that the larger universe looks much like our own galaxy. But authors of a report published Wednesday in the journal *Nature* say that there are many more red dwarfs -- small, dim stars that can't be picked out individually when very far off -- in certain other galaxies than in the Milky Way.

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If any galaxy would look different from ours on the inside, it would be these elliptical types, van Dokkum and Conroy figured.

They raised the red dwarf estimate within these galaxies -- which constitute one-third of all known galaxies -- by a factor of nine, which would triple the star census of the universe.

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Record - 19

DIALOG(R)

First super-Earth atmosphere analyzed; Shrouded in steam or hydrogen clouds,
Vancouver Province (Canada), Final ed, pC16,
Thursday, December 2, 2010

TEXT:

PARIS - Astronomers have for the first time analyzed the atmosphere of a 'super-Earth,' the name given to rocky exoplanets only a few times larger than our own, according to a study released Wednesday.

The breakthrough is a key step in the quest to identify planets in other solar systems that could potentially host forms of life we might recognize, the team said.

"We've reached a milestone on the road toward characterizing these worlds," said lead author Jacob Bean, a professor at the Harvard-Smithsonian Center for Astrophysics.

The exoplanet in question, dubbed GJ 1214b, is some 42 light years -- four hundred trillion kilometres -- from our corner of the universe, with a radius about 2.6 times that of Earth.

Discovered last year, GJ 1214b circles a small, faint star, making it that much easier for scientists to tease out data about the atmosphere by analyzing starlight as it passes the rim of the planet on its way to us.

Depending on the chemical composition and weather of the atmosphere, specific signature wavelengths of light are absorbed.

Using the European Space Agency's Very Large Telescope in Chile, Bean and colleagues were able to narrow the range of possibilities from three to two.

The first is that GJ 1214b is shrouded by water which -- given the nearness to its star -- would be in the form of steam.

It could also be a rocky world with an atmosphere consisting mostly of hydrogen, but with high clouds or haze obscuring the view.

What the exoplanet is not, the observations prove, is a 'mini-Neptune' with a small rocky core and a deep, hydrogen-rich atmosphere.

"Although we can't say yet exactly what that atmosphere is made of, it is an exciting step forward to be able to narrow down the options for such a distant world to either steamy or hazy,' said Bean.

In either case, it is more than unlikely that GJ 1214b hosts life forms.

"This planet is much too hot to be considered habitable," Bean said. 'In the regions of the atmosphere with pressures similar to what are seen at sea level on Earth, the temperatures are estimated to be more than 500 degree Celsius.'

It circles its star every 38 hours at a distance of only two million km, seventy times closer than Earth's orbit of the sun.

Despite this, GJ 1214b is smaller, cooler and more Earthlike than any other known exoplanet.

Most of the more than 500 exoplanets discovered to date are "hot Jupiters,' so-called because of their large, gaseous masses and extreme temperatures.

But as observational tools become more powerful, astronomers have begun to identify more and more rocky orbs similar to our own.

"We are working to discover and eventually characterize the atmospheres of planets that would be habitable,' said Bean.

"We aren't there yet, but the goal is obtainable within the next decade,' he said.

Colour Photo: Agence France-Presse / An artist's impression shows the atmosphere around exoplanet GJ 1214b that has been analyzed for the first time by an international team of astronomers. The team studied the planet via telescope as it passed in front of its parent star and some of the starlight passed through the planets atmosphere. The team concluded the atmosphere is either mostly water in the form of steam or is dominated by thick clouds or hazes.;

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DIALOG(R)

Scientists find massive cache of stars; Discovery of red dwarfs triples number of stars in the universe,

Ottawa Citizen (Canada), Final ed, pA13

Thursday, December 2, 2010

TEXT:

WASHINGTON - Red dwarf stars are far more common than astronomers have believed -- in fact, they may make up 80 per cent of the star population, scientists said in a study on Wednesday that triples the number of stars in the universe.

They analyzed the light coming from galaxies known as elliptical galaxies and found they were chock full of these red dwarfs, which are small, cool stars.

"There are possibly trillions of Earths orbiting these stars," Pieter van Dokkum of Yale University, who led the research, said in a statement. 'It's one reason why people are interested in this type of star.'

The findings, published in the journal Nature, also suggest there is far less dark matter in these galaxies than had been proposed -- something that may be good as astronomers understand stars far better than they do dark matter.

"What we already knew was that these galaxies had a lot of unseen matter at their centres,' van Dokkum said in a telephone interview.

"What we didn't know was whether the matter was dark, this mysterious matters we don't know much about, or whether it was in the form of stellar bodies.'

The team did spectral analysis, examining the light that comes from the galaxies. Red dwarfs don't emit enough visible light to be seen from the Earth but they affect the overall glow from a galaxy.

"In these galaxies there are little pieces of the rainbow that are missing, wavelengths that have much less strength than the rest,' van Dokkum said. His team looked for these so-called absorption lines that are known to be made by red dwarf stars.

The data indicated they were abundant.

"We usually assume other galaxies look like our own. But this suggests other conditions are possible in other galaxies,' said Charlie Conroy of the Harvard-Smithsonian Center for Astrophysics, who was also involved in

the research.

"So this discovery could have a major impact on our understanding of galaxy formation and evolution," he said.

Photo: European Southern Observatory, Handout / Red dwarf stars are far more numerous than previously thought, scientists said Wednesday. Pieter van Dokkum of Yale University, who led the research, said there are possibly trillions of Earths orbiting these stars. 'It's one reason why people are interested in this type of star,' he says.;

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Record - 21

DIALOG(R)

How many stars in universe? Census indicates triple what we thought,

Amina Khan - LOS ANGELES TIMES,

Buffalo News (NY), Final ed, pA6

Thursday, December 2, 2010

TEXT:

LOS ANGELES - Here's a finding that may make some stargazers do a double take through their telescopes: There may be three times as many stars in the universe as we thought.

Fixing this astronomical miscalculation may force some researchers to reconsider what far-off galaxies really look like and how the stars within them came to be.

"It has terrifying implications for a lot of the astronomy we do," said California Institute of Technology astronomer Richard Ellis, who was not involved in the work.

Previous star counts relied on the assumption that the larger universe looks much like our own galaxy. But authors of a report published Wednesday in the journal *Nature* say that there are many more red dwarfs -- small, dim stars that can't be picked out individually when very far off -- in certain other galaxies than in the Milky Way.

The new census, based on analysis of the light signature of the galaxies using instruments at the Keck Observatory in Hawaii, pushes the total number of stars in the universe to 300 sextillion, or 100 billion squared -- multiplied by 30.

Red dwarfs are often a mere 10 to 20 percent of the mass of the sun, and hundreds of times dimmer. That makes them so faint as to be undetectable at great distances. To make up for what they couldn't see, astronomers for decades have assumed that the proportion of red dwarfs in other galaxies would be similar to the ratio known to exist in our own, said Yale University astronomer Pieter van Dokkum, the study's lead author.

Armed with recent advances that enabled them to better detect the faint signals of dim, low-mass stars, van Dokkum and co-worker Charlie Conroy of the Harvard-Smithsonian Center for Astrophysics looked at the radiation emanating from eight elliptical galaxies between 50 million and 300 million light years from Earth. These types of galaxies have a bulging shape and typically contain relatively old stars -- very different from spiral galaxies like the Milky Way, which have stars arrayed in flat, rotating disks and armlike projections where new stars are growing.

The scientists looked at the light given off by these galaxies to determine what chemicals were present, and in what amounts -- revealing the kinds of stars from which they originated. They found strong signs of sodium and iron, which are typically found in feeble, low-mass stars. They calculated that the strength of the sodium and iron signatures was enough to raise the red dwarf estimate within these galaxies by a factor of 9.

If that calculation holds for all elliptical galaxies -- which constitute one-third of all known galaxies -- that would triple the star census for the universe.

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Record - 22

DIALOG(R)

Starry starry starry night: Star count may triple,

Daily News Egypt,

Thursday, December 2, 2010

TEXT:

WASHINGTON - The universe may glitter with far more stars than even Carl Sagan imagined when he rhapsodized about billions upon billions. A new study suggests there are a mind-blowing 300 sextillion of them, or three times as many as scientists previously calculated. That is a 3 followed by 23 zeros. Or 3 trillion times 100 billion.

The estimate, contained in a study published online Wednesday in the journal Nature, is based on findings that there are many more red dwarf

stars the most common star in the universe than once thought.

But the research goes deeper than that. The study by Yale University astronomer Pieter van Dokkum and Harvard astrophysicist Charlie Conroy questions a key assumption that astronomers often use: that most galaxies have the same properties as our Milky Way. And that conclusion is deeply unsettling to astronomers who want a more orderly cosmos.

When scientists previously estimated the total number of stars, they assumed that all galaxies had the same ratio of dwarf stars as the Milky Way, which is spiral-shaped. Much of our understanding of the universe is based on observations made inside our own galaxy and then extrapolated to other galaxies.

But about one-third of the galaxies in the universe are elliptical, not spiral, and van Dokkum found they aren't really made up the same way as ours.

Using the Keck telescope in Hawaii, van Dokkum and a colleague gazed into eight distant, elliptical galaxies and looked at their hard-to-differentiate light signatures. The scientists calculated that elliptical galaxies have more red dwarf stars than predicted. A lot more.

"We're seeing 10 or 20 times more stars than we expected" van Dokkum said.

Generally scientists believe there are 100 billion to a trillion galaxies in the universe. And each galaxy - the Milky Way included - was thought to have 100 billion to a trillion stars. Sagan, the Cornell University scientist and best-selling author who was often impersonated by comedians as saying "billions and billions" usually said there were 100 billion galaxies, each with 100 billion stars.

Van Dokkum's work takes these numbers and adjusts them. That's because some of those galaxies, "the elliptical ones, which account for about a third of all galaxies", have as many as 1 trillion to 10 trillion stars, not a measly 100 billion. When van Dokkum and Conroy crunched the incredibly big numbers, they found that it tripled the estimate of stars in the universe from 100 sextillion to 300 sextillion.

That's a huge number to grasp, even for astronomers who are used to dealing in light years and trillions, Conroy said.

"It's fun because it gets you thinking about these large numbers", Conroy said. Conroy looked up how many cells are in the average human body - 50 trillion or so - and multiplied that by

the 6 billion people on Earth. And he came up with about 300 sextillion.

So the number of stars in the universe “is equal to all the cells in the humans on Earth ... a kind of funny coincidence”, Conroy said.

For the past month, astronomers have been buzzing about van Dokkum's findings, and many aren't too happy about them, said astronomer Richard Ellis of the California Institute of Technology.

Van Dokkum's paper challenges the assumption of “a more orderly Universe” and gives credence to “the idea that the universe is more complicated than we think”, Ellis said. “It's a little alarmist.”

Ellis said it is too early to tell if van Dokkum is right or wrong, but his work is shaking up the field “like a cat among pigeons.”

Van Dokkum agreed, saying, “Frankly, it's a big pain.”

Ellis said the new study does make sense. Its biggest weakness might be the assumption that the chemical composition of dwarf stars is the same in elliptical galaxies as in the Milky Way. That might be wrong, Ellis said. If it is, it would mean there are only five times more red dwarf stars in elliptical galaxies than previously thought, instead of 10 or 20, van Dokkum said.

Slightly closer to home, at least in our own galaxy, another study also published in Nature looks at a single red dwarf star in a way that is a step forward in astronomers' search for life beyond Earth. A team led by a Harvard scientist was able to home in on the atmosphere of a planet circling that star, using the European Southern Observatory's Very Large Telescope in Chile.

The planet lives up to the word alien. The team reports that this giant planet's atmosphere is either dense with sizzling water vapor like a souped-up steam bath, or it is full of hazy, choking hydrogen and helium clouds with a slightly blue tint. The latter is more likely, say the researchers and others not involved in the study.

While scientists have been able to figure out the atmosphere of gas giants the size of Jupiter or bigger, this is a first for the type of planet called a super Earth - something with a mass 2 to 10 times Earth's. The planet is more comparable to Neptune and circles a star about 42 light years from Earth. A light year is nearly 6 trillion miles.

The planet is nowhere near livable - it's about 440 degrees (about 225 degrees Celsius). "You wouldn't want to be there. It would be unpleasant," said study co-author Eliza Kempton of the University of California Santa Clara.

But describing its atmosphere is a big step toward understanding potentially habitable planets outside our solar system, said study chief author Jacob Bean at the Harvard Smithsonian Center for Astrophysics. Bean and Kempton looked at the light spectrum signature from the large planet as it passed in front of the dwarf star, and the result led to two possible conclusions: steam bath or haze.

The steam bath is the more interesting possibility because water is key to life, said outside scientist Alan Boss of the Carnegie Institution of Washington.

But an upcoming and still unpublished study by Kempton and Bryce Croll at the University of Toronto points more toward a hydrogen-helium atmosphere, several astronomers said.

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Record - 23

DIALOG(R)

US firm develops power from hydrogen,

New Jersey,

TradeArabia,

Thursday, December 2, 2010

TEXT:

BlackLight Power, a US-based company founded by a Harvard medical doctor called Randell Mills, has announced the production of electricity from a new form of Hydrogen. BlackLight Power on Wednesday said the new CIHT (Catalyst-Induced-Hydrino-Transition) technology has been independently confirmed by Dr KV Ramanujachary, Rowan University Meritorious Professor of Chemistry and Biochemistry. "We have demonstrated the ability to produce electrical power using chemical systems for the direct production of electric power from the conversion of hydrogen to hydrinos, a more stable form of hydrogen," said Dr Randell Mills, chairman, CEO and president of BlackLight Power. 'CIHT has a forecasted nominal cost per unit of power compared to that of thermal-based systems and produces electricity without requiring enormous thermally-driven mechanical generators.' 'Consequently,

more rapid dissemination is expected by deploying many autonomous distributed units that circumvent the huge barriers of entry into the power markets such as developing and building massive billion-dollar power plants with their associated power distribution infrastructure. This is especially true in emerging markets,' Dr Mills said. According to him, BlackLight Power is first focused on advancing CIHT technology to produce power to ultimately sell directly to consumers under power purchase agreements. "The business plan is akin to that of solar leasing, but the costs are potentially vastly cheaper, and the systems may be deployable for essentially all applications of all scales untethered to the Sun or the grid, or as in the case of fuel cells and cars, a fuel supply," said Dr Mills. "To realize how transformational this technology will be, imagine that an electric car can travel over 5,000 miles on the hydrogen energy from a gallon of water without any pollution whatsoever. The power source can then be lifted out and plugged into your electrical panel to power your home with enough power to spare to also power your neighborhood," he added. Akridge Energy, a licensee based in Maryland, intends to deploy distributed-scale CIHT electric power units at commercial real estate properties and sell electricity to its tenants and eventually into the local electric grid. John E. Akridge III, chairman and owner of Akridge Energy said, "BLP's breakthrough CIHT technology will allow us to become a major green-power producer for the DC metro area while enabling dramatic savings and unheard of independence.' 'It is ideal for our needs across the full spectrum of our applications: powering apartment complexes, commercial offices, retail outlets, and mixed-use projects,' he noted. Dr Ramanujachary said, "The chemicals used in CIHT technology are similar to those used in thermal and chemical cells that were separately, thoroughly and diligently validated over the past three years by a team at Rowan University that included myself.' 'Since the measurements on CIHT are electrical versus calorimetric, there can be no dispute over the power and the energy balance.' 'With further optimization, there is no doubt that this technology will present an economically viable and environmentally benign alternate to meet Global energy needs. If advanced to commercialization, it would be one of the most profound developments ever,' Dr Ramanujachary stated. BLP also announced today the replication of the extraordinary high-energy light emission below 80 nm from hydrogen at the Harvard Smithsonian Center for Astrophysics (CfA). These results, previously thought to be impossible based on past theory, are predicted to be from the formation of hydrinos, the company said.-TradeArabia News Service Copyright 2010 www.tradearabia.com

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DIALOG(R)

BlackLight Power, Inc. Announces Production of Electricity from a New Form of Hydrogen,

Emerging Markets Business Information News (EMBIN),
Thursday, December 2, 2010

TEXT:

)-- BlackLight Power, Inc. (BLP) today announced that CIHT (Catalyst-Induced-Hydrino-Transition) technology has been independently confirmed by Dr. K.V. Ramanujachary, Rowan University Meritorious Professor of Chemistry and Biochemistry. "We have demonstrated the ability to produce electrical power using chemical systems for the direct production of electric power from the conversion of hydrogen to hydrinos, a more stable form of hydrogen," said Dr. Randell Mills, Chairman, CEO and President of BlackLight Power, Inc. "CIHT has a forecasted nominal cost per unit of power compared to that of thermal-based systems and produces electricity without requiring enormous thermally-driven mechanical generators. Consequently, more rapid dissemination is expected by deploying many autonomous distributed units that circumvent the huge barriers of entry into the power markets such as developing and building massive billion-dollar power plants with their associated power distribution infrastructure. This is especially true in emerging markets." BlackLight Power is first focused on advancing CIHT technology to produce power to ultimately sell directly to consumers under power purchase agreements. "The business plan is akin to that of solar leasing, but the costs are potentially vastly cheaper, and the systems may be deployable for essentially all applications of all scales untethered to the Sun or the grid, or as in the case of fuel cells and cars, a fuel supply," said Dr. Mills. "To realize how transformational this technology will be, imagine that an electric car can travel over 5,000 miles on the hydrogen energy from a gallon of water without any pollution whatsoever. The power source can then be lifted out and plugged into your electrical panel to power your home with enough power to spare to also power your neighborhood," continued Dr. Mills. Akridge Energy, a licensee, intends to deploy distributed-scale CIHT electric power units at commercial real estate properties and sell electricity to its tenants and eventually into the local electric grid. John E. Akridge III, chairman and owner of Akridge Energy said, "BLP's breakthrough CIHT technology will allow us to become a major green-power producer for the DC metro area while enabling dramatic savings and unheard of independence. It is ideal for our needs across the full spectrum of our applications: powering apartment complexes, commercial offices, retail outlets, and mixed-use projects." Dr. K.V. Ramanujachary said, "The chemicals used in CIHT technology are similar to those used in thermal and chemical cells that were separately, thoroughly and diligently validated

over the past three years by a team at Rowan University that included myself. Since the measurements on CIHT are electrical versus calorimetric, there can be no dispute over the power and the energy balance. With further optimization, there is no doubt that this technology will present an economically viable and environmentally benign alternate to meet Global energy needs. If advanced to commercialization, it would be one of the most profound developments ever." Completion of Thermal Energy Balance and Chemical Characterization of Solids Fuels at Rowan University Additionally, an expanded team of scientists and engineers at Rowan University completed a thorough year-long series of additional testing of the thermal systems following the announcement and release of their validations in October 2008 and August 2009. Using BLP's proprietary solid-fuel chemistry capable of continuous regeneration, independently formulated and tested fuels generated on-demand energy greater than that of combustion at power levels of kilowatts. Furthermore, when using BLP's chemical process, Rowan University professors reported a net energy gain of up to 6.5 times the maximum energy potential of these materials from known chemical reactions. In a joint statement, Dr. K.V. Ramanujachary, Rowan University Meritorious Professor of Chemistry and Biochemistry, Dr. Amos Mugweru, Assistant Professor of Chemistry, Dr. John L. Schmalzel P.E., Professor of Engineering and Dr. Peter Jansson P.E., Associate Professor of Engineering said, "In additional independent tests conducted over the last 12 months involving 13 solid fuel mixtures made by us from commercially-available chemicals confirmed by multiple analyses, our team of engineering and chemistry professors, staff and students at Rowan University has independently and consistently generated energy in excesses ranging from 1.3 times to 6.5 times the maximum theoretical heat available through known chemical reactions." Chemists Drs. Ramanujachary and Mugweru said, "Additionally, we have analyzed the reactants and reaction products and are confident that the procedures we have followed and chemicals we have procured, characterized, and reacted are not capable of generating the quantities of heat we have observed with previously known chemistry. This significant development makes it readily possible for other laboratories to demonstrate the repeatability of these reactions that produce anomalous heat regularly in our university laboratory. Moreover, we have also reproduced BLP's tests for the third time that identify a new form of hydrogen as the likely explanation of the additional heat produced." Light Signature of Hydrino BLP also announced today the replication of the extraordinary high-energy light emission below 80 nm from hydrogen at the Harvard Smithsonian Center for Astrophysics (CfA). These results, previously thought to be impossible based on past theory, are predicted to be from the formation of hydrinos. The direct spectral observation of transitions of hydrogen to form hydrinos and their ubiquitous astrophysical presence as the identity of the dark matter of the universe were published in a paper entitled "Hydrino Continuum Transitions with Cutoffs at 22.8 nm and 10.1 nm," (Int. J. Hydrogen Energy) by Dr. Randell Mills and Dr. Ying

Lu. The CfA validation, which was headed by team leader Alexander Bykanov, PhD under contract with GEN3 Partners, showed hydrogen spectral emissions below 80 nanometers, the previously known ground state. This is decisive evidence of the existence of hydrinos as Dr. Randell Mills theoretically predicted. Describing the significance of the breakthrough, Dr. Mills said, "This is smoking-gun evidence of the existence of hydrinos. The light signature observed is from pure hydrogen and exists at a much higher energy level than deemed possible for this element in any known form." In a joint statement, Dr. Alexander Bykanov and Dr. Sam Kogen, GEN3 COO, said, "BLP's spectral results were identically independently reproduced, and we could find no conventional explanation for the emission of bright light from hydrogen in this very high energy region. We believe that this confirms hydrino emission." The Rowan validations of power production and hydrino product identification and the GEN3 Partners validation of hydrino light emission further confirm the BlackLight Process as a new non-polluting energy source. This process was first announced by BLP in October 2008. Hydrinos are a prior undiscovered form of hydrogen in lower-energy states produced by the BlackLight Process as latent energy is released by hydrogen atoms. The energy released during the formation of a hydrino is over 200 times the energy required to extract hydrogen from water by electrolysis. The CIHT cells are shown to extract this energy directly as electricity. With the diversion of a fraction of a percent of the electrical output, the hydrogen fuel can be created from water with the net providing power on-site. Thus, power can be generated anywhere including at homes and businesses and in cars without supporting fuels, generation, or distribution infrastructure.

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Record - 25

DIALOG(R)

NASA's super-Earth characterization could help find life on other planets,

ANI,

Asian News International,

Thursday, December 2, 2010

TEXT:

London, Dec 2 (ANI): Using a ground-based telescope, a team of astronomers, including two NASA Sagan Fellows, has made the first characterizations of a super-Earth's atmosphere.

A super-Earth is a planet up to three times the size of Earth and weighing

up to 10 times as much.

The findings are a significant milestone toward eventually being able to probe the atmospheres of Earth-like planets for signs of life.

The team determined the planet, GJ 1214b, is either blanketed with a thin layer of water steam or surrounded by a thick layer of high clouds.

"This is the first super-Earth known to have an atmosphere," said Jacob Bean, a NASA Sagan Fellow and astronomer at the Harvard-Smithsonian Center for Astrophysics in Cambridge, Mass.

"But even with these new measurements, we can't say yet what that atmosphere is made of. This world is being very shy and veiling its true nature from us."

GJ 1214b is 2.7 times the size of Earth and 6.5 times as massive. It has a low density for its size, leading astronomers to conclude the planet is some kind of solid body with an atmosphere.

Bean and his team observed infrared light as the planet crossed in front of its star. During such transits, the star's light filters through the atmosphere. Gases absorb the starlight at particular wavelengths, leaving behind chemical fingerprints detectable from Earth.

In the case of the super-Earth, no chemical fingerprints were detected; however, this doesn't mean there are no chemicals present. Instead, this information ruled out some possibilities for GJ 1214b's atmosphere, and narrowed the scope to either an atmosphere of water steam or high clouds.

Astronomers believe it's more likely that the atmosphere is too thin around the planet to let enough light filter through and reveal chemical fingerprints.

"This is an important step forward, narrowing our understanding of the atmosphere of this planet. Bizarre worlds like this make exoplanet science one of the most compelling areas in astrophysics today," said NASA Exoplanet Exploration Program Scientist Douglas Hudgins. (ANI)

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DIALOG(R)

THREEFOLD AS MANY STARS EXIST IN UNIVERSE?,

AMINA KHAN, LOS ANGELES TIMES,
Pittsburgh Post-Gazette (PA), SOONER ed, pA-3,
Thursday, December 2, 2010

TEXT:

LOS ANGELES -- Here's a finding that may make some stargazers do a double-take through their telescopes: There may be three times as many stars in the universe as we thought. Fixing this astronomical miscalculation may force some researchers to reconsider what far-off galaxies really look like, and how the stars within them came to be.

"It has terrifying implications for a lot of the astronomy we do," said Caltech astronomer Richard Ellis, who was not involved in the work.

Previous star counts relied on the assumption that the larger universe looks much like our own galaxy. But authors of a report published Wednesday in the journal *Nature* say there are many more red dwarfs -- small, dim stars that can't be picked out individually when very far off -- in certain other galaxies than in the Milky Way.

The new census, based on analysis of the light signature of the galaxies using instruments at the Keck Observatory in Hawaii, pushes the total number of stars in the universe to 300 sextillion (that's 100 billion squared, multiplied by 30).

Red dwarfs are often a mere 10 percent to 20 percent of the mass of the sun, and hundreds of times dimmer. That makes them so faint as to be undetectable at great distances. To make up for what they couldn't see, astronomers for decades have assumed that the proportion of red dwarfs in other galaxies would be similar to the ratio known to exist in our own, said Yale University astronomer Pieter van Dokkum, the study's lead author.

Armed with recent advances that enabled them to better detect the faint signals of dim, low-mass stars, Dr. van Dokkum and co-worker Charlie Conroy of the Harvard-Smithsonian Center for Astrophysics looked at the radiation emanating from eight elliptical galaxies between 50 million and 300 million light years from Earth. These types of galaxies have a bulging shape and typically contain relatively old stars -- very different from spiral galaxies like the Milky Way, which have stars arrayed in flat, rotating disks and armlike projections where new stars are growing. If any galaxy would look different from ours on the inside, it would be these elliptical types, Drs. van Dokkum and Conroy figured.

The scientists looked at the light given off by these galaxies to determine

what chemicals were present, and in what amounts -- revealing what kinds of stars they came from. They found strong signs of sodium and iron, which are typically found in feeble, low-mass stars. They calculated that the strength of the sodium and iron signatures was enough to raise the red dwarf estimate within these galaxies by a factor of nine.

If that calculation holds for all elliptical galaxies -- which constitute one-third of all known galaxies -- that would triple the star census of the universe.

Dr. Ellis said the results are not yet ironclad, in part because this paper relies on an assumption of its own: that red dwarfs in other galaxies have the same proportion of sodium, iron and other chemicals as red dwarfs in our own. Should future studies confirm the findings, astronomers may need to rejigger all kinds of basic numbers.

Among them: that the young universe may have had different proportions of stars than it does today; that stars and galaxies may grow differently than scientists believed; and that there may be slightly less dark matter in the centers of these galaxies than had been predicted.

And with so many more stars available, the probability that an Earth-like planet -- and other forms of life -- exists in a distant part of space is much higher, too.

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Record - 27

DIALOG(R)

You think Hollywood has a lot of stars ... science news,

SETH BORENSTEIN,

Virginia Pilot and Ledger-Star (Norfolk, VA), VP - The Virginian-Pilot ed, p6,
Thursday, December 2, 2010

TEXT:

By Seth Borenstein

The Associated Press

WASHINGTON

The universe may glitter with far more stars than even Carl Sagan imagined when he rhapsodized about billions upon billions.

A new study suggests there are a mind-blowing 300 sextillion of them, or

three times as many as scientists previously calculated. That is a 3 followed by 23 zeros. Or 3 trillion times 100 billion.

The estimate, contained in a study published online Wednesday in the journal *Nature*, is based on findings that there are many more red dwarf stars - the most common star in the universe - than once thought.

But the research goes deeper than that. The study by Yale University astronomer Pieter van Dokkum and Harvard astrophysicist Charlie Conroy questions a key assumption that astronomers often use: that most galaxies have the same properties as our Milky Way. And that conclusion is deeply unsettling to astronomers who want a more orderly cosmos.

When scientists previously estimated the total number of stars, they assumed that all galaxies had the same ratio of dwarf stars as the Milky Way, which is spiral-shaped. Much of our understanding of the universe is based on observations made inside our own galaxy and then extrapolated to other galaxies.

But about one-third of the galaxies in the universe are elliptical, not spiral, and van Dokkum found they aren't really made up the same way as ours.

Using the Keck telescope in Hawaii, van Dokkum and a colleague gazed into eight distant, elliptical galaxies and looked at their hard-to-differentiate light signatures. The scientists calculated that elliptical galaxies have more red dwarf stars than predicted. A lot more. "We're seeing 10 or 20 times more stars than we expected," van Dokkum said.

Generally scientists believe there are 100 billion to a trillion galaxies in the universe. And each galaxy - the Milky Way included - was thought to have 100 billion to a trillion stars. Sagan, the Cornell University scientist and best-selling author who was often impersonated by comedians as saying "billions and billions," usually said there were 100 billion galaxies, each with 100 billion stars.

Van Dokkum's work takes these numbers and adjusts them. That's because some of those galaxies - the elliptical ones, which account for about a third of all galaxies - have as many as 1 trillion to 10 trillion stars, not a measly 100 billion. When van Dokkum and Conroy crunched the incredibly big numbers, they found that it tripled the estimate of stars in the universe to 300 sextillion from 100 sextillion.

That's a huge number to grasp, even for astronomers who are used to dealing in light years and trillions, Conroy said.

"It's fun because it gets you thinking about these large numbers," Conroy

said. Conroy looked up how many cells are in the average human body - 50 trillion or so - and multiplied that by the 6 billion people on Earth. And he came up with about 300 sextillion.

So the number of stars in the universe "is equal to all the cells in the humans on Earth - a kind of funny coincidence," Conroy said.

For the past month, astronomers have been buzzing about van Dokkum's findings, and many aren't too happy about them, said astronomer Richard Ellis of the California Institute of Technology.

Van Dokkum's paper challenges the assumption of "a more orderly universe" and gives credence to "the idea that the universe is more complicated than we think," Ellis said. "It's a little alarmist."

Ellis said it is too early to tell whether van Dokkum is right or wrong, but his work is shaking up the field "like a cat among pigeons."

Van Dokkum agreed, saying, "Frankly, it's a big pain."

Ellis said the new study does make sense. Its biggest weakness might be the assumption that the chemical composition of dwarf stars is the same in elliptical galaxies as in the Milky Way. That might be wrong, Ellis said. If it is, it would mean there are only five times more red dwarf stars in elliptical galaxies than previously thought, instead of 10 or 20, van Dokkum said.

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an odd coincidence

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Record - 28

DIALOG(R)

How many stars? More than thought,

Amina Khan,

Los Angeles Times, Home Edition ed, p13

Thursday, December 2, 2010

TEXT:

Here's a finding that may make some stargazers do a double-take through their telescopes: There may be three times as many stars in the universe as we thought. Fixing this astronomical miscalculation may force some researchers to reconsider what far-off galaxies really look like and how the stars within them came to be.

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The scientists looked at the light given off by these galaxies to determine what chemicals were present, and in what amounts -- revealing what kinds of stars they came from. They found strong signs of sodium and iron, which are typically found in feeble, low-mass stars. They calculated that the strength of the sodium and iron signatures was enough to raise the red-dwarf estimate within these galaxies by a factor of nine.

If that calculation holds for all elliptical galaxies -- one-third of all known galaxies -- that would triple the star census of the universe.

Ellis said the results are not ironclad, in part because the paper relies on an assumption of its own: that red dwarfs in other galaxies have the same proportion of sodium, iron and other chemicals as Milky Way red dwarfs

Should future studies confirm the findings, astronomers may have to redo all kinds of basic numbers. Among them: The young universe may have had different proportions of stars than it does today.

amina.khan @latimes.com

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Record - 29

DIALOG(R)

Twinkle, Twinkle, Perhaps Times Three,

KENNETH CHANG,
New York Times (NY), Late Edition - Final ed, p19,
Thursday, December 2, 2010

TEXT:

It really is full of stars.

Scientists said Wednesday that the number of stars in the universe had been seriously undercounted, and they estimated that there could be three times as many stars out there as had been thought.

This undercounting, of cool, dim dwarf stars in certain galaxies, could throw a monkey wrench into astronomers' understanding of how galaxies formed and grew over the eons.

"It's very problematic," said Pieter van Dokkum, a professor of astronomy at Yale who reported the findings in the journal *Nature* with Charlie Conroy of the Harvard-Smithsonian Center for Astrophysics in Cambridge, Mass. The conundrum is that astronomers cannot actually count the dwarf stars, which have masses less than a third of that of the Sun, in galaxies outside the Milky Way. So instead, they counted the brighter Sun-like stars and assumed that there were about 100 unseen dwarfs for each larger Sun-like star, as is the case in the Milky Way.

Yet not every galaxy looks like the Milky Way, with its spiraling pinwheel arms. Some are blobby and elliptical, and it was an untested assumption that the distribution of star sizes in elliptical galaxies is the same as in the Milky Way.

Dr. van Dokkum and Dr. Conroy took an innovative approach to counting what they could not see. Because the dwarfs are cooler, the fingerprint of certain colors they emit and absorb is different from that of larger stars. Thus, while they could not see individual stars, the astronomers could calculate the number of dwarfs required to produce the telltale color fingerprint they detected in the light coming from the whole galaxy.

And they found that in eight elliptical galaxies, the ratio of dwarf stars to Sun-like stars was 1,000 or 2,000 to 1, rather than the 100 to 1 in the Milky Way. A typical elliptical galaxy, thought to consist of about 100 billion stars, would have one trillion or more stars. Ellipticals account for about a third of all galaxies, leading to the new estimate of at least three times as many stars over all.

"We may have to abandon this notion of using the Milky Way as a template for the rest of the universe," Dr. van Dokkum said. If the findings are correct, an undercount of dwarfs would mean astronomers have underestimated the masses of galaxies, and that would mean that galaxies developed earlier

and faster than currently thought.

"Which would be very interesting, actually," said Richard Ellis, a professor of astronomy at the California Institute of Technology who was not involved in the research. "It's very important that papers like this are published so that we are reminded how fragile our knowledge of the universe is."

Yet Dr. Ellis said he remained skeptical. "It's good data and it's a sound analysis," he said, "but there are a few escape clauses."

For one, the research assumes that the stars in an elliptical galaxy are made of exactly the same stuff as those in spiral galaxies, an assumption that cannot be tested yet.

Also inconclusive: whether we now have three times as many wishes.

PHOTO (PHOTOGRAPH BY NASA HUBBLE SPACE TELESCOPE)

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Record - 30

DIALOG(R)

Scientific milestone as new 'Earth' is discovered,

Western Mail (UK), First ed, p16,

Thursday, December 2, 2010

TEXT:

A "SUPER-EARTH" orbiting a star 40 light years away could be a steamy waterworld, new research suggests.

The exoplanet, which is 2.6 times bigger than Earth, has given scientists their first chance to analyse the atmosphere of a world outside the Solar System. Astronomers using the European Southern Observatory's 3.6-metre telescope in Chile discovered possible evidence of water in the form of steam shrouding the planet.

Alternatively, the planet could have a mostly hydrogen atmosphere hidden beneath high clouds or hazes, as seen on Venus or Saturn's moon Titan.

Codenamed GJ 1214b, the planet lies in the constellation of Ophiuchus, the Serpent Bearer.

Since it hugs its parent star at a distance of only two million kilometres - 70 times closer than the Earth is to the Sun - conditions on its surface

are hot.

The astronomers carried out their study by analysing light coming from the star as the planet passed in front of it. Specific wavelengths of the starlight were absorbed by gases in the atmosphere, providing clues to its composition.

The findings were published in the journal Nature.

Before making the observations, scientists had predicted a steam atmosphere, a cloud-obscured hydrogen atmosphere, or a deep hydrogen-rich atmosphere like that of Neptune.

The measurements did not show tell-tale signs of hydrogen, thereby ruling out the third option.

Dr Jacob Bean, from the Harvard-Smithsonian Center for Astrophysics in Massachusetts, US, who led the scientists, said: "This is the first super-Earth to have its atmosphere analysed. We've reached a real milestone on the road toward characterising these worlds.

"Although we can't yet say exactly what that atmosphere is made of, it is an exciting step forward."

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Record - 31

DIALOG(R)

Full steam ahead on planet GJ1214b,

Irish Times, Weekly ed, p20,

Thursday, December 2, 2010

TEXT:

Thu, Dec 02, 2010 - An exoplanet discovered in 2009 is a 'super-earth' a bit like our own, but scientists say it's unlikely to be a good place to live given its sizzling temperatures and atmosphere of clouds or steam, writes DICK AHLSTROM, Science Editor

SCIENTISTS HAVE for the first time gathered direct information about the atmosphere surrounding a distant, earth-like planet. It wouldn't offer the best option for a home away from home however given astronomers believe it could have an atmosphere made up almost entirely of steam.

This is one of the key theories to emerge following an analysis of the

exoplanet GJ 1214b. While astronomers can readily calculate the size and mass of the more than 500 exoplanets so far discovered in orbit around distant stars, they have struggled to get hard information about their atmospheres.

This information gap has now narrowed in a study of the atmosphere surrounding GJ 1214b, published this morning in the journal *Nature*. The planet is classed as a "super-earth", a rocky planet like our own but measuring between twice and 10 times the Earth's mass. It was discovered in 2009 and is one of a special category of exoplanets because it "transits" - that means the planet orbits directly in front of its star as we view it.

This immediately opens up the possibility of trying to peer into its atmosphere, not directly but by analysing the starlight passing through it from behind.

That is exactly what a research team involving US and German scientists, led by Prof Jacob Bean of the Harvard-Smithsonian Centre for Astrophysics, did. They used the European Southern Observatory's Very Large Telescope to capture spectrographic information that offers intriguing but complex data about what surrounds GJ 1214b.

The planet is our near neighbour in a galactic sense but still lies 40 light-years away in the constellation Ophiuchus, the Serpent Bearer. Its radius is 2.6 times bigger than Earth's, it is about 6.5 times as massive and it orbits its sun once every 38 hours.

Whatever the atmosphere it must certainly be a sizzling place given that the planet orbits just two million kilometres away from its sun. Yet it is the spectrographic data rather than the orbiting diameter that makes the scientists speculate about a steamy atmosphere.

They knew the planet had a substantial atmosphere because its apparent mass - calculated by how strongly its gravity tugs on its star - was much bigger than that of the rocky planet alone.

Three theories had evolved on what the atmosphere contained. One held that it was mostly hydrogen gas, but the spectrographic data did not show hydrogen. Another suggested that it was mostly hydrogen but that this was masked by a cloudy haze of some kind floating high above the planet. While the scientists acknowledged this as a possibility, they could identify "no candidate" for what the clouds might be. The third theory held that the atmosphere was made up almost entirely of steam. "Of the models proposed for the planet . . . only the predicted spectra from cloud-free atmospheres composed predominantly of water vapour (steam) agree with our measured transmission spectrum," the authors write in *Nature*.

"We have reached a real milestone on the road toward characterising these worlds," Prof Bean said. "Although we can't yet say exactly what that atmosphere is made of, it is an exciting step forward to be able to narrow down the options for such a distant world to either steamy or hazy." They want to have a return look at GJ 1214b, but this time looking for spectrographic data for a different set of light wavelengths. These will give scientists a clearer view of whether it is clouds or steam that surround the planet.

Looking for planets in the Goldilocks zone

An exoplanet or extrasolar planet is a planet outside of our own solar system. Astronomers always believed that exoplanets must exist around other stars but it was not until 1992 that the first such planet was found in orbit around a pulsar. Many more followed and as of 23rd November the tally stands at 504, with numbers increasing almost daily.

The number rises rapidly today because astronomers have much better tools for finding and confirming exoplanets including ground and space-based telescopes and specialised orbiting satellites. One such satellite is Nasa's Kepler orbiting observatory. Launched in March last year, Kepler will stare for the next three years at a single slice of sky, allowing it to monitor 145,000 stars at one time.

It is watching for the minute dip in a star's light intensity caused when an orbiting planet transits or passes in front of the star as observed by Kepler. The current assumptions hold that at least 10 per cent of sun-like stars will have orbiting planets of their own and probably many more than that.

The planets come in all shapes and sizes and the most commonly and easily detected planets are similar to our own gas giants Jupiter and Saturn. Kepler is designed however to spot Earth-sized planets, ones that might orbit their sun-like stars in the "Goldilocks" zone, not so close as to be overly hot and not so far away as to leave the planet too cold for habitation.

Being able to detect an exoplanet's atmosphere is the next step, with astronomers looking for signs of biological activity.

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Record - 32

DIALOG(R)

La NASA descubre atmosfera en una "superTierra",

EFE Mundo,

Thursday, December 2, 2010

TEXT:

Washington, 1 dic (EFE).- Un equipo de astrónomos de la NASA estableció que el exoplaneta GJ1214b, descubierto el pasado año y situado a 40 años luz de la Tierra, está cubierto por una fina capa de vapor de agua o hidrógeno, informó hoy la agencia espacial.

Una "superTierra" es un planeta que es hasta tres veces más grande que la Tierra y un peso hasta diez veces superior, que orbita alrededor de una estrella fuera de nuestro sistema solar.

Los investigadores del Centro de Astrofísica Harvard-Smithsonian en Cambridge, usaron los grandes telescopios LVT, del Observatorio Europeo Austral (ESO), en Chile, para observar este planeta extrasolar.

Al pasar por delante de su estrella, los telescopios detectaron con su luz infrarroja algunos de los gases que recubren la atmósfera, pero todavía tienen que ahondar más en sus investigaciones.

El equipo determinó que el GJ1214b está cubierto con una fina capa de vapor de agua o rodeado de una gruesa capa de nubes alta, que sugiere que el planeta tiene una composición helada o rocosa, y podría ser similar a Neptuno, aunque mucho más pequeño.

"Esta es la primera superTierra que se sabe que tiene una atmósfera", dijo Jacob Bean, astrónomo y miembro del Centro Harvard-Smithsonian para Astrofísica en Cambridge (Massachusetts), aunque todavía no se puede determinar con exactitud de qué está formada la atmósfera.

El GJ1214b fue descubierto en diciembre de 2009, es 2,7 veces el tamaño de la Tierra y 6,5 veces su masa, observaciones anteriores han demostrado que tiene una baja densidad, por lo que los astrónomos creen que se trata de un cuerpo sólido con una atmósfera.

El planeta orbita cerca de su estrella oscura, a una distancia de 0.014 unidades astronómicas (una unidad que es aproximadamente igual a la distancia media entre la Tierra y el Sol -aproximadamente 150 millones de kilómetros-) por lo que consideran que está demasiado cerca de su estrella como para ser habitable por cualquier forma de vida.

Esta técnica se ha utilizado para estudiar las atmósferas de planetas lejanos calientes como Júpiter, donde se encuentran gases como el hidrógeno, el metano y de vapor de sodio.

En el caso de la superTierra no se han detectado huellas químicas, sin embargo, esto no significa que no hay sustancias químicas presentes. EFE

elv/pgp/dmt

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Record - 33

DIALOG(R)

Scientists analyse a 'super-earth',
New Zealand Press Association,
Thursday, December 2, 2010

TEXT:

London, Dec 1 PA - A "super-Earth" orbiting a star 40 light years away could be a steamy waterworld, new research suggests.

The exoplanet, which is 2.6 times bigger than Earth, has given scientists their first chance to analyse the atmosphere of a world outside the Solar System.

Astronomers using the European Southern Observatory's 3.6-metre telescope in Chile discovered possible evidence of water in the form of steam shrouding the planet.

Alternatively, the planet could have a mostly hydrogen atmosphere hidden beneath high clouds or hazes, as seen on Venus or Saturn's moon Titan. Codenamed GJ 1214b, the planet lies in the constellation of Ophiuchus, the Serpent Bearer.

Since it hugs its parent star at a distance of only two million kilometres - 70 times closer than the Earth is to the Sun - conditions on its surface are hot.

The astronomers carried out their study by analysing light coming from the star as the planet passed in front of it.

Specific wavelengths of the starlight were absorbed by gases in the atmosphere, providing clues to its composition.

The findings were published in the journal Nature.

Before making the observations, scientists had predicted a steam atmosphere, a cloud-obscured hydrogen atmosphere, or a deep hydrogen-rich

atmosphere like that of Neptune.

The measurements did not show tell-tale signs of hydrogen, thereby ruling out the third option.

Dr Jacob Bean, from the Harvard-Smithsonian Centre for Astrophysics in Massachusetts, US, who led the scientists, said: "This is the first super-Earth to have its atmosphere analysed. We've reached a real milestone on the road toward characterising these worlds.

"Although we can't yet say exactly what that atmosphere is made of, it is an exciting step forward to be able to narrow down the options for such a distant world to either steamy or hazy.

"Follow-up observations in longer wavelength infrared light are now needed to determine which of these atmospheres exists on GJ 1214b."

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Record - 34

DIALOG(R)

Study suggests universe could have triple the number of stars we thought,

SETH BORENSTEIN,

Canadian Press,

Wednesday, December 1, 2010

TEXT:

WASHINGTON _ The night sky may be a lot starrier than we thought.

A study suggests the universe could have triple the number of stars scientists previously calculated. For those of you counting at home, the new estimate is 300,000,000,000,000,000,000. That's 300 sextillion.

The study questions a key assumption that astronomers often use: that most galaxies have the same properties as our Milky Way. And that's creating a bit of a stink among astronomers who want a more orderly cosmos.

It's one of two studies being published online Wednesday in the journal Nature that focus on red dwarf stars, the most common stars in the universe. The study that offers the new estimate on stars is led by a Yale University astronomer. He calculates that there are far more red dwarfs

than previously thought, and that inflates the total star count.

A second study led by a Harvard University scientist focuses on a distant "super Earth" planet and sees clues to the content of its atmosphere — the first of this kind of data for this size planet. It orbits a red dwarf.

Red dwarf stars — about a fifth the size of our sun — burn slowly and last much longer than the bigger, brighter stars, such as the sun in the centre of our solar system, said Yale astronomer Pieter van Dokkum. His study looks at how many red dwarfs are in elliptical-shaped galaxies.

When scientists had estimated previously how many stars there were in the universe, they assumed that all galaxies had the same ratio of dwarf stars as in our galaxy, which is spiral-shaped. Much of our understanding of the universe is based on observations inside our Milky Way and then extrapolated to other galaxies.

But about one-third of the galaxies in the universe are not spiral, but elliptical, and van Dokkum found they aren't really made up the same way as ours.

Using the Keck telescope in Hawaii, van Dokkum and a colleague gazed into eight other distant, but elliptical, galaxies and looked at their hard-to-differentiate light signatures. The scientists calculated that elliptical galaxies have more of those dwarf stars. A lot more.

"We're seeing 10 or 20 times more stars than we expected," van Dokkum said. By his calculations, that triples the number of estimated stars from 100 sextillion to 300 sextillion.

For the past month, astronomers have been buzzing about van Dokkum's findings, and many aren't too happy about it, said astronomer Richard Ellis of the California Institute of Technology.

Van Dokkum's paper challenges the assumption of "a more orderly universe" and gives credence to "the idea that the universe is more complicated than we think," Ellis said. "It's a little alarmist."

Ellis said it is too early to tell if van Dokkum is right or wrong, but it is shaking up the field "like a cat among pigeons."

Van Dokkum agreed, saying, "Frankly, it's a big pain."

Ellis said the new study does make sense. Its biggest weakness might be its assumption that the chemical composition of dwarf stars is the same in elliptical galaxies as in the Milky Way. That might be wrong, Ellis said.

Even if it is, it would mean there are only five times more red dwarf stars in elliptical galaxies than scientists previously thought, instead of 10 or 20, van Dokkum said.

Slightly closer to home, at least in our own galaxy, one dwarf star has astronomers at Harvard taking another step in their search for life. They were able to home in on the atmosphere of a planet circling that star using the European Southern Observatory's Very Large Telescope in Chile. The planet lives up to the word alien.

Their paper reports that this giant planet's atmosphere is either dense with sizzling water vapour like a souped-up steam bath, or it's full of hazy, choking hydrogen and helium clouds with a slightly blue tint. The latter is more likely, say the researchers and others not involved in the study.

While scientists have been able to figure out the atmosphere of gas giants the size of Jupiter or bigger, this is a first for the type of planet called a super Earth _ something with a mass two to 10 times Earth's. It is more comparable to Neptune and circles a star about 42 light years from Earth. A light year is nearly 9.5 trillion kilometres.

And while this planet is nowhere near livable _ it's about 225 degrees Celsius _ characterizing its atmosphere is a big step toward understanding potentially habitable planets outside our solar system, said study chief author Jacob Bean at the Harvard Smithsonian Center for Astrophysics.

"You wouldn't want to be there. It would be unpleasant," said study co-author Eliza Kempton of the University of California Santa Clara.

Bean and Kempton looked at the light spectrum signature from the large planet as it passed in front of the dwarf star, and the result led to two possible conclusions: steam bath or haze.

The steam bath is the more interesting possibility because water is key to life, said outside scientist Alan Boss of the Carnegie Institution of Washington.

But an upcoming and still unpublished study by Kempton and Bryce Croll at the University of Toronto points more toward a hydrogen-helium atmosphere, several astronomers said.

Online:

Nature: <http://www.nature.com/nature>

Record - 35

DIALOG(R)

'Milestone' in bid to sniff atmosphere of a 'super Earth' light-years away,

Pete Spotts Staff writer,

Christian Science Monitor (USA), ALL ed,

Wednesday, December 1, 2010

TEXT:

Some 40 light years from Earth, well within the sun's galactic "neighborhood," a planet nearly three times the size of Earth orbits a dim, low-mass star much smaller than the sun.

Recent observations indicated that the planet, a so-called "super Earth," has an atmosphere, and scientists Wednesday were applauding reports of the first measurements aimed at determining the kind of atmosphere the planet has. Measurements that were taken despite the planet's distance, the star's dimness, and its relatively small size. It was also the first time ever that measurements have been taken of a super Earth's atmosphere.

At this stage, "process of elimination" is the operative phrase. In the results reported Wednesday, a team of astronomers led by Jacob Bean at the Harvard-Smithsonian Center for Astrophysics in Cambridge, Mass., use their data to rule out one of three broad types of atmosphere that others had suggested the planet could have.

"Even with these new measurements, we can't say yet what that atmosphere is made of," said Dr. Bean. Still, the ability to rule out one possibility represents "a milestone on the road toward characterizing these worlds," he added in a prepared statement.

Atmosphere indicated by planet's low density
Last December, another team of astronomers announced that they'd discovered the planet, dubbed GL 1214b. Data they gathered watching the star's light dim and brighten as the planet crossed in front of it indicated a planet with nearly seven times Earth's mass. Yet when the team estimated the planet's density, it was too low for a planet of its size and mass if the planet was made entirely from rock and water ice.

Modeling results suggested that the planet itself was smaller than the observed radius, with the rest of the volume the team measured taken up with an atmosphere, perhaps consisting of steam. Other models pointed to an atmosphere made largely of hydrogen and helium gas. Still others suggested

a haze- or cloud-shrouded atmosphere like Venus's or like the atmosphere blanketing Saturn's moon Titan.

The results reported Wednesday in the journal *Nature* suggest that scientists can drop the hydrogen-helium possibility.

Interest in characterizing the atmospheres of extrasolar planets (and particularly those beginning to approximate Earth's size and mass) stems not only from a desire to fine tune the technologies that allow for such studies. A planet's atmosphere also can yield clues about its history.

For instance, the team notes that if the atmosphere is essentially steam, the planet likely would have had a high water-ice content at some point, implying that the planet could have first formed beyond the system's "snow line," a rough distance from the sun where compounds such as water, methane, and ammonia freeze out as ices.

The researchers gathered their data using the European Southern Observatory's Very Large Telescope in Chile. They measured the spectra from the star as the planet passed in front of it. The brightness of the star's spectrum varies with the light's wavelength as the starlight encounters different molecules in the planet's atmosphere. Thus the molecules in effect imprint their signatures on the starlight.

Hydrogen ruled out The planet's apparent size and density clearly point to the presence of an atmosphere. However the team saw no telltale variation in the star's spectrum that would reveal the atmosphere's composition. That allowed them to rule out the hydrogen explanation.

The planet is so close to its host star, that an atmosphere made up of hydrogen, a light gas, would be heated and expand, forming an extended envelope around the planet. Thus any starlight passing through would encounter lots of hydrogen molecules, making the hydrogen relatively easy to spot.

But the absence of evidence is not necessarily the evidence of absence.

The researchers posit that the atmosphere could exist in a dense layer relatively close to the planet's surface, a condition that would yield a very weak effect on the spectrum compared with an extended envelope of hydrogen. Or, they add, any spectral fingerprints could be too faint to pick up because clouds or haze block the light at the wavelengths the team used in its observations.

The Hubble Space Telescope should be able to help solve the mystery of GL 1214b's atmosphere because it operates at wavelengths of light that may overcome some of the limitations the team faced with its ground-based

spectroscope, notes Drake Deming, a researcher at NASA's Goddard Space Flight Center in Greenbelt, Md. He points out that time on the orbiting observatory already has been allotted for studying GL 1214b. And the James Webb Space Telescope, which currently is slated for launch in 2014, should be able to characterize the planet's atmosphere in still greater detail, he notes.

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Record - 36

DIALOG(R)

Universe might hold three times more stars than previously thought,

Pete Spotts - Staff writer,
Christian Science Monitor (USA), ALL ed,
Wednesday, December 1, 2010

TEXT:

It's a cosmic embarrassment of riches - the universe appears to hold three times the number of stars many astronomers might have estimated only a year ago.

That's the implication a pair of scientists has drawn after measuring eight huge elliptical galaxies that they selected from two vast galaxy clusters located between 53 million to 321 million light-years from Earth.

With as many as 200 billion galaxies in the observable universe, each with hundreds of billions of stars, the result - if it holds up - implies an enormous number of additional burning gas balls out there, with intriguing implications for explanations of how stars and galaxies form and evolve, researchers say.

IN PICTURES: Where stars form

The cause of this huge revision of the stellar census are stars known as red dwarfs, literally the dimmest stellar bulbs on the shelf. These stars weigh in at no more than about 30 percent of the sun's mass.

Surveys of our own galaxy, the Milky Way, have found that these dwarfs outnumber sun-like stars by about 100 to 1, explains Pieter van Dokkum, an astronomer at Yale University in New Haven, Conn. But the dwarfs are so dim and other galaxies so distant that red dwarfs fail to appear when astronomers try to account for the stars other galaxies contain.

As a consequence, when estimating how much of a galaxy's mass stars account for a(euro)" important to understanding a galaxy's life history a(euro)"

astronomers basically had to assume that the relative abundance of red-dwarf stars found in the Milky Way held true throughout the universe for every galaxy type and at every epoch of the universe's evolution, Dr. van Dokkum says.

"We always knew that was sort of a stretch, but it was the only thing we had. Until you see evidence to the contrary you kind of go with that assumption," he says.

Initial evidence that other galaxies might hold larger populations of red dwarfs appeared nearly 20 years ago, when a team of astronomers claimed to have spotted evidence for these dim, low-mass stars in other galaxies. The results were fascinating, but many scientists considered the data ambiguous.

How they did it In 2009, however, the Keck Observatory atop Hawaii's Mauna Kea modified a spectrometer used by one of its twin 10-meter telescopes, improving the likelihood of detecting these dim stars beyond the Milky Way.

Van Dokkum and colleague Charlie Conroy with the Harvard-Smithsonian Center for Astrophysics, in Cambridge, Mass., used the spectrometer to hunt for evidence of red dwarfs in eight bright elliptical galaxies, four in the Coma cluster and four in the nearer Virgo cluster.

These stellar bulbs may be dim individually, but if they exist there in sufficient numbers, and the spectrometer gathered the still-dim light long enough to yield a decent exposure, the unique spectral "fingerprints" for red dwarfs should appear, they reasoned.

Indeed, the fingerprints they sought appeared and were strong enough to suggest that there are about 1,000 red dwarfs in these galaxies for each sun-like star, and that they account for about 60 percent of the mass of all the stars in these galaxies.

Elliptical galaxies, essentially the oldest galaxies in the cosmos, make up only about a third of all the galaxies out there. But they hold so many more stars than other types of galaxies that their newly identified red-dwarf populations triple the number of stars in the cosmos.

In recent years, astrophysicists have put forward some plausible theoretical reasons for expecting the universe to hold more stars than previously estimated, notes Betsy Barton, an astronomer at the University of California at Irvine who has focused her research on galaxy evolution.

Still, "this is a big deal," she says of the results.

A clue in dark matter mystery For some, it may come as welcome news. If

observations of additional elliptical galaxies confirm the new results, it would solve one puzzle involving these galaxies and so-called dark matter (a term used to describe an as-yet unidentified form of matter that gives off no light, hence the term "dark," but whose gravitational influence is pervasive).

Astrophysicists say that without dark matter's additional mass, galaxies would fly apart as they spin because the visible matter present lacks the mass, hence the gravity, needed to hold the galaxies together.

Elliptical galaxies posed a problem: The motions of the stars they contained implied that they had more mass than one would get by adding the mass of the normal matter astronomers observed to the expected amount of dark matter in the neighborhood. Some suggested that ellipticals somehow had extra dark matter associated with them.

Instead, the newly detected red dwarfs could account for the difference, van Dokkum says.

What you see is not what you get. But the find also adds an element of complexity to galaxy studies, he adds.

Scientists gauge the mass of a distant galaxy by its intrinsic brightness. But only the brightest, most massive stars, which tend to be the fewest in number, provide enough light to reach Earth-bound telescopes. Astronomers have to extrapolate to estimate the relative abundance of stars in other mass ranges, based what they've gleaned about the distribution of stellar masses in our own galaxy.

"Now, it turns out that two galaxies can have the same light coming off of them, but they might have very different masses because they have a different number of these very low-mass stars," van Dokkum explains.

Still, the results need to be taken with caution, he acknowledges. When it comes to red dwarfs, astronomers "have made the mistake of assuming that the Milky Way was typical of all galaxies in the universe," he says. "We shouldn't make the mistake of assuming that these eight elliptical galaxies are representatives for all elliptical galaxies in the universe."

To that end, he says he's off to Keck this weekend to expand his hunt for the elusive red dwarfs in additional elliptical galaxies.

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DIALOG(R)

Astronomers note 'super-Earth' atmosphere,

UPI Science News,

Wednesday, December 1, 2010

TEXT:

U.S. astronomers say they've made the first measurements of the atmosphere of a distant "super-Earth" orbiting a far-off star.

Scientists at the Harvard-Smithsonian Center for Astrophysics say their first look at the atmosphere of the planet known as GJ 1214b raises as many questions as it answers, a Harvard release reported Wednesday.

"This is the first super-Earth known to have an atmosphere," astronomer Jacob Bean says. "But even with these new measurements we can't say yet what that atmosphere is made of. This world is being very shy and veiling its true nature from us."

GJ 1214b is 2.7 times the size of Earth and 6.5 times as massive, and is likely to be mostly a solid combination of rock or ices, unlike the hundreds of Jupiter-sized gas giants found to date around distant stars, the researchers say.

Scientists have theorized three atmospheric possibilities for GJ 1214b. The most intriguing was a thick blanket of steam vaporized by the nearby star. The second possibility was a mini-Neptune with a rocky core surrounded by ices and a hydrogen/helium atmosphere, and the third suggestion has no equivalent in our solar system: a big, rocky world with a soupy mix of gases, mainly hydrogen, recently emitted by volcanoes.

"A lot of people are putting this planet under a microscope," Bean says. "In the next year, we should have some solid answers about what it's truly like."

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Record - 38

DIALOG(R)

NASA Aids First Characterization Of Super-Earth Atmosphere,

National Aeronautics and Space Administration Documents,

Wednesday, December 1, 2010

TEXT:

Dec. 1, 2010

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RELEASE: 10-318

NASA AIDS FIRST CHARACTERIZATION OF SUPER-EARTH ATMOSPHERE

WASHINGTON -- A team of astronomers, including two NASA Sagan Fellows, has made the first characterizations of a super-Earth's atmosphere by using a ground-based telescope. A super-Earth is a planet up to three times the size of Earth and weighing up to 10 times as much. The findings, reported in the Dec. 2 issue of the journal *Nature*, are a significant milestone toward eventually being able to probe the atmospheres of Earth-like planets for signs of life.

The team determined the planet, GJ 1214b, is either blanketed with a thin layer of water steam or surrounded by a thick layer of high clouds. If the former, the planet itself would have an icy composition. If the latter, the planet would be rocky or similar to the composition of Neptune, though much smaller.

"This is the first super-Earth known to have an atmosphere," said Jacob Bean, a NASA Sagan Fellow and astronomer at the Harvard-**Smithsonian** Center for Astrophysics in Cambridge, Mass. "But even with these new measurements, we can't say yet what that atmosphere is made of. This world is being very shy and veiling its true nature from us."

GJ 1214b, first discovered in December 2009, is 2.7 times the size of Earth and 6.5 times as massive. Previous observations of the planet's size and mass demonstrated it has a low density for its size, leading astronomers to conclude the planet is some kind of solid body with an atmosphere. The planet orbits close to its dim star, at a distance of 0.014 astronomical units. An astronomical unit is the distance between Earth and the sun, approximately 93 million miles. GJ 1214b circles too close to its star to be habitable by any life forms.

Bean and his team observed infrared light as the planet crossed in front of its star. During such transits, the star's light filters through the atmosphere. Gases absorb the starlight at particular wavelengths, leaving behind chemical fingerprints detectable from Earth. This same type of technique has been used to study the atmospheres of distant "hot Jupiters,"

or Jupiter-like planets orbiting close to their stars, and found gases like hydrogen, methane and sodium vapor.

In the case of the super-Earth, no chemical fingerprints were detected; however, this doesn't mean there are no chemicals present. Instead, this information ruled out some possibilities for GJ 1214b's atmosphere, and narrowed the scope to either an atmosphere of water steam or high clouds. Astronomers believe it's more likely the the atmosphere is too thin around the planet to let enough light filter through and reveal chemical fingerprints.

"A steamy atmosphere would have to be very dense -- about one-fifth water vapor by volume -- compared to our Earth, with an atmosphere that's four-fifths nitrogen and one-fifth oxygen with only a touch of water vapor," Bean said. "During the next year, we should have some solid answers about what this planet is truly like."

The team, which included Bean's co-authors - Eliza Miller-Ricci Kempton, a NASA Sagan Fellow at the University of California in Santa Cruz, and Derek Homeier of the Institute for Astrophysics in Gottingen, Germany - examined GJ 1214b using the ground-based Very Large Telescope at Paranal Observatory in Chile.

"This is an important step forward, narrowing our understanding of the atmosphere of this planet," said NASA Exoplanet Exploration Program Scientist Douglas Hudgins. "Bizarre worlds like this make exoplanet science one of the most compelling areas in astrophysics today."

The Sagan Fellowship Program is administered by the NASA Exoplanet Science Institute at the California Institute of Technology in Pasadena. Its purpose is to advance the scientific and technical goals of NASA's Exoplanet Exploration Program. The program is managed for NASA by the Jet Propulsion Laboratory in Pasadena, Calif.

For information about NASA's planet-finding missions, visit:

<http://planetquest.jpl.nasa.gov>

For information about NASA's Sagan Fellowship Program, visit:

<http://nexsci.caltech.edu/sagan>

- -end-

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Record - 39

DIALOG(R)

Starry, starry night: Star count may triple,

SETH BORENSTEIN,

AP Alert – Science,

Wednesday, December 1, 2010

TEXT:

WASHINGTON_The universe may glitter with far more stars than even renowned astronomer Carl Sagan imagined when he rhapsodized about billions upon billions.

A new study suggests there are a mind-blowing 300 sextillion of them, or three times as many as scientists previously calculated. That is a 3 followed by 23 zeros. Or 3 trillion times 100 billion.

The estimate, contained in a study published online Wednesday in the journal *Nature*, is based on findings that there are many more red dwarf stars _ the most common star in the universe _ than once thought.

But the research goes deeper than that. The study by Yale University astronomer Pieter van Dokkum and Harvard astrophysicist Charlie Conroy questions a key assumption that astronomers often use: that most galaxies have the same properties as our Milky Way. And that conclusion is deeply unsettling to astronomers who want a more orderly cosmos.

When scientists previously estimated the total number of stars, they assumed that all galaxies had the same ratio of dwarf stars as the Milky Way, which is spiral-shaped. Much of our understanding of the universe is based on observations made inside our own galaxy and then extrapolated to other galaxies.

But about one-third of the galaxies in the universe are elliptical, not spiral, and van Dokkum found they aren't really made up the same way as ours.

Using the Keck telescope in Hawaii, van Dokkum and a colleague gazed into eight distant, elliptical galaxies and looked at their hard-to-differentiate light signatures. The scientists calculated that elliptical galaxies have more red dwarf stars than predicted. A lot more.

"We're seeing 10 or 20 times more stars than we expected," van Dokkum said.

Generally scientists believe there are 100 billion to a trillion galaxies in the universe. And each galaxy _ the Milky Way included _ was thought to

have 100 billion to a trillion stars. Sagan, the Cornell University scientist and best-selling author who was often impersonated by comedians as saying "billions and billions," usually said there were 100 billion galaxies, each with 100 billion stars.

Van Dokkum's work takes these numbers and adjusts them. That's because some of those galaxies _ the elliptical ones, which account for about a third of all galaxies _ have as many as 1 trillion to 10 trillion stars, not a measly 100 billion. When van Dokkum and Conroy crunched the incredibly big numbers, they found that it tripled the estimate of stars in the universe from 100 sextillion to 300 sextillion.

That's a huge number to grasp, even for astronomers who are used to dealing in light years and trillions, Conroy said.

"It's fun because it gets you thinking about these large numbers," Conroy said. Conroy looked up how many cells are in the average human body _ 50 trillion or so _ and multiplied that by the 6 billion people on Earth. And he came up with about 300 sextillion.

So the number of stars in the universe "is equal to all the cells in the humans on Earth _ a kind of funny coincidence," Conroy said.

For the past month, astronomers have been buzzing about van Dokkum's findings, and many aren't too happy about them, said astronomer Richard Ellis of the California Institute of Technology.

Van Dokkum's paper challenges the assumption of "a more orderly universe" and gives credence to "the idea that the universe is more complicated than we think," Ellis said. "It's a little alarmist."

Ellis said it is too early to tell if van Dokkum is right or wrong, but his work is shaking up the field "like a cat among pigeons."

Van Dokkum agreed, saying, "Frankly, it's a big pain."

Ellis said the new study does make sense. Its biggest weakness might be the assumption that the chemical composition of dwarf stars is the same in elliptical galaxies as in the Milky Way. That might be wrong, Ellis said. If it is, it would mean there are only five times more red dwarf stars in elliptical galaxies than previously thought, instead of 10 or 20, van Dokkum said.

Slightly closer to home, at least in our own galaxy, another study also published in Nature looks at a single red dwarf star in a way that is a step forward in astronomers' search for life beyond Earth. A team led by a

Harvard scientist was able to home in on the atmosphere of a planet circling that star, using the European Southern Observatory's Very Large Telescope in Chile.

The planet lives up to the word alien. The team reports that this giant planet's atmosphere is either dense with sizzling water vapor like a souped-up steam bath, or it is full of hazy, choking hydrogen and helium clouds with a slightly blue tint. The latter is more likely, say the researchers and others not involved in the study.

While scientists have been able to figure out the atmosphere of gas giants the size of Jupiter or bigger, this is a first for the type of planet called a super Earth _ something with a mass 2 to 10 times Earth's. The planet is more comparable to Neptune and circles a star about 42 light years from Earth. A light year is nearly 6 trillion miles. (10 trillion kilometer)

The planet is nowhere near livable _ it's about 440 degrees (about 225 degrees Celsius). "You wouldn't want to be there. It would be unpleasant," said study co-author Eliza Kempton of the University of California Santa Clara.

But describing its atmosphere is a big step toward understanding potentially habitable planets outside our solar system, said study chief author Jacob Bean at the Harvard Smithsonian Center for Astrophysics. Bean and Kempton looked at the light spectrum signature from the large planet as it passed in front of the dwarf star, and the result led to two possible conclusions: steam bath or haze.

The steam bath is the more interesting possibility because water is key to life, said outside scientist Alan Boss of the Carnegie Institution of Washington.

But an upcoming and still unpublished study by Kempton and Bryce Croll at the University of Toronto points more toward a hydrogen-helium atmosphere, several astronomers said.

Online:

Nature: <http://www.nature.com/nature>

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Record - 40

DIALOG(R)

Universe may have more stars than thought,

UPI Science News,

Wednesday, December 1, 2010

TEXT:

The observable universe may hold as many as three times the number of stars previously estimated by astronomers just a year ago, U.S. researchers say.

Astronomers at Yale University said a particular kind of galaxy may contain 10 times more red dwarf stars than thought, which would triple the number of stars in the universe as a whole, the Christian Science Monitor reported Wednesday.

The Yale researchers surveyed eight huge elliptical galaxies selected from two vast galaxy clusters 53 million to 321 million light-years from Earth.

Surveys of our own galaxy, the Milky Way, have found red dwarfs outnumber sun-like stars by about 100 to 1, Yale astronomer Pieter van Dokkum said. But the dwarfs are so dim and other galaxies so distant that red dwarfs fail to appear when astronomers try to account for the stars other galaxies contain, he said.

Astronomers had to assume the abundance of red-dwarf stars in the Milky Way held true throughout the universe for every galaxy type, van Dokkum said.

"We always knew that was sort of a stretch, but it was the only thing we had. Until you see evidence to the contrary you kind of go with that assumption," he said.

He and colleague Charlie Conroy with the Harvard-Smithsonian Center for Astrophysics used an improved spectrometer at the Keck Observatory in Hawaii to hunt for evidence of red dwarfs in the eight distant galaxies to come up with their new estimate.

Still, the results need to be taken with caution, van Dokkum acknowledges.

When it comes to red dwarfs, astronomers "have made the mistake of assuming that the Milky Way was typical of all galaxies in the universe," he said.

"We shouldn't make the mistake of assuming that these eight elliptical galaxies are representatives for all elliptical galaxies in the universe."

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Record - 41

DIALOG(R)

Astronomos analizan atmosfera de lejana estrella similar a la Tierra,

dpa, International Services in Spanish,

Wednesday, December 1, 2010

TEXT:

Londres/Gotinga (Alemania), 1 dic (dpa) - Un equipo de astrónomos alemanes y estadounidenses analizó por primera vez la atmósfera de un planeta similar a la Tierra, que orbita alrededor de una estrella enana roja.

Las observaciones muestran que el planeta posee mucho vapor de agua en la atmósfera y hasta está envuelto en densas nubes, indicaron los especialistas en un artículo publicado en la revista británica "Nature" (volumen 468, número 7324, páginas 669-672). Posiblemente, tiene un océano hirviente en su superficie.

El planeta que tiene la denominación GJ 1214b orbita una estrella enana roja en la constelación de Ofiuco. El sistema, descubierto en 2009, pertenece a la vecindad cósmica de la Tierra y está a una distancia de la misma de unos 40 años-luz. Un año-luz es la distancia que recorre la luz en un año y corresponde poco menos de diez billones de kilómetros.

GJ 1214b es considerada una "supertierra": su diámetro es unas 2,6 veces mayor que la de la Tierra y tiene una masa unas 6,5 veces mayor que la misma.

Los astrónomos postularon diferentes hipótesis relacionadas con este exoplaneta: o se trata de un planeta rocoso, como la Tierra, que posiblemente hasta posee agua en su superficie, o se asemeja más a un satélite del planeta gaseoso Neptuno, con una atmósfera rica en hidrógeno y un pequeño núcleo rocoso.

Con los instrumentos del Observatorio Europeo Austral (ESO), los astrónomos encabezados por Jacob Bean de la Universidad de Gotinga y el Centro Harvard Smithsonian de Astrofísica analizaron la atmósfera de la supertierra. Esto es posible porque visto desde la Tierra, pasa cada 38 horas por delante de la estrella a la que orbita. La atmósfera del planeta es entonces iluminada por la radiación que emite la estrella.

Al analizar la atmósfera iluminada, los astrónomos no pudieron descubrir hidrógeno, lo que refuerza la hipótesis de que la atmósfera está dominada por vapor de agua.

Ya cuando descubrieron la supertierra, los astrónomos especularon sobre la presencia de agua en su superficie.

Pero debido a la escasa distancia del planeta a su estrella, el agua debe evaporarse. En el exoplaneta se estima que la temperatura alcanza alrededor de 200 grados Celsius, por lo que es improbable que haya vida allí.

También en otros exoplanetas se halló agua y los astrónomos analizaron la atmósfera de otros exoplanetas grandes. Sin embargo, el GJ 1214b es el primer exoplaneta similar a la Tierra en el que se logra esto.

dpa tim eig box

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Record - 42

DIALOG(R)

BLACKLIGHT POWER ANNOUNCES PROD'N OF ELECTRICITY FROM HYDROGEN,

Asia Pulse,

Tuesday, November 30, 2010

TEXT:

(Full text of a statement. Contact details below.)

(BW)(NJ-BLACKLIGHT-POWER) BlackLight Power, Inc. Announces Production of Electricity from a New Form of Hydrogen

Independent studies validate breakthrough non-polluting energy source based on hydrino theory

Energy Editors

CRANBURY, N.J.--(BUSINESS WIRE) - Nov. 29, 2010-- BlackLight Power, Inc.

(BLP) today announced that CIHT (Catalyst-Induced-Hydrino-Transition) technology has been independently confirmed by Dr. K.V. Ramanujachary, Rowan University Meritorious Professor of Chemistry and Biochemistry.

"We have demonstrated the ability to produce electrical power using chemical systems for the direct production of electric power from the conversion of hydrogen to hydrinos, a more stable form of hydrogen,"

said Dr. Randell Mills, Chairman, CEO and President of BlackLight Power, Inc. "CIHT has a forecasted nominal cost per unit of power compared to that of thermal-based systems and produces electricity without requiring

enormous thermally-driven mechanical generators. Consequently, more rapid dissemination is expected by deploying many autonomous distributed units that circumvent the huge barriers of entry into the power markets such as developing and building massive billion-dollar power plants with their associated power distribution infrastructure. This is especially true in emerging markets."

BlackLight Power is first focused on advancing CIHT technology to produce power to ultimately sell directly to consumers under power purchase agreements.

"The business plan is akin to that of solar leasing, but the costs are potentially vastly cheaper, and the systems may be deployable for essentially all applications of all scales untethered to the Sun or the grid, or as in the case of fuel cells and cars, a fuel supply," said Dr.

Mills. "To realize how transformational this technology will be, imagine that an electric car can travel over 5,000 miles on the hydrogen energy from a gallon of water without any pollution whatsoever. The power source can then be lifted out and plugged into your electrical panel to power your home with enough power to spare to also power your neighborhood," continued Dr. Mills.

Akridge Energy, a licensee, intends to deploy distributed-scale CIHT electric power units at commercial real estate properties and sell electricity to its tenants and eventually into the local electric grid.

John E. Akridge III, chairman and owner of Akridge Energy said, "BLP's breakthrough CIHT technology will allow us to become a major green-power producer for the DC metro area while enabling dramatic savings and unheard of independence. It is ideal for our needs across the full spectrum of our applications: powering apartment complexes, commercial offices, retail outlets, and mixed-use projects."

Dr. K.V. Ramanujachary said, "The chemicals used in CIHT technology are similar to those used in thermal and chemical cells that were separately, thoroughly and diligently validated over the past three years by a team at Rowan University that included myself. Since the measurements on CIHT are electrical versus calorimetric, there can be no dispute over the power and the energy balance. With further optimization, there is no doubt that this technology will present an economically viable and environmentally benign alternate to meet Global energy needs. If advanced to commercialization, it would be one of the most profound developments ever."

Completion of Thermal Energy Balance and Chemical Characterization of Solids Fuels at Rowan University

Additionally, an expanded team of scientists and engineers at Rowan University completed a thorough year-long series of additional testing of the thermal systems following the announcement and release of their validations in October 2008 and August 2009. Using BLP's proprietary solid-fuel chemistry capable of continuous regeneration, independently formulated and tested fuels generated on-demand energy greater than that of combustion at power levels of kilowatts. Furthermore, when using BLP's chemical process, Rowan University professors reported a net energy gain of up to 6.5 times the maximum energy potential of these materials from known chemical reactions.

In a joint statement, Dr. K.V. Ramanujachary, Rowan University Meritorious Professor of Chemistry and Biochemistry, Dr. Amos Mugweru, Assistant Professor of Chemistry, Dr. John L. Schmalzel P.E., Professor of Engineering and Dr. Peter Jansson P.E., Associate Professor of Engineering said, "In additional independent tests conducted over the last 12 months involving 13 solid fuel mixtures made by us from commercially-available chemicals confirmed by multiple analyses, our team of engineering and chemistry professors, staff and students at Rowan University has independently and consistently generated energy in excesses ranging from 1.3 times to 6.5 times the maximum theoretical heat available through known chemical reactions."

Chemists Drs. Ramanujachary and Mugweru said, "Additionally, we have analyzed the reactants and reaction products and are confident that the procedures we have followed and chemicals we have procured, characterized, and reacted are not capable of generating the quantities of heat we have observed with previously known chemistry. This significant development makes it readily possible for other laboratories to demonstrate the repeatability of these reactions that produce anomalous heat regularly in our university laboratory. Moreover, we have also reproduced BLP's tests for the third time that identify a new form of hydrogen as the likely explanation of the additional heat produced."

Light Signature of Hydrino

BLP also announced today the replication of the extraordinary high-energy light emission below 80 nm from hydrogen at the Harvard Smithsonian Center for Astrophysics (CfA). These results, previously thought to be impossible based on past theory, are predicted to be from the formation of hydrinos. The direct spectral observation of transitions of hydrogen to form hydrinos and their ubiquitous astrophysical presence as the identity of the dark matter of the universe were published in a paper entitled "Hydrino Continuum Transitions with Cutoffs at 22.8 nm and 10.1 nm," (Int. J. Hydrogen Energy) by Dr. Randell Mills and Dr. Ying Lu. The CfA validation,

which was headed by team leader Alexander Bykanov, PhD under contract with GEN3 Partners, showed hydrogen spectral emissions below 80 nanometers, the previously known ground state. This is decisive evidence of the existence of hydrinos as Dr. Randell Mills theoretically predicted.

Describing the significance of the breakthrough, Dr. Mills said, "This is smoking-gun evidence of the existence of hydrinos. The light signature observed is from pure hydrogen and exists at a much higher energy level than deemed possible for this element in any known form."

In a joint statement, Dr. Alexander Bykanov and Dr. Sam Kogen, GEN3 COO, said, "BLP's spectral results were identically independently reproduced, and we could find no conventional explanation for the emission of bright light from hydrogen in this very high energy region. We believe that this confirms hydrino emission."

The Rowan validations of power production and hydrino product identification and the GEN3 Partners validation of hydrino light emission further confirm the BlackLight Process as a new non-polluting energy source. This process was first announced by BLP in October 2008. Hydrinos are a prior undiscovered form of hydrogen in lower-energy states produced by the BlackLight Process as latent energy is released by hydrogen atoms. The energy released during the formation of a hydrino is over 200 times the energy required to extract hydrogen from water by electrolysis. The CIHT cells are shown to extract this energy directly as electricity. With the diversion of a fraction of a per cent of the electrical output, the hydrogen fuel can be created from water with the net providing power on-site. Thus, power can be generated anywhere including at homes and businesses and in cars without supporting fuels, generation, or distribution infrastructure. BlackLight thermal power sources are also independent of a fuels infrastructure and have further advantages over traditional central generation in distributed electrical power applications as well as retrofits. Engineering designs are available at: <http://www.blacklightpower.com/>.

Successful Application of Theory

The classical theory that predicts the existence of hydrinos has enjoyed a number of other recent significant confirmations and successes. These include:

- The prediction of an important emission line from hydrino atoms at 24.1cm-1
- The absence of time dilation in red-shift quasars together with acceleration of the cosmic expansion and the masses of fundamental particle regarding the nature of spacetime

- The solution of the muonic H Lamb shift regarding the nature of particles such as the electron and photons and their physics of atomic bonding and energy transitions in atoms

- The vast solutions of bonding in molecules and other forms of matter that are the basis of the Millsian software

Professors Peter Jansson, K.V. Ramanujachary, and Amos Mugweru, have released reports outlining the full documentation and results of the off-site replication and independent testing of the new power systems, new-generation chemistry, and hydrino characterization testing, which are available at: [http:// www.blacklightpower.com/](http://www.blacklightpower.com/).

Recent presentations and other materials that help to further explain the BlackLight Process are also available on BLP's Web site.

A technical paper providing the detailed chemistry that BLP believes laboratories can easily follow and replicate is given at <http://www.blacklightpower.com/>.

Dr. Alexander Bykanov and Dr. Sam Kogen have released a report outlining the full documentation and results of the replication of the hydrino emission at CfA, which are available at: <http://www.blacklightpower.com/>.

BlackLight's published hydrino-emission paper can also be found there.

About BlackLight Power

BlackLight Power, Inc. is the inventor of a new primary energy source applicable to essentially all power applications such as thermal, electrical, automotive, marine, rail, aviation, and aerospace. The BlackLight Process, the power source, is the process of releasing the latent energy of the hydrogen atom.

For more information, please visit [http:// www.blacklightpower.com/](http://www.blacklightpower.com/)

About Rowan University

Rowan University, Glassboro, NJ, is a highly ranked comprehensive public university that offers bachelor through doctoral degrees. The University comprises seven colleges: Business, Communication, Education, Engineering, Fine & Performing Arts, Liberal Arts & Sciences, and Professional & Continuing Education. U.S. News & World Report ranks Rowan's College of Engineering 23rd in the nation among programs that offer bachelor and master degrees.

GEN3 Partners

GEN3 Partners is a leading innovation consulting company based in Boston, MA with a network of 7,000 scientists and engineers experienced at testing and developing breakthrough technologies for Fortune 100 companies.

About Akridge Energy

Akridge Energy based in Maryland is an energy subsidiary of Akridge.

Founded in 1974, Akridge is a full-service commercial real estate firm in the Washington, DC area. Their projects total over 12 million square feet of office, industrial/flex, residential, retail and entertainment space at a value of over \$2.0 billion. For nine of the last ten years, Akridge has been ranked the number one real estate firm in the country, among firms of similar size, for client satisfaction by the industry's foremost benchmarking firm, CEL & Associates. Akridge has been honored by awards for sustainability from the following organizations: the Greater Washington Board of Trade, the Washington Business Journal, Bisnow on Business, the District of Columbia's Department of the Environment, the Smart Business Network of Washington, and the Environmental Protection Agency's Energy Star program. Akridge is the winner of the National Capital Business Ethics Award given by the Society of Financial Service Professionals for ethical business conduct and is recognized as a "Best Place to Work" in Greater Washington according to the Washington Business Journal.

For more information about Akridge, please visit www.akridge.com Glossary:

BlackLight Process: A novel chemical process invented by BLP causing the latent energy stored in the hydrogen atom to be released as a new primary energy source.

Hydrino: Hydrinos are a new form of hydrogen theoretically predicted and discovered by BLP. Hydrinos are produced during the BlackLight Process as energy is released from the hydrogen atom as the electron transitions to a lower-energy state resulting in a smaller radius hydrogen atom. The identity of the dark matter of the universe as hydrinos is supported by BlackLight's spectroscopic and analytical results as well as astrophysical observations.

CIHT Technology: The direct generation of electrical power by the formation of hydrinos. The fuel is hydrogen that may be produced from water by diverting as little as 0.5 per cent of the electrical output.

Spectral Emissions: Spectral emission of an atom such as hydrogen is a unique signature that acts like a fingerprint of its characteristics. Each

line of the spectrum is characteristic of and identifies the energy levels of the atom.

Hill & Knowlton for BlackLight Power, Inc.

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KEYWORD: United States North America New Jersey

INDUSTRY KEYWORD: Energy Alternative Energy Other Energy Research Science

CATEGORY KEYWORD: Product/Service

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Record - 43

DIALOG(R)

Brian Marsden: Comet tracker on guard for Earth,

Thomas H. Maugh II,
Calgary Herald (Canada), Final ed, pC7,
Sunday, November 28, 2010

TEXT:

Astronomer Brian G. Marsden stood sentinel to protect the planet from collisions with interplanetary rocks and other remnants of the solar system's creation.

Director emeritus of the Minor Planet Center at the Harvard-Smithsonian Center for Astrophysics in Cambridge, Mass., Marsden was perhaps best known for his 1998 announcement that an asteroid known as 1997 XF11 might strike the Earth in 2028, causing untold damage. The announcement sparked additional studies that quickly showed that such an impact was unlikely.

Marsden, who was once called "a cheery herald of fear" by the New York Times, also played a key role in the demotion of Pluto from major to minor planetary status, which also gained him a certain amount of infamy.

"Brian was one of the most influential comet investigators of the 20th century, and definitely one of the most colourful," astronomer Charles Alcock, director of the Harvard-Smithsonian centre, said in a statement.

Marsden said he made the announcement about 1997 XF11 as a 'last-ditch effort' to encourage the acquisition of further observations to refine calculations of the object's orbit, and that is indeed what transpired. Photos from 1990 emerged the next day and new calculations showed that the object was highly unlikely to strike our planet.

Critics, however, suspected that Marsden made the announcement in an effort to secure more funding for the search for interplanetary objects that could potentially strike Earth and that, too, has happened as such objects have grown in the public consciousness.

Marsden also was interested in the discovery of what he called 'transneptunian' objects and his colleagues called 'objects in the Kuiper Belt,' the region extending from the orbit of Neptune to the edge of the solar system. When the first of these objects was discovered in 1992, Marsden countered that these were not the first because Pluto -- albeit somewhat larger -- had to be considered one of these objects and it had been discovered in 1930. He became a firm advocate of 'demoting' Pluto.

The discovery of Eris, a dwarf planet similar in size to Pluto, in 2005, led to the inevitable demotion of Pluto to dwarf planet status in 2006. Marsden was quite entertained by the fact that Pluto was 'retired' as a planet on the same day that he retired as director of the Minor Planet Center.

The feat Marsden was most proud of was his prediction of the return of Comet Swift-Tuttle, which is associated with the Perseid meteor shower that occurs each August. Most astronomers thought that the comet, which had been discovered in 1862, would make its reappearance in 1981.

Marsden, however, suspected that it was identical with one seen in 1737. That meant it would not reappear until late 1992. He was correct. Swift-Tuttle has the longest orbital period of all the comets whose returns have been successfully predicted.

Marsden died of cancer at Lahey Hospital in Burlington, Mass. He was 73.

Photo: Courtesy, Harvard-Smithsonian Center For Astrophysics, AFP-Getty Images / Brian Geoffrey Marsden was considered one of the most influential asteroid investigators.;

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Wolbach Library: CfA in the News ~ Week ending 12 December 2010

1. **You hate to put a price on scientific wonder**, Alvin Bessent. Alvin Bessent is a member of Newsday's editorial board., Newsday (USA), ALL EDITIONS ed, pA38, Thursday, December 9, 2010
2. **33pc of Sun's blasts are 'sneak attacks' that occur without warning**, Hindustan Times, Wednesday, December 8, 2010
3. **Water vapor confirmed for first time on Super Earth**, Korea Times, Monday, December 6, 2010

Record - 1

DIALOG(R)

You hate to put a price on scientific wonder,

Alvin Bessent. Alvin Bessent is a member of Newsday's editorial board.

Newsday (USA), ALL EDITIONS ed, pA38,

Thursday, December 9, 2010

TEXT:

What's a wow worth?

Three times in recent days, scientists announced startling discoveries worthy of that unbridled exclamation of childlike wonder.

With shrinking government all the rage, such moments may come fewer and further between. That would be a shame. Wide-eyed amazement may not be the most cost-effective item on Washington's balance sheet, but it nourishes the spirit and expands the mind.

Consider the entirely new form of life discovered recently in a lake bed near California's Yosemite National Park. It's a bacterium that researchers say feeds on arsenic and, in a trick never seen before, incorporates that often poisonous substance into its DNA.

It's no surprise that some scientists are challenging those findings. We had believed that every form of life was made up of the same six elements - carbon, hydrogen, oxygen, nitrogen, phosphorus and sulfur - until NASA astrobiologist Felisa Wolfe-Simon found one that maybe isn't.

That unassuming little microbe, affectionately known as GFAJ-1, reportedly for "give Felisa a job," has upended what we know about the nature of life by demonstrating its existence as we never imagined it could be. "We've

cracked open the door to what's possible for life elsewhere in the universe," Wolfe-Simon told CNN.

Then there's the study that suggests there are three times as many stars in the heavens as we thought, an awesome 300 sextillion. That's a three and 23 zeros. How could we have missed all those points of light?

And how about news of two mysterious bubbles filled with hot, charged gas, erupting from the center of the Milky Way? The previously undetected bubbles - extending north and south from our galaxy's core - are so big that it takes light 25,000 years to travel from one sharp edge to the other.

Doug Finkbeiner, the project's lead researcher at the Harvard-Smithsonian Center for Astrophysics, readily admits he doesn't really know what these bubble things are yet, or their origin. One theory is they're the product of a gigantic belch from the black hole that sits at the center of the galaxy. "This was something that was unexpected. It's really an understand-our-universe-and-our-place-in-it kind of thing," he said.

In fact we don't immediately know what to make of most strange and exciting discoveries. That's what makes them strange and exciting. But we do know that the research that leads us to them costs money.

President Barack Obama took office promising to increase the \$140 billion yearly federal investment in scientific research. Now he says he'll freeze all domestic discretionary spending and Republicans promise actual cuts.

Unfortunately, science is an easy target once you move beyond medical research and similar, more grounded pursuits. It's hard for arsenic-eating bacteria and galactic energy belches to compete for money with law enforcement and road repairs. And it's admittedly hard to see how such discoveries will help anybody turn a profit - though they may contain the seeds of future economic growth. You never know.

That's the thing about nature. As it reveals its mysteries, one tantalizing tidbit at a time, it often clues us in that what we're convinced we know absolutely isn't necessarily so. There's a lesson in that.

With the nation divided into warring ideological camps over so many things, we should all take a breath and entertain, for a moment, the possibility that when we're most certain we're right, something could come along and upend what we think we know.

So, what's a little humility worth?

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Record - 2

DIALOG(R)

33pc of Sun's blasts are 'sneak attacks' that occur without warning,

Hindustan Times,

Wednesday, December 8, 2010

TEXT:

Washington, Dec. 8 -- Astronomers have revealed that one-third of the Sun's blasts are 'sneak attacks' that may occur without warning.

'If space weather forecasters rely on some of the traditional danger signs, they'll miss a significant fraction of solar eruptions,' said Suli Ma of the Harvard-Smithsonian Center for Astrophysics (CfA).

Ma and her colleagues studied 34 solar eruptions over 8 months using the STEREO spacecraft, which allows us to study the Sun from two different angles simultaneously.

STEREO is ideal for studying coronal mass ejections, or CMEs. A CME is a huge eruption from the Sun that blasts a billion tons of highly charged particles into space at speeds greater than a million miles per hour. When those charged particles reach Earth, they interact with our planet's magnetic field, potentially creating a geomagnetic storm. Such a storm can interfere with satellite communications, disrupt power grids, or even short out orbiting satellites.

The new study revealed that 11 of the 34 CMEs observed by STEREO were 'stealthy,' showing none of the usual signals. As a result, any system designed to watch for such warning signs could miss one-third of all solar blasts.

'Meteorologists can give days of warning for a hurricane, but only minutes for a tornado. Currently, space weather forecasting is more like tornado warnings,' said Smithsonian astronomer Leon Golub.

'We might know an eruption is imminent, but we can't say exactly when it will happen. And sometimes, they catch us by surprise,' he added.

The team plans to continue looking for subtle clues that might allow us to predict an impending 'stealth' CME. They caution that their study occurred during a prolonged minimum of solar activity; conditions may change as solar activity increases over the next few years.

Their findings appeared in the Oct. 10, 2010 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)

Water vapor confirmed for first time on Super Earth,

Korea Times,

Monday, December 6, 2010

TEXT:

It is highly probable that Super Earth planet contains water in vapor or a thick haze in its atmosphere, the first-ever confirmation by scientists, SPACE.com reported last Wednesday.

Super Earth, far away from the galaxy which the solar system belongs to, is believed to have the similar environment like Earth, such as existence of water and atmosphere.

The atmosphere has been checked on the Super Earth for the first time as the planet out of the our galaxy, extra-solar planet researcher Jacob Bean of the Harvard-Smithsonian Center for Astrophysics said in the latest issue of science journal Nature.

The planet GJ 1214 was presumed to have similar atmosphere of Earth, when it was detected by researchers for the first time last year. The planet is 40 light years away from Earth and is as big as 2.7 times the Earth in diameter and about 6.5 times in mass, which has made the planet called Super Earth.

Researchers found that water could exist on three quarters of GJ 1214b, after observing the planet and its fixed star through the telescope 3.6 meters in diameter at the European Southern Observatory in Chile for one year, the paper said on its website.

However, this planet is only 200 million kilometers away from its mother star, 1/70 the distance between Earth and its mother star, Sun, making the planet hotter, according to the researchers.

As a result, it is highly probable that water exists as vapor, not liquid

as it exists on Earth. They analyzed that the atmosphere is haze-like due to vaporized hydrogen and clouds.

It is meaningful that we have analyzed atmosphere of an exoplanet although we were unable to identify the composition of the atmosphere exactly. It is the development a step more on the planet, Dr. Bean said, adding that they would conduct an additional study on the planet from now on.

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Wolbach Library: CfA in the News ~ Week ending 19 December 2010

1. **Research in the area of geometry reported from R.F. Penna and colleagues**, Science Letter, p1701, Tuesday, December 21, 2010
2. **Qatar-led team finds its first alien world**, Daily News Egypt, Thursday, December 16, 2010
3. **Qatar-1b marks new research era**, Habib Toumi, Gulf News, Thursday, December 16, 2010
4. **Discovery of a new planet is a 'joint venture for humanity' and takes, forward search for life**, Times, The (UK), 01 ed, Wednesday, December 15, 2010
5. **Scots stargazers' hot find: a giant planet roasting at 1,100C**, Fiona MacLeod, Scotsman (Edinburgh, Scotland), 1 ed, p22, Wednesday, December 15, 2010
6. **Qatar-led international team discovers a new alien world**, Hindustan Times, Wednesday, December 15, 2010
7. **Milky Way blows cosmic bubbles: Gamma-ray blobs emanate from the center of the galaxy.**, Cowen, Ron, Science News, v178, n12, p18(1), Saturday, December 4, 2010
8. **Up with science.**, Clough, G. Wayne, Smithsonian, v41, n8, p26(1), Wednesday, December 1, 2010

Record - 1

DIALOG(R)

Research in the area of geometry reported from R.F. Penna and colleagues,
Science Letter, p1701,
Tuesday, December 21, 2010

TEXT:

According to a study from the United States, "The standard general relativistic model of a razor-thin accretion disc around a black hole, developed by Novikov & Thorne (NT) in 1973, assumes the shear stress vanishes at the radius of the innermost stable circular orbit (ISCO) and that, outside the ISCO, the shear stress is produced by an effective turbulent viscosity. However, astrophysical accretion discs are not razor thin; it is uncertain whether the shear stress necessarily vanishes at the ISCO, and the magnetic field, which is thought to drive turbulence in discs, may contain large-scale structures that do not behave like a simple local scalar viscosity."

"We describe 3D general relativistic magnetohydrodynamic simulations of

accretion discs around black holes with a range of spin parameters, and we use the simulations to assess the validity of the NT model. Our fiducial initial magnetic field consists of multiple (alternating polarity) poloidal field loops whose shape is roughly isotropic in the disc in order to match the isotropic turbulence expected in the poloidal plane. For a thin disc with an aspect ratio vertical bar h/r vertical bar similar to 0.07 around a non-spinning black hole, we find a decrease in the accreted specific angular momentum of 2.9 per cent relative to the NT model and an excess luminosity from inside the ISCO of 3.5 per cent. The deviations in the case of spinning black holes are also of the same order. In addition, the deviations decrease with decreasing vertical bar h/r vertical bar. We therefore conclude that magnetized thin accretion discs in X-ray binaries in the thermal/high-soft spectral state ought to be well described by the NT model, especially at luminosities below 30 per cent of Eddington where we expect a very small disc thickness vertical bar h/r vertical bar less than or similar to 0.05. We use our results to determine the spin equilibrium of black hole accretion discs with a range of thicknesses and to determine how electromagnetic stresses within the ISCO depend upon black hole spin and disc thickness. We find that the electromagnetic stress and the luminosity inside the ISCO depend on the assumed initial magnetic field geometry. We consider a second geometry with field lines following density contours, which for thin discs leads to highly radially elongated magnetic field lines. This gives roughly twice larger deviations from NT for both the accreted specific angular momentum and the luminosity inside the ISCO. Lastly, we find that the disc's corona (including any wind or jet) introduces deviations from NT in the specific angular momentum that are comparable to those contributed by the disc component, while the excess luminosity of bound gas from within the ISCO is dominated by only the disc component," wrote R.F. Penna and colleagues (see also).

The researchers concluded: "Based on these indications, we suggest that differences in results between our work and other similar work are due to differences in the assumed initial magnetic field geometry as well as the inclusion of disc gas versus all the gas when comparing the specific angular momentum from the simulations with the NT model."

Penna and colleagues published the results of their research in Monthly Notices of the Royal Astronomical Society (Simulations of magnetized discs around black holes: effects of black hole spin, disc thickness and magnetic field geometry. Monthly Notices of the Royal Astronomical Society, 2010;408(2):752-782).

For additional information, contact R.F. Penna, 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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Record - 2

DIALOG(R)

Qatar-led team finds its first alien world,

Daily News Egypt,
Thursday, December 16, 2010

TEXT:

DOHA: A Qatar-led international team has made its first find in its search for planets orbiting distant stars - a huge gas giant 20 percent larger than Jupiter that orbits a star 500 light years away.

The planet has been named Qatar-1b and its discovery is to be reported in the journal Monthly Notices of the Royal Astronomical Society, the Qatar Foundation for Education, Science and Community Development said on Wednesday.

Working in collaboration with astronomers in Britain and the United States, and using data collected by Qatar's wide-angle cameras in the US state of New Mexico, the team were able to identify the planet from the dip in light from the parent star as its orbit took it between the star and Earth. The team had to use computers to sift through data from hundreds of thousands of stars before making their lucky find.

“The discovery of Qatar-1b is a great achievement — one that further demonstrates Qatar's commitment to becoming a leader in innovative science and research,” said Dr Khalid Al Subai, leader of the Qatar exoplanet survey and a research director at the foundation.

“Qatar is proud to contribute to the search for planets around other stars.” Qatar-1b orbits just 3.5 million kilometers from its parent star and roasts at a temperature of around 1100 degrees Celsius.

Professor Keith Horne of St Andrews University in Scotland which collaborated in the research said that using the same technology the team hoped eventually to find planets more similar to our own.

“Qatar-1b is just the beginning,” Horne said. “With Qatar's new planet-hunting cameras, we should soon be finding smaller planets as well, hot Saturns and hot Neptunes, and ultimately, with a different technique, cool Earths.”

Qatar-1b circles its star once every 1.4 days, meaning that its "year" is just 34 hours long. It also spins on its axis once every 34 hours as it is expected to be tidally locked with its star, such that one side of the planet always faces the star.

Scientists at the Universities of Leicester and Keele in England and the Harvard-Smithsonian Center for Astrophysics in the United States also collaborated in the research.

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Record - 3

DIALOG(R)

Qatar-1b marks new research era,

Habib Toumi,

Gulf News,

Thursday, December 16, 2010

TEXT:

Discovery to help experts LOCATE more planets in future, astronomer says

Manama Qatar-1b, a new planet orbiting a distant star, has been discovered by a Qatari astronomer and scientists in the UK and US, Qatari media reported.

The "hot Jupiter" adds to the growing list of planets orbiting distant stars, or exoplanets. The team from the universities of St Andrews, Leicester and Keele in the UK and the Harvard-Smithsonian Centre for Astrophysics (CfA) in the US submitted their results to the journal, Monthly Notices of the Royal Astronomical Society.

"Qatar is proud to contribute to the search for planets around other stars. The discovery of Qatar-1b is a great achievement -- one that further demonstrates Qatar's commitment to becoming a leader in innovative science and research," said Dr Khalid Al Subai, leader of the Qatar exoplanet survey and a research director at Qatar Foundation for Education, Science and Community Development. "The discovery of Qatar-1b marks the beginning of a new era of collaborative astrophysics research between Qatar, UK and US" he said, quoted by Gulf Times.

According to St Andrews astronomer Prof Keith Horne: "Qatar-1b is just the

beginning. With Qatar's new planet-hunting cameras, we should soon be finding smaller planets as well, hot Saturns and hot Neptunes, and ultimately, with a different technique, cool Earths".

Building on UK technology developed for the Super WASP exoplanet survey, the St Andrews and Leicester teams worked with Dr Al Subai to establish the computer systems used to process raw images from Al Subai's cameras, extracting and sifting through data from hundreds of thousands of stars.

Characteristic dip

Over a period of time, some planets will temporarily and periodically block the light of the parent star they orbit as they pass directly between that star and the Earth. These "transit" events produce a characteristic dip in the light from the star that then reveals the orbiting planet. Of the vast number of stars observed, only a few will have detectable planets.

"The discovery of Qatar-1b is a wonderful example of how science and modern communications can erase international borders and time zones. No one owns the stars. We can all be inspired by the discovery of distant worlds," said CfA team member David Latham.

To find the new world, Qatar's wide-angle cameras (located in New Mexico) took images of the sky every clear night beginning in early 2010. The photographs then were transmitted to the UK for analysis by collaborating astronomers at St Andrews and Leicester universities and by Dr Al Subai in Qatar. That analysis narrowed the field to a few hundred candidate stars.

The Harvard-Smithsonian team, with Dr Al Subai, followed up on the most promising candidates, making spectroscopic observations with the 1.5m diameter telescope at the Smithsonian's Whipple Observatory in Arizona. Such observations can weed out binary-star systems with grazing eclipses, which mimic planetary transits. They also measured the stars' dimming more accurately using KeplerCam on Whipple's 1.2m telescope.

Orbital period

Two UK telescopes, the 1m Gregory Telescope at St Andrews and the 0.6m telescope at Keele, were used to confirm the Qatar-1b transits, refine the orbital period and pin down the planetary radius. Observing between snowstorms, St Andrews students took part in the discovery of Qatar-1. "We look forward to teams of UK and Qatari students working together to discover new worlds," said St Andrews astronomer Prof Andrew Cameron.

The resulting data confirmed the existence of a planet now called Qatar-1b, orbiting an orange Type K star 550 light years away. Qatar-1b is a gas

giant 20 per cent larger than Jupiter in diameter and 10 per cent bigger. It belongs to the "hot Jupiter" family because it orbits 3.5 million km from its star -- only six stellar radii away. The planet roasts, at a temperature of around 1,100 degrees Celsius.

Qatar-1b circles its star once every 1.4 days, meaning that its "year" is just 34 hours long. It's expected to be tidally locked with the star, so one side of the planet always faces the star. As a result, the planet spins on its axis once every 34 hours -- three times slower than Jupiter, which rotates once in 10 hours.

at a glance

from a distance

550
light years away ?Qatar-1b orbits its star

20%

larger in size ?than Jupiter

The discovery of Qatar-1b is a wonderful example of how science and modern communications can erase international borders and time zones. We can all be inspired by the discovery of distant worlds."

Dr Khalid Al Subai

Leader of Qatar exoplanet survey

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Record - 4

DIALOG(R)

Discovery of a new planet is a 'joint venture for humanity' and takes forward search for life,

Times, The (UK), 01 ed,

Wednesday, December 15, 2010

TEXT:

It is not the first new planet to have been found by modern astronomers and it is certainly not the most hospitable surface temperatures reach 1100C (2012F) but yesterday's announcement of the discovery of Qatar-1b has been

greeted with euphoria by the scientific community. Qatar-1b is a "hot Jupiter", a planet outside our solar system, similar in size to Jupiter, but much closer to its own sun. It takes 12 years for Jupiter to orbit our Sun; Qatar-1b takes 34 hours to complete the same cycle.

The identification of the planet about 550 light years from Earth is extraordinary enough, but it is the degree of international co-operation involved that is exciting the scientific community.

The approach, at least according to the researchers involved, will eventually provide answers to two of the most intractable questions: "how was the Earth made?" and even "is there anybody out there?" The foundations of this project comprise thousands of images captured in New Mexico on a telescope developed by a Qatari scientist, mind-boggling computing power supplied by British universities, and data from Nasa's Kepler space observatory, co-ordinated by the Harvard-Smithsonian Centre in Cambridge, Massachusetts, and all supported by research input from Germany and Denmark.

But for all the high technology involved, vital observations were made this month by two postgraduate students, Grant Miller and David Brown, who scrambled across a snowy football field to open the dome of the University of St Andrews telescope.

From there they recorded the last readings of the planet's transit across its star, before Qatar-1b disappeared out of view, behind our own Sun.

The identification of this world was a landmark in "the planet-hunting business", said Professor Andrew Cameron at the University of St Andrews.

"The bottom line is, eventually, we want to achieve an understanding of how planetary systems form, which in turn will tell us how normal or unusual Earth and our own solar system is.

"We are trying to determine the number of solar systems that are possible homes to planets like Earth. It is a philosophical adventure that people have dreamt about tackling for centuries in science fiction and in all sorts of Creation myths.

"To be at a point in history where we have the computing power at our disposal to be able to take this on as a serious scientific investigation is tremendously exciting."

The quest for Qatar-1b began in January with the collection of raw images from the Alsubai planet-hunting telescopic cameras in New Mexico, representing data from about one million stars. These images were recorded every ten minutes, every night, all night, on powerful software developed

at St Andrews, and the data was then processed and archived at Leicester. Using evidence of "blinking", suggesting the transit of a planet in front of a sun, a shortlist was drawn up of about 25 stars that could have planets orbiting them.

This group of the most promising candidates was followed up by David Latham, of the Harvard-Smithsonian Centre for Astrophysics, who made observations from Arizona to weed out binary-star systems that appear to mimic planetary transits.

"One by one, we eliminated all the false positives until this one lovely planet survived," Professor Cameron said. Subsequent observations of Qatar-1b were made at St Andrews and from the telescope at Keele University in Staffordshire.

Research projects in Britain and America have so far identified about 100 planets that cross the face of their parent star and are visible on telescopes.

Qatar-1b represented the first step of internationalising the whole process of planet-hunting, "a joint venture for humanity", Professor Cameron said.

He had no doubt that the trend would continue. Nasa's Kepler telescope is already identifying Earth-like planets orbiting other stars, and its successor, the Plato mission, scheduled to begin in 2018, would develop that work.

"With suitable space instruments it should be possible to discern the chemical compositions of those atmospheres and to see if they have been modified by life or not," Professor Cameron said. "I think I'll live long enough to see life, even if it is only microbial life."

Behind the story

The blink Only a tiny proportion of distant planets in other solar systems are visible from Earth, even with the most powerful satellite-based telescopes. Easiest to spot are planets which pass relatively frequently in front of their own sun, in a direct line of sight from Earth. Qatar-1b is visible because it is so close to its own sun, and the effect of its short orbit makes the star "blink".

Bubble ahead

A "bauble" of gas has been spotted in our neighbouring galaxy by the Hubble Space Telescope (Hannah Devlin writes).

The bubble-shaped shroud of gas, in the Large Magellanic Cloud, a satellite galaxy of the Milky Way, is the aftermath of a supernova explosion that took place four centuries ago. The sphere is about 160,000 light years from Earth.

'I think I'll live long enough to see life, even if it is only microbial'

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Record - 5

DIALOG(R)

Scots stargazers' hot find: a giant planet roasting at 1,100C,

Fiona MacLeod,

Scotsman (Edinburgh, Scotland), 1 ed, p22,

Wednesday, December 15, 2010

TEXT:

STUDENTS from St Andrews University have helped to discover a new gas giant using planet-hunting cameras which could ultimately lead astronomers to new Earths.

PhD students Grant Miller and David Brown used Scotland's largest optical telescope to confirm the presence of Qatar-1b - a gas planet similar to Jupiter.

They used the 0.9m diameter James Gregory telescope at the university campus observatory, to measure its diameter.

St Andrews astronomer Professor Keith Horne said: "Qatar-1b is just the beginning. With Qatar's new planet-hunting cameras, we should soon be finding smaller planets as well, hot Saturns and hot Neptunes, and ultimately, with a different technique, cool Earths."

Working with astronomers in Qatar, the United States, Germany, Denmark and England over the internet, the students were able to find the new planet, in record time.

The planet is known as a "hot Jupiter" because it orbits 3.5 million km from its star - so close it roasts at a temperature of around 1,100C.

It will be added to the growing list of alien planets orbiting distant stars, or exoplanets, discovered by scientists around the world.

The UK scientists worked closely with Dr Khalid Alsubai, at the Qatar

Foundation for Education, Science and Community Development. Together, they processed raw images from the Alsubai cameras, extracting and sifting through data from hundreds of thousands of stars.

To find the new world, Qatar's wide-angle cameras, located in New Mexico, took images of the sky every clear night, beginning early this year.

The digital images were then transmitted to the UK for computer analysis by collaborating astronomers at St Andrews and Leicester universities and Dr Alsubai in Qatar.

That analysis narrowed the field to a few hundred candidate stars.

Over time, some planets will temporarily and periodically block the light of the parent star they orbit as they pass directly between that star and the Earth.

These "transit" events produce a characteristic dip in the light from the star that then reveals the orbiting planet.

Of the vast number of stars observed, only a few will have detectable planets.

The group followed up on the most promising candidates, with Dr David Latham, of the Harvard-Smithsonian Centre for Astrophysics, making observations from Arizona to weed out false alarms.

Qatar-1b is a gas giant planet, 20 per cent larger than Jupiter in diameter and 10 per cent more massive.

Dr Latham said: "The discovery of Qatar-1b is a wonderful example of how science and modern communications can erase international borders and time zones.

"No-one owns the stars. We can all be inspired by the discovery of distant worlds."

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Record - 6

DIALOG(R)

Qatar-led international team discovers a new alien world,

Hindustan Times,

Wednesday, December 15, 2010

TEXT:

Washington, Dec. 15 -- They are not just an exciting part of sci-fi flicks; they exist in real world too. And here's another evidence to prove that-researchers have discovered a new alien world.

A Qatar led international team of researchers has found 'hot Jupiter,' now named Qatar-1b. The discovery has added to the growing list of alien planets orbiting distant stars.

The Qatar exoplanet survey hunts for stars that 'wink,' dimming slightly every time an orbiting planet creates a 'mini-eclipse' by crossing in front of the star as seen from Earth.

Transit searches like this must sift through thousands of stars to find the small fraction with detectable planets. The complex observations and analysis create perfect opportunities for teamwork.

"The discovery of Qatar-1b is a wonderful example of how science and modern communications can erase international borders and time zones. No one owns the stars. We can all be inspired by the discovery of distant worlds," said CfA team member David Latham.

To find the new world, Qatar's wide-angle cameras (located in New Mexico) took images of the sky every clear night beginning in early 2010.

The Harvard-Smithsonian team, with Khalid Al Subai, leader of the Qatar exoplanet survey followed up on the most promising candidates, making spectroscopic observations with the 60-inch-diameter telescope at the Smithsonian's Whipple Observatory in Arizona.

Such observations can weed out binary-star systems with grazing eclipses, which mimic planetary transits. They also measured the stars' dimming more accurately with Whipple's 48-inch telescope.

The resulting data confirmed the existence of a planet now called Qatar-1b, orbiting an orange Type K star 550 light-years away. Qatar-1b is a gas giant 20 percent larger than Jupiter in diameter and 10 percent more massive.

It belongs to the 'hot Jupiter' family because it orbits 2.2 million miles from its star - only six stellar radii away. The planet roasts at a temperature of around 2,000 degrees Fahrenheit.

Qatar-1b circles its star once every 1.4 days, meaning that its 'year' is just 34 hours long and the planet spins on its axis once every 34 hours. Published by HT Syndication with permission from Asian News International. For any query with respect to this article or any other content

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Record - 7

DIALOG(R)

Milky Way blows cosmic bubbles: Gamma-ray blobs emanate from the center of the galaxy.

Cowen, Ron,

Science News, v178, n12, p18(1),

Saturday, December 4, 2010

TEXT:

Twin bubbles of gamma ray-emitting gas, each the size of a small galaxy, sit above and below the center of the Milky Way like the ends of a giant dumbbell, astronomers have discovered.

Douglas Finkbeiner of the Harvard-Smithsonian Center for Astrophysics in Cambridge, Mass., and colleagues analyzed data from NASA's Fermi Gamma-ray Space Telescope to find the bubbles. Finkbeiner described the findings, which appear in the Dec. 1 *Astrophysical Journal*, during a November 9 briefing.

The bubbles aren't readily apparent because a high-energy gamma-ray fog, discovered by Finkbeiner and his colleagues last year, fills the sky, mainly due to high-speed electrons and protons interacting with light and interstellar gas in the galaxy. But when Finkbeiner and his colleagues subtracted the fog from the Fermi telescope's data, they uncovered the two giant lobes.

Depending on when the bubbles were generated, each lobe could hold the energy released by 100,000 supernovas, Finkbeiner said. Each has a diameter of about 25,000 light-years, roughly the length of the Large Magellanic Cloud, a satellite galaxy of the Milky Way.

[ILLUSTRATION OMITTED]

One possible source of the bubbles is a proposed wave of star birth at the galaxy's center millions of years ago. If a large population of massive stars were born all at the same time, their explosive deaths could have created enough energy, in the form of energetic electrons or protons, to power the bubbles and cause them to glow with gamma rays. However, previous evidence suggests that the number of massive newborns required to provide the energy would be unrealistically high.

Finkbeiner said he now favors another explanation--jets of material expelled by the supermassive black hole that is thought to reside at the galactic center. At present, the black hole isn't radiating much. But if it went on a feeding frenzy a few million years ago, the black hole would have hurled jets of material that could easily power the bubbles. This could be the first evidence for a major eruption of the supermassive black hole, Finkbeiner said.

It's also possible that the best explanation could turn out to be a combination of both sources, he said. Supernova explosions from a population of massive stars might have inflated the bubbles, while subsequent jet activity from the black hole might have set the bubbles aglow in gamma rays.

Theorist David Spergel of Princeton said that he suspects that the central black hole, as massive as about 4 million suns, is the energy source. Black holes at the centers of other galaxies drive winds and jets that can be powerful enough to expel heavy elements and gas from the galaxies. The new observations "suggest that our own Milky Way may [also] be driving material outwards," he said.

By Ron Cowen

The Milky Way is blowing bubbles of cosmic proportions.

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Record - 8

DIALOG(R)

Up with science.,

Clough, G. Wayne,

Smithsonian, v41, n8, p26(1),

Wednesday, December 1, 2010

TEXT:

ATLANTA'S HUGE Hartsfield-Jackson airport is one of the world's busiest; each year 82 million passengers go through it. And it is but one of more than 1,000 sites worldwide--such as public parks, metro stations, arts festivals, libraries and hospitals--where people can see spectacular astronomical images provided by the award-winning From Earth to the Universe, a project of the Chandra group at the **Smithsonian** Astrophysical Observatory.

Especially after World War II, America's leaders came to understand the importance of science and technology. The National Science Foundation, founded in 1950, offered increased funding to universities and nonprofit organizations. Sputnik's 1957 launch further stimulated research investment. By 1958, total federal funding for scientific research and development was \$7 billion. The U.S. government now spends more than \$100 billion on R&D; the private sector invests another \$290 billion or so. Science and technology underpin our country's success in global competition. The Internet, space exploration and other key advances were spawned by past investments in science.

Yet our country faces many critical decisions. How do we handle climate change and other environmental challenges? How much should we invest in alternative fuels? How will we repair our decaying infrastructure? Finding answers will require in-depth public understanding of science and technology. But polls suggest that scientific literacy is on the wane, and science education is declining. Our K-12 mathematics and science education ranks 48th worldwide, while 49 percent of U.S. adults don't know how long it takes for Earth to circle the Sun (a year). Science and engineering are devolving into ever-smaller specialties, and few scientists and engineers effectively communicate the broader contexts of key issues.

To increase scientific literacy, partnerships of government agencies like NSF and NASA with universities, science museums, corporations and science and engineering associations are essential. New strategic search tools will also be needed to explore general information--not just the specialized knowledge that only a few understand--about science and technology. The Smithsonian Natural History Museum's Ocean Portal and Human Origins Web sites are good examples of such tools.

The Smithsonian must play a central role in a coordinated national effort to foster scientific literacy, and involve all of our K-12 science programs, including those in our various museums, research centers and the National Zoo. By promoting scientific literacy and convening key partners to address the critical issues of our time, we will enhance 21st-century relevance for the Smithsonian's enduring mission--the increase and diffusion of knowledge.

G. WAYNE CLOUGH is Secretary of the Smithsonian Institution.

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Wolbach Library: CfA in the News ~ 26 December 2010

1. **Research on astronomy described by A. Siemiginowska and colleagues**, Science Letter, p2343, Tuesday, December 28, 2010
2. **Research from P.E.J. Nulsen et al broadens understanding of astronomy**, Science Letter, p2112, Tuesday, December 28, 2010
3. **New findings reported from U. Keshet and co-authors describe advances in astronomy**, Science Letter, p1121, Tuesday, December 28, 2010
4. **New findings from H.B. Liu and co-authors in the area of astronomy published**, Science Letter, p1024, Tuesday, December 28, 2010
5. **New findings from G. Torres and co-researchers in the area of astronomy described**, Science Letter, p1022, Tuesday, December 28, 2010
6. **New astronomy study findings have been reported by S. Ma and co-researchers**, Science Letter, p844, Tuesday, December 28, 2010
7. **New life sciences study results reported from J.L. Bean et al**, Life Science Weekly, p1346, Tuesday, December 28, 2010
8. **Keele's link to new world**, Sentinel, (Stoke-on-Trent, UK), p2, Friday, December 24, 2010
9. **NASA scientists' breakthrough in determining hyperactivity of black holes**, ANI, Asian News International Tuesday, December 21, 2010
10. **Dust thou art not & unto dust thou shan't return: common mistakes in teaching biogeochemical cycles.**
O'Connell, Dan, THE AMERICAN BIOLOGY TEACHER, v72, n9, p552(5) Monday, November 1, 2010

Record - 1

DIALOG(R)

Research on astronomy described by A. Siemiginowska and colleagues,
Science Letter, p2343,
Tuesday, December 28, 2010

TEXT:

According to a study from the United States, "We present the first results from a new, deep (200 ks) Chandra observation of the X-ray luminous galaxy cluster surrounding the powerful (L similar to 10^{47} erg s $^{-1}$), high-redshift ($z = 1.067$), compact-steep-spectrum radio-loud quasar 3C 186. The diffuse X-ray emission from the cluster has a roughly ellipsoidal shape and extends out to radii of at least similar to 60 arcsec (similar to 500 kpc)."

"The centroid of the diffuse X-ray emission is offset by 0.68 ± 0.11 (similar to 5.5 ± 0.9 kpc) from the position of the quasar. We measure a cluster mass within the radius at which the mean enclosed density is 2500 times the critical density, $r(2500) = 283^{(-13)}_{(+18)}$ kpc, of $1.02^{(-0.14)}_{(+0.21)} \times 10^{14}$ M_{\odot} . The gas-mass fraction within this radius is $f(\text{gas}) = 0.129^{(-0.016)}_{(+0.015)}$. This value is consistent with measurements at lower redshifts and implies minimal evolution in the $f(\text{gas})(z)$ relation for hot, massive clusters at $0 < z < 1.1$. The measured metal abundance of $0.42^{(-0.07)}_{(+0.08)}$ Solar is consistent with the abundance observed in other massive, high-redshift clusters. The spatially resolved temperature profile for the cluster shows a drop in temperature, from kT similar to 8 keV to kT similar to 3 keV, in its central regions that is characteristic of cooling-core clusters. This is the first spectroscopic identification of a cooling-core cluster at $z > 1$. We measure cooling times for the X-ray emitting gas at radii of 50 kpc and 25 kpc of $1.7 \pm 0.2 \times 10^9$ years and $7.5 \pm 2.6 \times 10^8$ years, as well as a nominal cooling rate (in the absence of heating) of $400 \pm 190 M_{\odot} \text{ year}^{-1}$ within the central 100 kpc. In principle, the cooling gas can supply enough fuel to support the growth of the supermassive black hole and to power the luminous quasar," wrote A. Siemiginowska and colleagues (see also).

The researchers concluded: "The radiative power of the quasar exceeds by a factor of 10 the kinematic power of the central radio source, suggesting that radiative heating may be important at intermittent intervals in cluster cores."

Siemiginowska and colleagues published the results of their research in *Astrophysical Journal* (High-redshift X-ray Cooling-core Cluster Associated With The Luminous Radio-loud Quasar 3c 186. *Astrophysical Journal*, 2010;722(1):102-111).

For additional information, contact A. Siemiginowska, Harvard [Smithsonian](#)

Center Astrophysics, 60 Garden St., Cambridge, MA 02138, USA.

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Record - 2

DIALOG(R)

Research from P.E.J. Nulsen et al broadens understanding of astronomy,
Science Letter, p2112,
Tuesday, December 28, 2010

TEXT:

According to a study from the United States, "A new method is introduced for making X-ray mass determinations of spherical clusters of galaxies. Treating the distribution of gravitating matter as piecewise constant and the cluster atmosphere as piecewise isothermal, X-ray spectra of a hydrostatic atmosphere are determined up to a single overall normalizing factor."

"In contrast to more conventional approaches, this method relies on the minimum of assumptions, apart from the conditions of hydrostatic equilibrium and spherical symmetry. The method has been implemented as an XSPEC mixing model called CLMASS, which was used to determine masses for a sample of nine relaxed X-ray clusters. Compared to conventional mass determinations, CLMASS provides weak constraints on values of M_{500} , reflecting the quality of current X-ray data for cluster regions beyond $r(500)$. At smaller radii, where there are high quality X-ray spectra inside and outside the radius of interest to constrain the mass, CLMASS gives confidence ranges for M_{2500} that are only moderately less restrictive than those from more familiar mass determination methods," wrote P.E.J. Nulsen and colleagues (see also).

The researchers concluded: "The CLMASS model provides some advantages over other methods and should prove useful for mass determinations in regions where there are high quality X-ray data."

Nulsen and colleagues published the results of their research in Astrophysical Journal (Model-independent X-ray Mass Determinations. Astrophysical Journal, 2010;722(1):55-64).

For additional information, contact P.E.J. Nulsen, Harvard [Smithsonian](#)

Center Astrophysics, 60 Garden St., Cambridge, MA 02138, USA.

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Record - 3

DIALOG(R)

New findings reported from U. Keshet and co-authors describe advances in astronomy,

Science Letter, p1121,

Tuesday, December 28, 2010

Text:

According to a study from the United States, "Some galaxy clusters show diffuse radio emission in the form of giant halos (GHs) on Mpc scales or minihalos (MHs) on smaller scales. Comparing Very Large Array and XMM-Newton radial profiles of several such clusters, we find a universal linear correlation between radio and X-ray surface brightness, valid in both types of halos."

"It implies a halo central emissivity $j(\nu) = 10^{(-31.4 \pm 0.2)} (n/10^{-2} \text{ cm}^{-3})^2 (T/T_0)^{0.2 \pm 0.5} \text{ erg s}^{-1} \text{ cm}^{-3}$, where T and T_0 are the local and central temperatures, respectively, and n is the electron number density. We argue that the tight correlation and the scaling of $j(\nu)$, combined with morphological and spectral evidence, indicate that both GHs and MHs arise from secondary electrons and positrons, produced in cosmic-ray ion (CRI) collisions with a strongly magnetized $B \geq 3 \mu\text{G}$ intracluster gas. When the magnetic energy density drops below that of the microwave background, the radio emission weakens considerably, producing halos with a clumpy morphology (e. g., RXC J2003.5-2323 and A2255) or a distinct radial break. We thus measure a magnetic field $B = 3 \mu\text{G}$ at a radius r similar or equal to 110 kpc in A2029 and r similar or equal to 50 kpc in Perseus. The spectrum of secondaries, produced from hadronic collisions of similar to 20 GeV CRIs, reflects the energy dependence of the collision cross section. We use the observed spectra of halos, in particular where they steepen with increasing radius or frequency, to (1) measure B similar or equal to $10(\nu/700 \text{ MHz}) \mu\text{G}$ with ν the spectral break frequency, (2) identify a correlation between the average spectrum and the central magnetic field, and (3) infer a CRI spectral index s less than or similar to -2.7 and energy fraction $\xi(p)$ similar to $10^{(-3.6 \pm 0.2)}$ at particle energies above 10 GeV," wrote U. Keshet and colleagues

(see also).

The researchers concluded: "Our results favor a model where CRIs diffuse away from their sources (which are probably supernovae, according to a preliminary correlation with star formation), whereas the magnetic fields are generated by mergers in GHs and by core sloshing in MHs."

Keshet and colleagues published the results of their research in *Astrophysical Journal* (Using Radio Halos And Mini-halos To Measure The Distributions Of Magnetic Fields And Cosmic Rays In Galaxy Clusters. *Astrophysical Journal*, 2010;722(1):737-749).

For additional information, contact U. Keshet, 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)

New findings from H.B. Liu and co-authors in the area of astronomy published,

Science Letter, p1024,

Tuesday, December 28, 2010

TEXT:

According to a study from the United States, "This is the first paper of our series of high-resolution (1 ") studies of the massive star-forming region G10.6-0.4. We present the emission line observations of the hot core type tracers ((OCS)-C-13, OCS, SO₂) with similar to 0 ".5 resolution."

"By comparing the results to the high-resolution NH₃ absorption line observation, we confirm for the first time the rotationally flattened hot toroid in the central <0.1 pc region, which has a rotational axis perpendicular to its geometrical major axis. In addition, we present the observations of NH₃, (CS)-C-13, and CH₃CN with similar to 1 " resolution, and follow the dynamics of the molecular accretion flow from the 0.3 pc radius to the inner 0.03 pc radius. With reference to the rotational axis of the hot toroid, we measure the rotational velocity from the molecular emission in the region. The results are consistent with an envelope with a rapid decrease of the specific angular momentum from the outer to the inner

region," wrote H.B. Liu and colleagues (see also).

The researchers concluded: "These new results improve the current understanding of the molecular accretion flow in an ultracompact H II region created by the embedded O-type cluster."

Liu and colleagues published their study in *Astrophysical Journal* (The Decrease Of Specific Angular Momentum And The Hot Toroid Formation: The Massive Clump G10.6-0.4. *Astrophysical Journal*, 2010;722(1):262-272).

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

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Record - 5

DIALOG(R)

New findings from G. Torres and co-researchers in the area of astronomy described,

Science Letter, p1022,

Tuesday, December 28, 2010

TEXT:

"When making use of tabulations of empirical bolometric corrections for stars (BCV), a commonly overlooked fact is that while the zero point is arbitrary, the bolometric magnitude of the Sun (M-bol,M-circle dot) that is used in combination with such tables cannot be chosen arbitrarily. It must be consistent with the zero point of BCV so that the apparent brightness of the Sun is reproduced," scientists in the United States report (see also).

"The latter is a measured quantity, for which we adopt the value $V\text{-circle dot} = -26.76 \pm 0.03$. Inconsistent values of M-bol,M-circle dot are listed in many of the most popular sources of BCV. We quantify errors that are introduced by failure to pay attention to this detail," wrote G. Torres and colleagues.

The researchers concluded: "We also take the opportunity to reprint the BCV coefficients of the often used polynomial fits by Flower, which were misprinted in the original publication."

Torres and colleagues published their study in *Astronomical Journal* (On The

Use Of Empirical Bolometric Corrections For Stars. *Astronomical Journal*, 2010;140(5):1158-1162).

For more information, contact G. Torres, Harvard **Smithsonian** Center Astrophysics, 60 Garden St., Cambridge, MA 02138, USA.

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

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Record - 6

DIALOG(R)

New astronomy study findings have been reported by S. Ma and co-researchers, *Science Letter*, p844, Tuesday, December 28, 2010

TEXT:

"Taking advantage of the two viewpoints of the STEREO spacecraft, we present a statistical study of coronal mass ejections (CMEs) with and without distinct low coronal signatures (LCSs) from 2009 January 1 to August 31. During this period, the lines of sight from STEREO A and B are almost perpendicular and nearly a quarter of the Sun was observed by both," scientists in the United States report (see also).

"We identified 34 CMEs that originated from around this area and find that (1) about 1 out of 3 CMEs that were studied during 8 months of solar minimum activity are stealth CMEs; a CME is stealth if no distinct LCS (such as coronal dimming, coronal wave, filament eruption, flare, post-eruptive arcade) can be found on the disk. (2) The speeds of the stealth CMEs without LCSs are typically below 300 km s⁻¹. Comparing with the slow CMEs with LCSs, the stealth CMEs did not show any clear differences in their velocity and acceleration evolution. (3) The source regions of the stealth CMEs are usually located in the quiet Sun rather than active regions. Detailed study indicates that more than half of the stealth CMEs in this paper showed some faint change of the coronal structures (likely parts of flux ropes) when they could be observed over the solar limb before or during the CME evolution," wrote S. Ma and colleagues.

The researchers concluded: "Finally, we note that space weather detection systems based on LCSs totally independent of coronagraph data may fail to detect a significant proportion of CMEs."

Ma and colleagues published their study in Astrophysical Journal (Statistical Study Of Coronal Mass Ejections With And Without Distinct Low Coronal Signatures. Astrophysical Journal, 2010;722(1):289-301).

For more information, contact S. Ma, 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 - 7

DIALOG(R)

New life sciences study results reported from J.L. Bean et al,
Life Science Weekly, p1346,
Tuesday, December 28, 2010

TEXT:

According to recent research from the United States, "In contrast to planets with masses similar to that of Jupiter and higher, the bulk compositions of planets in the so-called super-Earth regime (masses 2-10 times that of the Earth) cannot be uniquely determined from a measurement of mass and radius alone. For these planets, there is a degeneracy between the mass and composition of both the interior and a possible atmosphere in theoretical models(1,2)."

"The recently discovered transiting super-Earth exoplanet GJ 1214b is one example of this problem(3). Three distinct models for the planet that are consistent with its mass and radius have been suggested(4). Breaking the degeneracy between these models requires obtaining constraints on the planet's atmospheric composition(5,6). Here we report a ground-based measurement of the transmission spectrum of GJ 1214b between wavelengths of 780 and 1,000 nm. The lack of features in this spectrum rules out (at 4.9 sigma confidence) cloud-free atmospheres composed primarily of hydrogen. If the planet's atmosphere is hydrogen-dominated, then it must contain clouds or hazes that are optically thick at the observed wavelengths at pressures less than 200 mbar," wrote J.L. Bean and colleagues (see also).

The researchers concluded: "Alternatively, the featureless transmission spectrum is also consistent with the presence of a dense, water vapour atmosphere."

Bean and colleagues published their study in Nature (A ground-based transmission spectrum of the super-Earth exoplanet GJ 1214b. Nature, 2010;468(7324):669-672).

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

Publisher contact information for the journal Nature is: Nature Publishing Group, Macmillan Building, 4 Crinan St., London N1 9XW, England.

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Record - 8

DIALOG(R)

Keele's link to new world,
Sentinel, (Stoke-on-Trent, UK), p2,
Friday, December 24, 2010

TEXT:

Scientists at Keele University have collaborated with colleagues in Qatar and America in discovering a new world.

The discovery of the planet Qatar-1b was the result of cooperation between researchers at Keele, a Qatari astronomer, and the Harvard-**Smithsonian** Center for Astrophysics in the United States.

Keele's 0.6m telescope was used to confirm the discovery of the planet, described as a "hot Jupiter", after it was first found by Qatari wide-angled cameras in New Mexico.

Researchers at universities in Leicester and St Andrews were also involved. Dr. Khalid Al Subai, leader of the Qatar exoplanet survey, said: "The discovery of Qatar-1b marks the beginning of a new era of collaborative astrophysics research between Qatar, the United Kingdom, and the United States."

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Record - 9

DIALOG(R)

NASA scientists' breakthrough in determining hyperactivity of black holes,

ANI,

Asian News International,

Tuesday, December 21, 2010

TEXT:

Washington, Dec 21 (ANI): Scientists have been able to determine how often the biggest black holes have been active over the last few billion years, thanks to a new study from NASA's Chandra X-ray Observatory.

The breakthrough could help them understand better how massive stars explode, which ones leave behind black holes or neutron stars, and how many black holes are in our galaxy and others.

"We've found that only about one percent of galaxies with masses similar to the Milky Way contain supermassive black holes in their most active phase," said Daryl Haggard of the University of Washington in Seattle, WA, and Northwestern University in Evanston, IL.

"Trying to figure out how many of these black holes are active at any time is important for understanding how black holes grow within galaxies and how this growth is affected by their environment," he added.

The team used a survey called the Chandra Multiwavelength Project, which covers 30 square degrees on the sky. Combining Chandra's X-ray images with optical images from the Sloan Digital Sky Survey, about 100,000 galaxies were analyzed. Out of those, about 1,600 were X-ray bright, signaling possible AGN activity.

"This is the first direct determination of the fraction of field galaxies in the local Universe that contain active supermassive black holes," said co-author Paul Green of the Harvard-Smithsonian Center for Astrophysics in Cambridge, MA.

One result is that the fraction of galaxies containing AGN depends on the mass of the galaxy. Another result is that a gradual decrease in the AGN fraction is seen with cosmic time since the Big Bang.

The study also has important implications for understanding how the neighbourhoods of galaxies affects the growth of their black holes.

"It seems that really active black holes are rare but not antisocial. This has been a surprise to some, but might provide important clues about how the environment affects black hole growth," said Haggard.

These results were published in the November 10th issue of the

Astrophysical Journal. (ANI)

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Record - 10

DIALOG(R)

Dust thou art not & unto dust thou shan't return: common mistakes in teaching biogeochemical cycles.,

O'Connell, Dan,
THE AMERICAN BIOLOGY TEACHER, v72, n9, p552(5)
Monday, November 1, 2010

TEXT:

[ILLUSTRATION OMITTED]

Without ever opening their textbooks, my high school biology students can usually give a plausible-sounding account of biogeochemical cycles. First, they explain that plants take in nutrients from the soil. Then, animals come along, eat the plants, and build their bodies from the plant-derived materials. Finally, the animals and plants die, decompose, and give their bodies to the soil to restore the nutrients needed to sustain future generations. It is a simple, familiar, and beautiful tale--from soil, to plant, to animal and back. It is no wonder my students have learned it by heart.

Unfortunately, this familiar story is untrue. But, if you have difficulty spotting its errors, you are in good company. The authors of several of the most widely used and highly regarded biology and environmental science texts have the same trouble. These published errors are especially regrettable because they reinforce common misconceptions about biogeochemical transfers (Annenberg Foundation & Corporation for Public Broadcasting [CPB], 1997; Keeley et al., 2005; Koba & Tweed, 2009). This makes it particularly difficult for students to understand the truth (Treagust, 1988).

Often, the truth in science is stranger than fiction. Although I studied photosynthesis in middle school, high school, college, and graduate school, it was not until years later that its significance finally sank in. Plants do not eat soil. They eat air! More precisely, plants and all other autotrophs use carbon dioxide as their principal nutrient source. It accounts for about 90% of nutrient uptake. Water comes in a distant second,

contributing only about 5% to plant dry mass. More than a dozen other nutrients combine to make up the remaining 5% (Markert, 1992; Freeman, 2008). (1)

Although it is widely understood that the biosphere is formed from just two main ingredients, $C[O.sub.2]$ and $[H.sub.2]O$, the fact is still astonishing. Carbon dioxide--an invisible, odorless, mildly toxic, and very rare atmospheric gas--is, by far, the biosphere's most important building material. Equally surprising, all but a tiny fraction of the material in dead organisms is quickly converted back to this same simple molecule (Falkowski et al., 2000). The small fraction of the biosphere's carbon that is sequestered as soil organic material is nutritionally unavailable to plants (Hungate et al., 1997; King, 1997). If decomposers did not vaporize almost all organic detritus, producers would soon be without a carbon source and life on earth would be devastated.

These facts are so important that they should be integral to any introductory course in biology or environmental science. Yet many authors not only fail to correct misconceptions about material cycles, they perpetuate them.

Such mistakes hinder a proper understanding of climate change, including its causes and possible solutions. This is one of the most pressing environmental issues of our time. So, it is imperative that these misconceptions be replaced with clear understandings. It is now evident that Earth's climate system is profoundly influenced by the amount of carbon dioxide in the atmosphere (Sarmiento & Wofsy, 1999). It is also clear that humans have been altering this amount at an alarming rate (Pachauri & Reisinger, 2007). Every student of biology and environmental science should appreciate that when producers perform photosynthesis, they build their bodies almost entirely from a greenhouse gas. Only by understanding this process can students hope to follow arguments for alternative fuels, reforestation, habitat preservation, and other strategies for mitigating anthropogenic $C[O.sub.2]$. (2)

Correcting mistaken ideas about material cycles is also vital because this subject is so counterintuitive and interesting. Where do the materials in our body come from? Where do they eventually go? Where does fat go when a person loses weight? What do plants use to build their bodies? How are we dependent on atmospheric gases for our survival? The answers to these questions are so surprising as to offer golden opportunities for inspiring lasting interest in science. Teachers squander such opportunities when familiar but mistaken ideas about material cycles replace the unfamiliar and fascinating truth.

However, before addressing the widespread use of inaccurate and misleading

accounts of material transfers, I ask you to briefly consider some of the possible sources.

* The Sources of Misconceptions about Biogeochemical Cycles

Ask your class to complete this familiar phrase: "Ashes to ashes, dust to --," The text for this prayer, part of the English Burial Service, is derived from the Biblical verses in Genesis that tell of God's response after Adam and Eve have eaten the fruit from the forbidden tree.

(17) Cursed is the ground for thy sake; in sorrow shalt thou eat of it all the days of thy life;

(18) Thorns also and thistles shall it bring forth to thee; and thou shalt eat the herb of the field; (19) In the sweat of thy face shalt thou eat bread, till thou return unto the ground; for out of it wast thou taken: for dust thou art, and unto dust shalt thou return.

Genesis 3:17-19, King James Version

Although the author of Genesis was surely not striving to describe biogeochemical cycles literally or with scientific accuracy, this description holds great intuitive appeal. For those trying to understand the source and fate of biological material, the Genesis story gives a common-sense answer. Throughout these verses, the materials of the biosphere are shown to come from the ground. Not only are thorns and thistles produced by the ground, but Adam and Eve are cursed to eat of the ground, which their bodies are said to be made of, and fated to return to.

In 350 BCE, about a century after Genesis was written, Aristotle addressed a similar question: Where do the materials that make up plants come from? Unfortunately, he reached a similar conclusion. Aristotle began by noting that the body is divided into an upper, a middle, and a lower part. Food enters animals in the upper part, whereas excretion is performed by the lower part. Plants, he reasoned, are the reverse of animals in this respect. So Aristotle mistakenly claimed that "there is a correspondence between the roots in a plant and what is called the mouth in animals, by means of which they take in their food" (translated by G. R. T. Ross; http://classics.mit.edu/Aristotle/youth_old.L1.html). Unfortunately, Aristotle's mistake was viewed as scientific truth for hundreds of years (King, 1997).

Still, it is easy to imagine how the mistake could have arisen. When compared to carbon dioxide, soil appears to be much more potent and substantial. Playing soil through one's fingers, the harvest bounty can seem latent within. Soil is where seeds are planted. Soil is what farmers till, fertilize, and water. Gardeners everywhere are advised to treat soil

with the utmost care. Indeed, the status of soil has sometimes been elevated to that of a living thing (Harris, 2005), which it certainly is not. But to the uneducated, soil can appear to be both the source and final resting place of organic material. We have all casually observed plants growing where soil is present and not growing where soil is absent. Experiences like these reinforce the mistaken belief that soil stores the primary nutrients for plants. This makes material cycles a particularly hard subject for students to grasp (Barker, 2001; Koba & Tweed, 2009).

* A Critique of Materials Used for the Teaching of Biogeochemical Cycles
Although the essential details of material cycles, such as the carbon cycle, have been established for over 50 years, it is not uncommon to encounter passages like the following:

Producers that supply food for us and other consumers get the nutrients they need from soil and water. Indeed you are mostly composed of soil nutrients imported into your body by the food you eat. (Miller & Brewer, 2008)

Both of the sentences above are almost completely incorrect. Producers get only a tiny fraction of the nutrients they need from soil, and we are composed almost entirely from atmospheric carbon dioxide and water. Yet this quotation is taken from a textbook in its 15th edition!

Sadly, Tyler Miller and Richard Brewer's (2008) *Living in the Environment* is far from alone in misrepresenting biogeochemical cycles. The North Carolina Department of Agriculture and Consumer Services misinforms us that plants grow by "absorbing nutrients from the soil" (see <http://www.ncagr.gov/cyber/kidswrld/plant/nutrient.htm>). Likewise, Johnson and Raven (2006) summarize biogeochemical cycles this way:

Carbon atoms, for example, are passed from one organism to another in a great circle of use. Producers are eaten by herbivores, herbivores are eaten by predators, and top predators die and decay; their carbon atoms then become part of the soil to feed the producers in a long and complex cycle that reuses this important element.

I wish there were a more delicate way to respond to this description, but it is just plain wrong. It entirely omits the importance of atmospheric gases stating instead that producers obtain carbon from the soil. A subsequent chapter on terrestrial adaptations of plants repeats this error (Johnson & Raven, 2006).

Surprisingly, when Scott Freeman's otherwise outstanding textbook tackles biogeochemical cycles it makes a similar error. Indeed, Freeman's scheme for material cycles (Freeman, 2008: figure 54.13) could have been drawn by Aristotle himself. The figure depicts a tree absorbing nutrients from the soil using only its roots and not its leaves. The leaves are shown being eaten by a deer, which assimilates the plant nutrients. Finally, the materials from both the tree and the deer are shown returning to the soil, not to the atmosphere. The role of C[O.sub.2] is not mentioned in the figure, its caption, or the accompanying text.

While it is inevitable that some details will be left out of any generalized scheme, the most essential details should be the last to go. A summary of biogeochemical cycles that includes soil but not atmospheric gases is like a description of blood that mentions only white cells and not red. (3)

Biology, by Ken Miller and Joseph Levine, is perhaps the most widely used high school biology textbook in the United States. Fortunately, it does a much better job of describing the importance of CO₂. Still, the authors' list of essential plant nutrients does not include carbon, hydrogen, or oxygen. Instead, their list and the accompanying text describe nitrogen, phosphorus, potassium, magnesium, and calcium as the "most important" plant nutrients (Miller & Levine, 2006). In fact, none of these comes anywhere close to carbon, oxygen, or hydrogen in supplying biomass. (4)

When authors deal explicitly with biosphere-atmosphere transfers, one might expect such mistakes to disappear. Descriptions of material flowing between biosphere and atmosphere should be potent reminders of the importance of the atmosphere as the main reservoir of nitrogen and of biologically available carbon. However, after Sylvia Mader explains the role of C[O.sub.2] as the carbon source for producers and consumers, the next sentence states, "When organisms (e.g., plants, animals, and decomposers) respire, a portion of this carbon is returned to the atmosphere as carbon dioxide" (Mader, 2004). The rest is said to contribute to carbon deposits, such as soil carbon, ocean sediments, and fossil fuel deposits. Given the Aristotelian tendencies of students to think of soil as a primary reservoir of plant nutrients, it seems prudent to compare Mader's "portion" that returns with the rest. What fraction of the organic material produced each year contributes to the formation of soil, fossil fuels, and other forms of sequestered carbon? Mader makes it sound like the majority of assimilated carbon is headed for sequestration. Could "a portion" be more than 50 percent? Fortunately, Mader's accompanying figure caption provides the answer. About 120 gigatons of carbon are removed each year from the atmosphere by photosynthesis. About 60 gigatons return to the atmosphere through animal and plant respiration, and 60 more return to the atmosphere through decay, which is really just another name for respiration performed

by decomposers. So, this caption (but not the main text) indicates that essentially all of the carbon that is converted to organic material each year is converted back to carbon dioxide. In other words, the "portion" of assimilated carbon returned to the atmosphere is approximately 100% (Mader, 2004).

* How to Address Misconceptions about Material Cycles

Any manuscript as ambitious as a biology textbook is bound to contain errors. Only a mean-spirited nitpicker would draw public attention to unimportant or isolated textbook errors. But the idea that biomass comes from and returns to soil is too important and too pervasive a mistake to overlook. One obvious corrective step is to substitute accurate, clear resources in place of flawed texts. This is easily done. For example, *Biology* by Neil Campbell does a fine job of consistently avoiding the inaccuracies described above (Campbell et al., 1999).

Another excellent source is *Biology: Exploring the Way Life Works* (Hoagland et al., 2001). The authors not only avoid inaccuracies; they write with unusual clarity, emphasizing key facts judiciously. When addressing the sources of biological matter and energy, they offer the bold section title "Life runs on sugar."

Although nearly all my students have previously been asked to memorize the chemical equation for photosynthesis, they have not internalized its importance in the carbon cycle. One reason may be that photosynthesis is typically presented in lessons about energy, and not in those about nutrition or ecology. Of course, photosynthetic products are not only used for energy. If they were, photosynthetic organisms would not be able to build their bodies; nor would their dependent consumers be able to build theirs. Life requires the anabolic utilization of the products of carbon fixation. These products are the building blocks for the biosynthesis of amino acids, lipids, nucleic acids, and almost all other essential biological molecules.

By contrast, my students typically think of "sugar" as an unhealthy additive found in candy bars or soft drinks. They do not see it as an indispensable anabolic feedstock for the biosphere. *Biology: Exploring the Way Life Works* combats this misconception nicely when the text points out that photosynthetic organisms make enough sugar each year to fill a 30-million-mile-long freight train. This supply of sugar, Hoagland et al. tell us, sets the budget for nearly all the energy use and biosynthesis that can occur in the biosphere--which brings the biogeochemical importance of photosynthesis into clear focus.

Unfortunately, prior beliefs are notoriously difficult to change. Merely

assigning even the best textbook readings seems unlikely to reform students' beliefs about material cycles. I recommend instead that teachers begin by uncovering these beliefs. Ask students "Where does the material in your body come from?" When they cite food and drink, push them to explain how the material got into their food or drink. (55) Explain that this question really amounts to asking how producers acquire nutrients. Research shows that even accomplished high school and college students answer this question like Aristotle, pointing mistakenly again and again to soil (Annenberg Foundation & CPB, 1997). Likewise, when asked to explain where the organic material of terrestrial organisms will end up, students describe a cycle, with organic material somehow returning to the soil (Annenberg Foundation & CPB, 1997).

One strategy for addressing these mistakes is to simply remind students that for almost 90% of the time that life has existed on Earth, it thrived without soil (Campbell et al., 1999). Until 450 million years ago, almost all life was restricted entirely to aquatic and marine environments. Plants with the ability to take up material from soil arose long after animals. Although soil composition ranks among the most powerful abiotic influences on contemporary terrestrial ecosystems, such ecosystems are historical oddities. Nevertheless, as odd as they are, their main source of materials is the same as that used throughout the first 3 billion years of life on earth: atmospheric C[O.sub.2].

Describing epiphytes and explaining hydroponic agriculture are two more ways to show that producers, even plants, can flourish without soil.

Another way to avoid Aristotle's mistake is to remind students of the elemental composition of plants. Like all living things, plants are made from three main elements: carbon, oxygen, and hydrogen. In corn, these three comprise 94.5% of dry mass (Latshaw & Miller, 1924). In humans, they make up 94% of total mass (Emsley, 1998). Carbon enters the biosphere really, really important, that does not mean it is all-important. If our planet were to suddenly lose every last crumb of soil, life, in some form, almost exclusively during photosynthesis, when gaseous carbon dioxide is combined with water to make carbohydrates. Carbon dioxide, either from the air or dissolved in marine or fresh water, is the source of more than 90% of the material assimilated by producers. Water, too, contributes a significant amount of material (Campbell et al., 1999; Freeman, 2008). Everything else--the nitrogen, (6) potassium, phosphorus, sulfur, calcium, sodium, magnesium, and many other essential soil micronutrients - make up less than 5% of the dry mass of a typical vascular plant (Epstein, 1972; Campbell et al., 1999; Freeman, 2008).

Perhaps the most direct proof of the minor role of soil in plant nutrition is also one of the earliest: Jean Baptiste van Helmont's willow tree

experiment. Van Helmont transplanted the shoot of a young willow tree into a large pot of soil. He weighed the willow and the soil separately. After watering the tree and watching it grow for 5 years, he uprooted the tree, shook off the soil, and weighed each again. The tree had gained 164 pounds; the potting soil had lost only 2 ounces (Hershey, 1991). We now know that C[O.sub.2] and water were the source of the other 163. (9) pounds.

Of course, these mass ratios are not just true for willows. Carbon is the *sin qua non* for almost all cellular biosynthesis. All this carbon enters the biosphere directly from the atmosphere or from atmospheric C[O.sub.2] that has dissolved in water.

Because the truth about plant nutrition is often at odds with students' beliefs, an inquiry-based investigation may be the most persuasive. Peruzzi (2009) presents a method for performing a van Helmont-like experiment with students. Similarly, I have suggested an inquiry-based investigation of photosynthesis and cellular respiration that highlights the importance of carbon dioxide transfers and reveals the minor role of soil in plant nutrition (O'Connell, 2008).

* Conclusion: An Incognito Truth

Although each of the authors criticized above has misled their readers, each also describes the role of atmospheric gases accurately. It is not that some experts believe that the biosphere obtains most of its materials from the atmosphere and others do not. All scientific authorities acknowledge the same simple truth: the air, not the soil, supplies the biosphere with the vast majority of its building material. Likewise, all authorities agree that soil is wonderful and sometimes essential stuff. I do not emphasize the minor material role of soil in the carbon cycle in an attempt to deny the importance of soil. We all owe an enormous debt to Steven Hales, Jean Senebier, Theodore de Saussure, Jean-Baptiste Boussingault, and dozens of other scientists who helped discover the mineral nutrient requirements of plants (Epstein, 1972). Their hard-won knowledge has transformed the world, helping to supply food to over 6 billion people (Matthews, 2007). Cultivating the soil has been, and will surely continue to be, essential to the ecological success of humans for the foreseeable future (Foley, 2009). Nevertheless, just because soil is

would go on.

But like carbon dioxide itself, this truth is hard to see. To the uneducated it sounds preposterous to suggest that an invisible gas and a tasteless liquid are the principal building blocks of tomatoes, blackberries, lobsters, Moses, Aristotle, you, and me. So in addition to simply avoiding texts that publish misconceptions, teachers should present evidence for, and guide investigation of, at least one counterintuitive

biogeochemical transfer.

Of course, before teachers can do this, they have to be aware of the misconceptions in the first place. Given the influence of both culture and experience in supporting the Aristotelian view, it is understandable that some teachers might be unaware of these misconceptions. But in fact, these misconceptions seem to be pervasive-even among experts. On its Web site, the publisher of *Living in the Environment* boasts that, since 1975, Tyler Miller's textbooks have been the "most widely used environmental science textbooks in the United States and throughout the world." They have been used by "almost 3 million students and have been translated into eight languages." In addition, Miller's textbook is the required text for three of the four AP Environmental Science syllabi presented as exemplary (see <http://apcentral.collegeboard.com/apc/public/courses/syllabi/index.html>). The fact that a text with such canonical reach has gone uncorrected for decades is a reminder of the powerful influence of folk beliefs and misconceptions.

If we fail to address such misconceptions in our courses, we risk graduating students who are ill-equipped to understand plant nutrition, climate change, and other fundamentals. Alternatively, if we succeed, our students may realize that scientific knowledge can transform the way they see the world.

A course in biology should make students aware that the muscles propelling them down the soccer field, the hair standing on the backs of their necks, and the very brains they use to understand the world are all built almost entirely from a rare atmospheric gas. Because most students do not experience their muscles, hair, or brains in this way, teachers have a grand opportunity to inspire awed wonder. Richard Dawkins has described such wonder as "one of the highest experiences of which the human psyche is capable. It is a deep aesthetic passion to rank with the finest that music and poetry can deliver" (Dawkins, 2000). It is my hope that correcting misconceptions about biogeochemical cycles will help students experience this wonder.

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(1) Unfortunately, in plant nutrition, the term "macronutrient" is used for nitrogen, potassium, calcium, phosphorus, magnesium, and sulfur - elements that constitute only a very small fraction of plant dry mass. A more accurate term would be "micronutrient." But this term is used to describe the set of even rarer elements whose total combined mass typically constitutes less than 1% of dry mass.

(2) This mistake also obscures the true importance of humus, which can improve fertility, but only indirectly, such as by changing the chemical and physical properties of soil.

(3) The idea that plants get almost all nutrients from the soil is comparable to the notion that New York City is 130 miles from San Francisco. Both estimates are off about twenty-fold.

(4) Miller and Levine (2006) also reinforce the misconception that metabolized nutrients exit animal bodies as defecated waste. Fecal matter is not metabolic waste. It is more accurate to see feces as material that never really entered an animal's body. The vast majority of the organic material that crosses into the body is consumed in cellular respiration and, thus, is not expelled as feces, but rather, exhaled CO₂ (Freeman, 2008).

(5) In addition to food and drink, molecular oxygen is incorporated into the bodies of all aerobes when it is converted to water during oxidative phosphorylation. In humans, about 9% of our water needs are satisfied in this way (Committee on Animal Nutrition, 2003).

(6) Whether to consider nitrogen soil-derived or atmosphere-derived is not

a simple question. In marine environments, of course, there is no soil. Instead, certain plankton species perform nitrogen fixation, making the atmosphere the main source of nitrogen for most marine systems. In terrestrial environments, nitrogen also enters the biosphere from the atmosphere. However, it is first reduced by soil microbes. Also, unlike carbon, a significant amount of nitrogen is retained in soil after living things decompose (Postgate, 1998). In truth, both the soil and the atmosphere are important nitrogen reservoirs. Still, most textbooks overlook the direct uptake of nitrogen from the atmosphere. Instead, they almost invariably focus exclusively on soil microbes - a fixation they would do well to get over.

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