The Celestial Mechanic

The Official Newsletter of the Astronomy Associates of Lawrence

Volume 34 Number 03 **March 2008**

Calendar of Events

Monthly Meeting

No Meeting in March due to Spring Break

SPRING PUBLIC OBSERVING SCHEDULE

Weather Permitting
Memorial Stadium
Sunday, March 30
9:00-10:30 PM

President:
Luis Vargas
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INSIDE THIS ISSUE

Report from the Officers on the February Meeting:

The meeting in February was well attended, drawn by the attraction of learning about that ever-popular topic, black holes, specifically the large one at the center of our own galaxy. It is now believed that these once impossible objects are ubiquitous—they should populate every galaxy core, while millions should be in orbit within every galaxy as the dead remnants of higher mass stars. Even mini black holes are postulated as byproducts of the early universe though, to date, none of the miniature scale have been detected.

Other activities this last month included a half-day visit to an elementary school in the region by Rick Heschmeyer and Rex Powell. There will be a report on this, with photos, in the next newsletter. Other exciting news included in this month's newsletter is the announcement that astronaut Steve Hawley is retiring from NASA and returning to KU as a faculty member within astronomy. Steve took part in an exhausting 4-city

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Of Local Interest—KU physicists probe 'brave new world' with gargantuan particle accelerator

Its magnets are heavier than the Eiffel Tower. It houses the mightiest supercomputer in existence. It creates temperatures hotter than the sun's heart and more frigid than the deepest realms of the cosmos. In fact, the largest scientific device ever built looks like it came from the "Close Encounters" movie set. But the Large Hadron Collider is a real instrument that scientists will use to push forward human understanding of the underlying properties of the universe.

Thanks to a five-year, $2.5 million National Science Foundation award, students and faculty from the University of Kansas will be on hand when the new particle accelerator begins operation this summer in Europe. The KU researchers will help to monitor crashes between beams of hadrons — physicists' jargon for a set of subatomic particles, such as protons — that the supercollider will fire at near-light speed along its 16.5-mile underground track. The purpose of the Large Hadron Collider is to create conditions that existed during the fraction of a nanosecond after the "Big Bang" that created the universe. "How energy works is what we're trying to figure out," said Alice Bean, professor of physics and astronomy at KU. "If you think about the Big Bang theory, there was a lot of energy in the universe and we've seen cooling ever since."

According to Bean, research at the supercollider relies on Albert Einstein's breakthrough formula $E=mc^2$, which expresses the idea that mass and energy are two forms of the same thing. "If you put more energy you can make more mass," Bean said. "So part of what we're trying to do is create that energy and then we can create particles with mass. When you collide protons together, you can get that mass together. You can see what happened at that time in the universe."

Bean is the principal investigator of the NSF's Partnerships for International Research and Education grant to support two or three KU students at both the graduate and undergraduate levels who will work at the particle accelerator each year. KU is the lead institution on the award that also funds participation by students from Kansas State University, the University of Nebraska, the University of Illinois-

From the Officers, continued

(Continued from page 1)

tour before finishing off at a reception at the Dole Center. He is looking forward to beginning his duties as a faculty member in Fall 2008. Our March meeting would normally be scheduled for Friday, March 14. However, that Friday is the first evening of Spring Break and Spring Break continues through March 24, so we will cancel the meeting for this month. Meanwhile, Rick Heschmeyer is working on setting up a Girl Scout astronomy night in April and making plans for Astronomy Day in May. Keep your eyes peeled for updates in future newsletters.

In regional events, the date of the Heart of America Star Party is set and a brochure is enclosed with the newsletter. In related news, the national Astronomical League convention, ALCON EXPO 2008 is scheduled for July 18-19 in Des Moines, Iowa. Additional details and forms can be found at www.alconexpo.com.

The weather has been unusually unpredictable this year, switching from warm to snow on very short timescales while making scheduling of open observing a real challenge. We again cancelled the observing session at the stadium in February due to the partial cloud cover. It wasn't as bad as had been predicted, but it would have been a real stretch to see much on a relatively cold evening. Our next scheduled evening at Memorial Stadium is Sunday, March 30 — weather permitting. Note: we start much later (9PM) due to the time change and the later sunsets. If any changes are required, we will let you know. Otherwise, feel free to join us as a helper or an observer - either way is fine. If you have any suggestions for talks, speakers, or public events, please feel free to contact us, particularly Rick Heschmeyer (rcjbm@sbcglobal.net), the events coordinator for the club. Hope to see you at Memorial Stadium. ALL for now.

(Continued from page 1)

Chicago and the University of Puerto Rico-Mayaguez.

Students will live in Switzerland to carry out their research for the supercollider at the Paul Scherrer Institute in Villigen and attend classes at Eidgenoessische Technische Hochschule in Zurich. The Large Hadron Collider, which straddles the border between Switzerland and France, is a project of CERN, the European Organization for Nuclear Research. KU's involvement with the collider is not new. Bean's research group worked with more than 2,000 physicists from 35 nations to build a crucial component of the particle accelerator, a detector known as the Compact Muon Solenoid. Specifically, the KU team worked to develop the solenoid's silicon strip detector, which has 10 million electronic readout channels and covers an area over 2,000 square feet. "If there's an interesting collision, there are hundreds of particles that come out," said Bean. "You want to track them. So the way of doing that is using silicon, just like the chips in your computer. Several students from the University of Kansas, including undergraduates, graduate students and post-doctoral researchers, worked to build this detector that's sitting in there — and the idea is that it will figure out where all these particles went."

Going forward, students from KU will perform research to upgrade the Compact Muon Solenoid for CERN's next-generation particle accelerator, dubbed the Super Large Hadron Collider, that is scheduled to come online within a decade. Indeed, these KU researchers will be poised at the vanguard of physics. Bean says breakthroughs made by smashing hadrons together might someday change life for millions of people, much like the discovery of the electron and development of the Internet. "This is at the forefront of research where were tying to understand 'how is matter made?' and 'what is mass?' " said Bean. "We have particles that have a lot of mass that are very, very tiny. And we don't understand how that can be so. If we can understand that, maybe we can do stuff like in the old 'Star Trek.' You know, 'Beam me up, Scotty.' We can change our mass and put it different places. That's science fiction right now. But in order to get there, you need to understand how these things work."

About the Astronomy Associates of Lawrence

The club is open to all people interested in sharing their love for astronomy. Monthly meetings are typically on the second Friday of each month and often feature guest speakers, presentations by club members, and a chance to exchange amateur astronomy tips. Approximately the last Sunday of each month we have an open house on Memorial Stadium. Periodic star parties are scheduled as well. For more information, please contact the club officers:Luis Vargas at lcvargas@ku.edu, Gary Webber at gwebber@ku.edu, our faculty advisor, Prof. Bruce Twarog at btwarog@ku.edu. our events coordinator, Rick Heschmeyer at rcjbm@sbcglobal.net. Because of the flexibility of the schedule due to holidays and alternate events, it is always best to check the Web site for the exact Fridays and Sundays when events are scheduled. The information about AAL can be found at **http://www.ku.edu/~aal.**

Copies of the *Celestial Mechanic* can also be found on the web at
http://www.ku.edu/~aal/celestialmechanic

Astronaut Steve Hawley comes home to KU to teach, promote science education

LAWRENCE — Astronaut Steve Hawley is coming home to Planet Jayhawk.

University of Kansas Chancellor Robert Hemenway announced today that Hawley, a Salina native and 1973 KU graduate in physics and astronomy, will join the university faculty this fall to teach and to promote education in science and math.

Hemenway and Hawley, one of three astronauts from Kansas, are making the announcement in a series of press events today at Salina Central High School, from which Hawley graduated in 1969; the Kansas Cosmosphere and Space Center in Hutchinson; the Statehouse in Topeka; and the Dole Institute of Politics on KU's Lawrence campus. "Steve Hawley has always been generous in sharing his experiences and observations with our students and faculty over the years, so we are thrilled and gratified that he will now be doing that on a full-time basis here at KU," Hemenway said. "He will enhance an already incredibly strong physics and astronomy program, as well as be able to travel Kansas so young people statewide can be inspired and encouraged to pursue careers in science."

In Kansas, the number of teacher licenses in chemistry, biology and physics have plummeted, Hemenway noted, and many schools in the state will recruit overseas to fill more than 400 secondary teaching positions in science and mathematics this year. "Science education is vital to the future of this state and nation," Hemenway said. "We need people like Steve to build a new excitement and urgency about science and math education." Hawley, 56, said his new role at KU fulfills a longtime desire to return to Kansas, adding that the mission of promoting interest in science is a perfect fit.

"In my career, I have literally had the chance to see the world," Hawley said. "But today there is no place else I would rather be. It is good to be home. Working with students at KU and across Kansas is a wonderful opportunity to share what I have seen and encourage them to set high goals and go out and discover what this world has to offer."

The National Aeronautics and Space Administration selected Hawley to be an astronaut in 1978. He became the third Kansan — all of whom are KU graduates — to fly in space. His first shuttle experience, in 1984, was the maiden flight of the shuttle Discovery and involved numerous experiments and deployment of several satellites. He was a mission specialist on shuttle flights in 1986, 1990, 1997 and 1999.

During his 1990 flight aboard Discovery, the crew deployed the Hubble Space Telescope, and he returned to Hubble on the second servicing mission in 1997. During his 1999 flight, the crew deployed the Chandra X-ray Observatory — the third of NASA's space observatories. He has logged more than 32 days in space.

From 2001 to 2002, Hawley was director of Flight Crew Operations at NASA's Johnson Space Center in Houston. He is now director of astromaterials research and exploration science at NASA. In that role, Hawley oversees research in planetary and space science and is responsible for NASA's collection of astromaterials, including the moon rocks, comet dust, Martian meteorites and solar wind particles.

Hawley has received numerous honors, including Kansan of the Year in 1992; Kansas Aviation Hall of Fame induction in 1997; KU's Distinguished Service Citation in 1998; and the NASA Distinguished Service Medal in 1998 and 2000. He was recognized as a distinguished alumnus of KU's College of Liberal Arts and Sciences in 2007. KU has a rich history in astronomy, starting with alumnus Clyde Tombaugh, who discovered Pluto on Feb. 18, 1930, and is the namesake of the campus observatory.

Other Kansas astronauts were Ron Evans, a St. Francis native who grew up in Topeka, and Joe Engle, a Chapman native. They earned aeronautical engineering degrees at KU in 1955 and 1956, respectively. Evans piloted the Apollo 17 command module that orbited the moon. Engle piloted the space shuttle Columbia in two approach and landing tests in 1977 and commanded two shuttle missions, including Columbia's second flight into space in 1981. Evans died in 1990.

KU's Department of Physics and Astronomy has 25 faculty members and offers undergraduate and graduate degree programs. Faculty research draws $3.7 million a year in external funding for studies in large scale (solar system, galaxy and universe by the astronomy, cosmology and space physics groups); small scale (nuclear, high energy and astro-particle physics groups); and bulk matter physics (condensed matter and biophysics groups). Strong interdisciplinary programs exist in biophysics, nano-bio science, accelerator physics and astrobiology.

Invisible Spiral Arms

by Patrick L. Barry

At one time or another, we've all stared at beautiful images of spiral galaxies, daydreaming about the billions of stars and countless worlds they contain. What mysteries—and even life forms—must lurk within those vast disks?

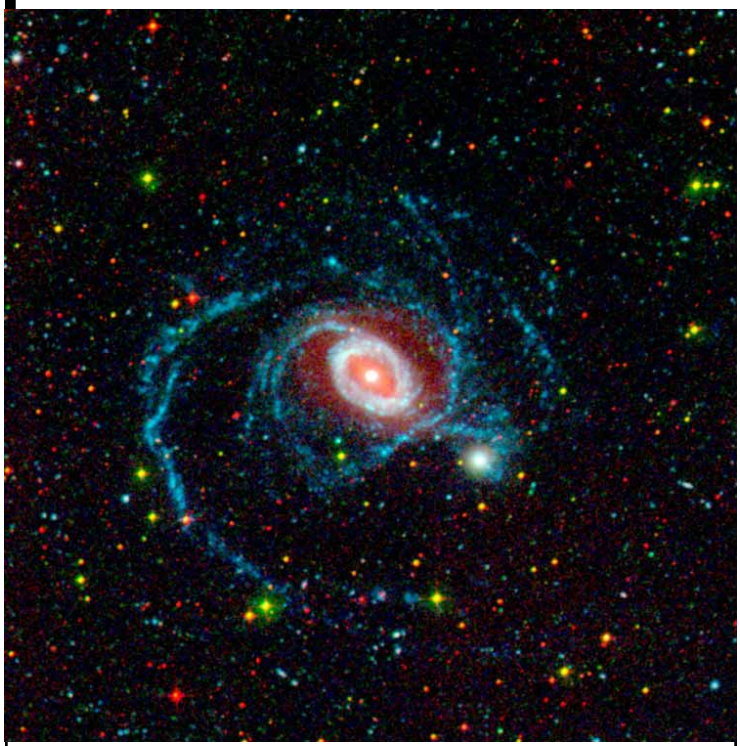
Now consider this: many of the galaxies you've seen are actually much larger than they appear. NASA's Galaxy Evolution Explorer, a space telescope that "sees" invisible, ultraviolet light, has revealed that roughly 20 percent of nearby galaxies have spiral arms that extend far beyond the galaxies' apparent edges. Some of these galaxies are more than three times larger than they appear in images taken by ordinary visible-light telescopes.

"Astronomers have been observing some of these galaxies for many, many years, and all that time, there was a whole side to these galaxies that they simply couldn't see," says Patrick Morrissey, an astronomer at Caltech in Pasadena, California, who collaborates at JPL.

The extended arms of these galaxies are too dim in visible light for most telescopes to detect, but they emit a greater amount of UV light. Also, the cosmic background is much darker at UV wavelengths than it is for visible light. "Because the sky is essentially black in the UV, far-UV enables you to see these very faint arms around the outsides of galaxies," Morrissey explains.

These "invisible arms" are made of mostly young stars shining brightly at UV wavelengths. Why UV? Because the stars are so hot. Young stars burn their nuclear fuel with impetuous speed, making them hotter and bluer than older, cooler stars such as the sun. (Think of a candle: blue flames are hotter than red ones.) Ultraviolet is a sort of "ultra-blue" that reveals the youngest, hottest stars of all.

"That's the basic idea behind the Galaxy Evolution Explorer in the first place. By observing the UV glow of young stars, we can see where star formation is active," Morrissey says.



In this image of galaxy NGC 1512, red represents its visible light appearance, the glow coming from older stars, while the bluish-white ring and the long, blue spiral arms show the galaxy as the Galaxy Evolution Explorer sees it in ultraviolet, tracing primarily younger stars. (Credit: NASA/JPL-Caltech/DSS/GALEX).

The discovery of these extended arms provides fresh clues for scientists about how some galaxies form and evolve, a hot question right now in astronomy. For example, a burst of star formation so far from the galaxies' denser centers may have started because of the gravity of neighboring galaxies that passed too close. But in many cases, the neighboring galaxies have not themselves sprouted extended arms, an observation that remains to be explained. The Galaxy Evolution Explorer reveals one mystery after another!

"How much else is out there that we don't know about?" Morrissey asks. "It makes you wonder."

Spread the wonder by seeing for yourself some of these UV images at www.galex.caltech.edu. Also, Chris Martin, principle scientist for Galaxy Evolution Explorer —or rather his cartoon alter-ego—gives kids a great introduction to ultraviolet astronomy at spaceplace.nasa.gov/en/kids/live#martin.

This article was provided by the Jet Propulsion Laboratory, California Institute of Technology, under a contract with the National Aeronautics and Space Administration.

Super Stars Require Right Environment to Rise

By Dave Mosher

Hollywood megastars need just right the right conditions to explode onto the scene, a phenomenon shared by rare supermassive celestial stars. Two scientists think they have decoded the gassy recipe to create stars as much as 100 times bigger than the sun, perhaps solving the mystery of their formation. Mark Krumholz Princeton University in New Jersey and his colleague Christopher McKee of the University of California Berkeley used mathematical models to show how small stars can prime superstar formation.

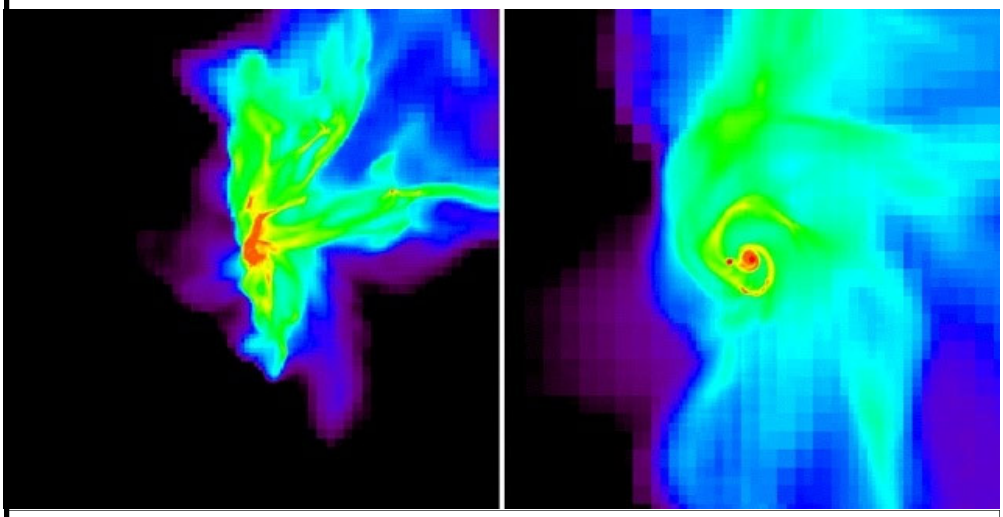
"Gravity tends to break interstellar gas clouds into small pieces, preventing massive star formation," Krumholz said. "But little stars heating up a gas cloud can smooth it out, forcing gravity to create a huge star."

Krumholz and McKee detail their findings in the Feb. 28 issue of the journal *Nature*.

Although massive stars are about a million times rarer than the most common stars — those about 80 percent smaller than the sun — they are the movers and shakers of the universe.

"They're very rare, but massive stars are the dominant players in galaxies," Krumholz said. "They're the things that can push around and heat up interstellar gas, which is essentially where all stars come from."

He also explained that big stars seed the cosmos with elements that are required for life.



Simulation of the collapse of an interstellar gas cloud into a massive star. The left side shows the whole cloud, and the right side shows a zoom-in around the massive star in the center. Credit: Mark Krumholz

"They enrich the universe with metals from their supernovae," he said, noting that only enormous stars are powerful enough to fuse together small atoms and create the heavy materials.

To form a galactic superpower, Krumholz said an interstellar gas cloud needs to be thousands of times more dense than average. Problem is, gravity tends to break dense gas clouds into pieces and thwart massive star formation. "The challenge isn't getting enough gas, it's getting the cloud into a small enough region and preventing its breakup," he said.

If a few small stars form within the cloud, Krumholz explained, they can heat up the cloud and increase its "column density," or pressure. The heating process prevents gravity from taking control of the cloud, breaking it up and forming only small stars. "Heating up the gas helps pressure win over gravity's influence, ultimately forcing the gas cloud to collapse in a massive star," Krumholz said.

The new view of star formation highlights the rarity of massive stars — the only kind astronomers on Earth can see in distant galaxies — but leads to the possibility that more stars form in galaxies than previously thought. "There may be significant parts of galaxies where massive stars can't form, but lower-mass stars like the sun can," Krumholz said. "We estimate the number of stars in a galaxy on the amount of light we see, and if massive stars are missing, then it's possible that we've dramatically underestimated the rate of star formation in distant regions of the universe."

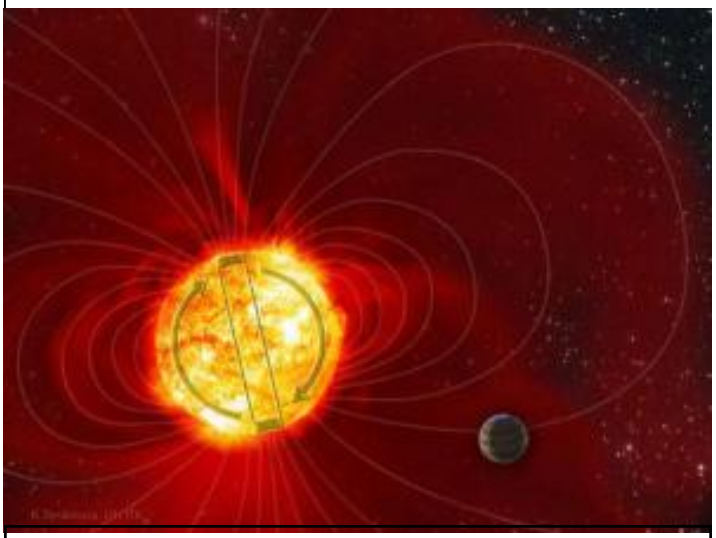
Sun-like Star Flips Its Magnetic Field Like Our Sun: First Observation

ScienceDaily

An international group of astronomers that includes the University of Hawaii's Evgenya Shkolnik have discovered that the sun-like star tau Bootis flipped its magnetic field from north to south sometime during the last year.

It has been known for many years that the Sun's magnetic field changes its direction every 11 years, but this is the first time that such a change has been observed in another star. The team of astronomers, who made use of Canada-France-Hawaii Telescope atop Mauna Kea, are now closely monitoring tau Bootis to see how long it will be before the magnetic field reverses again.

Magnetic field reversals on the sun are closely linked to the varying number of sunspots seen on the sun's surface. The last "solar minimum," the time when number of sunspots was the lowest and the magnetic flip occurred, was in 2007. The first sunspot of the new cycle appeared just last month.



The magnetic field of the sun-like star tau Bootis has flipped its north and south poles, the first time this has been observed in a star other than our sun. The shortened cycle of this event may be due to interactions with its nearby massive planet. (Credit: Karen Teramura (UH IfA))

The magnetic cycle of the Sun impacts the Earth's climate and is believed to have caused the little ice age in the seventeen century. The Earth's magnetic field also flips, although much less frequently and more erratically.

The international team led by Jean-Francois Donati and Claire Moutou of France caught tau Bootis in the process of flipping its magnetic field while they were mapping the magnetic fields of stars.

What makes tau Bootis even more interesting is that it harbors a giant planet orbiting very close to the surface of the star. The planet is actually so close (only one twentieth the distance between the sun and Earth) and so massive (about 6.5 times the size of Jupiter) that it succeeded in forcing the surface of the star to co-rotate with the planet's orbital motion through tidal torques. This is the same effect that causes the moon to co-rotate around Earth so that we see only one side of the moon.

Since the astronomers managed to catch tau Bootis in this state of magnetic flipping during just two years of observations, it is likely that this event is much more frequent on tau Bootis than it is on the sun. It is possible that the giant planet that has already managed to speed up the surface of tau Bootis is also spinning up the magnetic engine of its host star. The astronomers will keep their telescopes focused on tau Bootis in coming years to make sure they catch the star's next magnetic turnover. Their goal is a better understanding of how magnetic engines work in stars, including our sun.

Slightly hotter and 20 percent more massive than the sun, tau Bootis is fairly bright and visible with the naked eye and located only 51 light-years away from us. It is currently rises about midnight and is visible for most of the night near the bright star Arcturus in the constellation Bootis in the northeast part of the sky.

Montana Girl Wins Planet Mnemonic Contest

By The Associated Press

A fourth-grader at Riverview Elementary School has won the National Geographic planetary mnemonic contest, developing a handy way to remember the newly assigned 11 planets, including three dwarfs. National Geographic Children's Books created the contest in response to the recent announcement by the scientific community that there are now 11 recognized planets - Mercury, Venus, Earth, Mars, Ceres, Jupiter, Saturn, Uranus, Neptune, Pluto and Eris. Ceres, Pluto and Eris are considered dwarf planets.Ten-year-old Maryn Smith's winning mnemonic is My Very Exciting Magic Carpet Just Sailed Under Nine Palace Elephants. "When I got the call, my first response was, 'I won?"' Smith said in a statement. "I can't believe that next year my teacher will be teaching her new class the order of the planets using my mnemonic!"

Smith's mnemonic will be published in astronomer David Aguilar's next National Geographic book, "11 Planets: A New View of the Solar System." It also will be recorded into a song by Grammy-nominated singer and songwriter Lisa Loeb. Both are scheduled to be released in March.

Earth's Final Sunset Predicted

By Clara Moskowitz

"Some say the world will end in fire, Some say in ice," wrote the poet Robert Frost. Astronomers, it turns out, are in the former camp.

A new calculation predicts that Earth will be swallowed up by the sun in 7.6 billion years, capping off a longstanding debate over whether the sun's gravitational pull will have weakened enough for Earth to escape final destruction or not. Other theorists have predicted that our planet will fry as the sun expands in its old age. But the time estimates have varied by a couple billion years.

"Although people have looked at these problems before, we would claim this is the best attempt that's been made to date, and probably the most reliable," said astronomer Robert Smith, emeritus reader at the U.K.'s University of Sussex, who made the new calculations with astronomer Klaus-Peter Schroeder of the University of Guanajuato in Mexico. "What we've done is to refine existing models and to put the best calculations we can at each point in the model."

If 7.6 billion years doesn't sound like an urgent death sentence, don't relax yet. Regardless of whether Earth will ultimately be vaporized, as the sun heats up, our planet will become too hot to live on before then.

"After a billion years or so you've got an Earth with no atmosphere, no water and a surface temperature of hundreds of degrees, way above the boiling point of water," Smith told *SPACE.com*. "The Earth will become dry basically. It will become completely impossible for life of any kind to exist. It's a pretty gloomy forecast."

Nonetheless, scientists are curious about the ultimate fate of our planet after we are gone (like all previous hominids and more than 99 percent of all species that have lived on Earth, humans will probably go extinct, and it will likely happen sooner than a billion years).

Smith's earlier studies found that Earth would narrowly escape being engorged. As the sun ages and expands into a red giant star, it will shed its outer gaseous layers, thus losing mass and weakening its gravitational pull. Previous calculations found that this let-up would allow the Earth's orbit to shift outward, enabling the planet to slip free of the smoldering sun.

But this scenario doesn't account for tidal forces, and the drag of the sun's outer layers. As the Earth orbits the sun, its smaller gravitational pull isn't completely negligible — it actually causes the side of the sun closest to our planet to hoard more mass and bulge out toward us.

"Just as the Earth is pulling on the sun's bulge, it's pulling on the Earth, and that causes the Earth to slow in its orbit," Smith said. "It will spiral back and finally end up inside the sun."

In addition, the gas that the sun expels will also drag Earth inward toward its demise.

Smith's previous calculations had ignored these effects.

"We didn't think it mattered, but it turns out it does," he said. "You might say our previous models had a gap."

Artist's conception of the view of a hypothetical planet around a distant red giant star. James Gitlin (STScI)

There may even be hope for Earth. Some scientists have proposed a scheme for down the road to use the gravity of a passing asteroid to budge Earth out of the way of the sun toward cooler territory, assuming there is life around at the time that is intelligent enough to engineer this solution.

"It sounds like science fiction, but there's a group of people who have quite seriously suggested that it might be possible," Smith said. "If it's done right, that would just keep the Earth moving fast enough to keep it out of harm's way. Maybe life could go on for as much as 7 billion years."

Astronomers Discover Largest-ever Dark Matter Structures Spanning 270M Light-years

A University of British Columbia astronomer with an international team has discovered the largest structures of dark matter ever seen. Measuring 270 million light-years across, these dark matter structures criss-cross the night sky, each spanning an area that is eight times larger than the full moon.

"The results are a major leap forward since the presence of a cosmic dark matter web that extends over such large distances has never been observed before," says Ludovic Van Waerbeke, an assistant professor in the Dept. of Physics and Astronomy. To glimpse the unseen structures, the team of French and Canadian scientists "X-rayed" the dark matter, an invisible web that makes up more than 80 per cent of the mass of the universe.

The team used a recently developed technique called "weak gravitational lensing," which is similar to taking an X-ray of the body to reveal the underlying skeleton. The study relied on data gathered from the world's largest digital camera. "This new knowledge is crucial for us to understand the history and evolution of the cosmos," says Van Waerbeke. "Such a tool will also enable us to glimpse a little more of the nature of dark matter."

The astronomers observed how light from distant galaxies is bent and distorted by webs of dark matter as it travels toward Earth. They then mapped dark matter structures by measuring the distortions seen in these galaxy light patterns. The study involved 19 researchers from 11 institutions and was led by UBC, the Institut d'Astrophysique de Paris, the Universite Pierre and Marie Curie (UPMC) and the University of Victoria. Van Waerbeke and his co-authors will publish their findings in a forthcoming issue of the journal Astronomy and Astrophysics. The submission can be seen at: http://arxiv.org/abs/0712.0884.

The team spent several years developing the gravitational lensing tool, which is one of the major goals of the Canada-France-Hawaii-Telescope (CFHT) Legacy Survey. The gravitational lensing technique also played a pivotal role in another recent UBC first: UBC astrophysicist Catherine Heymans and Van Waerbeke produced jointly with an international team the highest resolution map ever of dark matter.

Local Stargazers Look Past Hubble: 2 NASA Projects to Focus on Telescope Advances

Baltimore Sun

NASA selected two Baltimore astronomers yesterday to conduct a pair of yearlong studies -- one to advance technologies for a powerful successor to the Hubble Space Telescope and the other to design new instruments for other large orbiting observatories.

The Hubble successor -- called ATLAS -- would have a 52-foot mirror and could become the first telescope to confirm the presence of life on planets outside our solar system, said Marc Postman, 49, an astronomer at the Space Telescope Science Institute in Baltimore, the principal investigator on the $1 million study. "We certainly may detect an Earth-like planet with another telescope, but ATLAS almost guarantees that you will," he said. "That's the exciting part of it." The second study, to be led by STScI astronomer Ken Sembach, will examine the feasibility of adding ultraviolet spectrographs to large space telescopes.

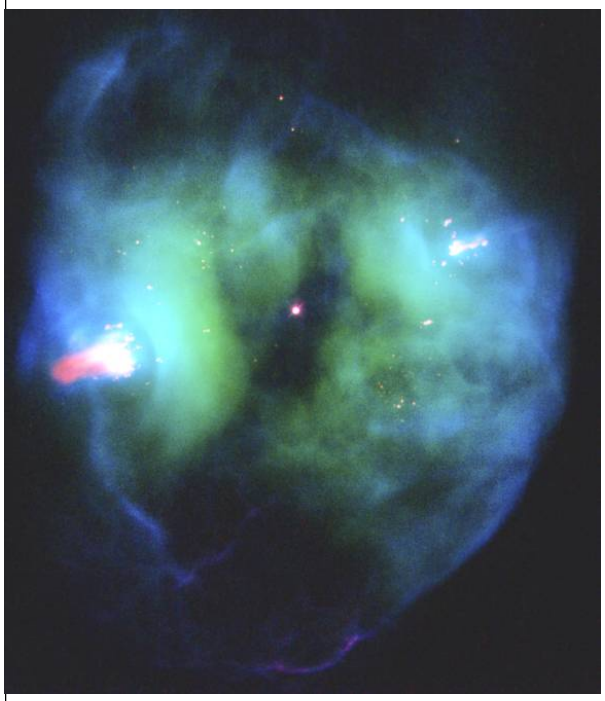
It would be a new technology, designed to reveal more of the "cosmic web" of invisible dark matter and gas that cosmologists believe interacts with stars and galaxies to shape the large-scale structure of the universe. "Our goal is to reduce the cost of future NASA missions by producing novel instrument designs and a roadmap for investments in enabling technologies at ultraviolet wavelengths," Sembach said in a news release on the project. He received about $300,000 from NASA for the work. The two new studies NASA has assigned to the institute -- among 19 NASA has funded with a total of $12 million -- could one day lead to NASA contracts to build and fly the hardware. That would expand the work at the Space Telescope Science Institute in Baltimore into the mid-21st century, Postman said. That's well beyond the life of Hubble, or another STScI project, the James Webb Space Telescope, which is set for launch as soon as 2013.

The results will be submitted to the scientific community during the next "decadal survey" that will set priorities for future space science missions. ATLAS stands for Advanced Technology Large-Aperture Space telescope.

Last Confessions Of A Dying Star

HST Press Release

Probing a glowing bubble of gas and dust encircling a dying star, NASA's Hubble Space Telescope reveals a wealth of previously unseen structures. The object, called NGC 2371, is a planetary nebula, the glowing remains of a Sun-like star. The remnant star visible at the center of NGC 2371 is the super-hot core of the former red giant, now stripped of its outer layers. Its surface temperature is a scorching 240,000 degrees Fahrenheit. NGC 2371 lies about 4,300 light-years away in the constellation Gemini. The Hubble image reveals several remarkable features, most notably the prominent pink clouds lying on opposite sides of the central star. This color indicates that they are relatively cool and dense, compared to the rest of the gas in the nebula. Also striking are the numerous, very small pink dots, marking relatively dense and small knots of gas, which also lie on diametrically opposite sides of the star. These features appear to represent the ejection of gas from the star along a specific direction. The jet's direction has changed with time over the past few thousand years. The reason for this behavior is not well understood, but might be related to the possible presence of a second star orbiting the visible central star.



A planetary nebula is an expanding cloud of gas ejected from a star that is nearing the end of its life. The nebula glows because of ultraviolet radiation from the hot remnant star at its center. In only a few thousand years the nebula will dissipate into space. The central star will then gradually cool down, eventually becoming a white dwarf, the final stage of evolution for nearly all stars. The Hubble picture of NGC 2371 is a false-color image, prepared from exposures taken through filters that detect light from sulfur and nitrogen (red), hydrogen (green), and oxygen (blue). These images were taken with Hubble's Wide Field Planetary Camera 2 in November 2007, as part of the Hubble Heritage program.

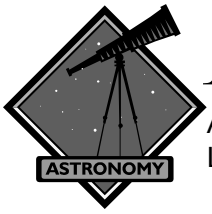
MIT Picked to Develop Telescope for NASA's Use From Moon Base

Boston Herald

MIT scientists have won a prestigious NASA contract to develop a powerful moon-based radio telescope which could help reveal the orgins of the universe. The mammoth telescope array would be installed on about a square mile of the far side of the moon and probe deep space for clues to the origins of stars, star clusters and galaxies.

"The telescope will look at radiation from very, very early in the history of the universe. We want to see how the gases (formed) into galaxies," said professor Jeffrey Hoffman, a member of the Lunar Array for Radio Cosmology project. Hoffman said they want to install it on the far side of the moon so the array is shielded from Earth-based radio waves that would interfere with the telescope's sensitive antennae.

The telescope would explore the greatest unknown realms of astronomy, the so-called "cosmic Dark Ages" where stars and galaxies were first born, shortly after the Big Bang. The team is headed by professor Jacqueline Hewitt and includes nine other MIT scientists as well as experts from other institutions including Harvard.



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