Calendar of Events
PUBLIC OBSERVING
Prairie Park Nature Center

Spring Schedule
Sunday March 01
8:00—9:30 PM
Sunday March 29
8:30—10:00 PM
Sunday May 03
8:30—10:00 PM

MONTHLY MEETINGS
2001 Malott — 7:30 PM
FRIDAY, February 20

FUTURE ASTRONOMY:
PAN-Starrs, LSST, & TMT
Dr. Barbara Anthony-Twarog
University of Kansas

President:
Rick Heschmeyer
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Observing Clubs
Doug Fay
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Volume 35 Number 02
February 2009

Report from the Officers:
The first meeting and the first observing
session of the year went off without a
hitch. A good crowd showed up to hear a
presentation on the possibilities for time
travel based upon the current scientific
thinking about what moving in space-time
might mean. The good news is that, at
present, there appears to be no explicit
evidence that time travel can’t occur. In
fact, time travel into the future has already
been accomplished. The challenging part
is the past. The bad news is that most
means of moving through time are impos-
sible with current technology and may re-
main prohibitively expensive forever.

A hearty AAL welcome to new members:

ERIC BOGATIN
KIM GLOVER

NASA Calls on Public to Vote For Hubble Telescope’s Target

NASA is turning control of the Hubble Space Telescope over to the general
crowd to vote for one of six candidate astronomical objects for Hubble to observe in honor of the International
Year of Astronomy, which began this month. The options, which Hubble has
not previously photographed, range from far-flung galaxies to dying stars.

Votes can be cast until March 1.

Hubble's camera will take a high-resolution image revealing new details
about the object that receives the most votes. The image will be released
during the International Year of Astronomy’s “100 Hours of Astronomy” from
April 2 to 5.

Everyone who votes also will be entered into a random drawing to receive
one of 100 copies of the Hubble photograph made of the winning celestial
body.

NASA is also inviting teachers and students to participate in a related Hub-
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 at the Prairie Park Nature Center. Periodic star parties are scheduled as well. For more information, please contact the club officers: our president, Rick Heschmeyer at rcjbm@sbcglobal.net, our webmaster, Gary Webber, at gwebber@ku.edu, or our faculty advisor, Prof. Bruce Twarog at btwarog@ku.edu. 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

The public observing session went off as planned, despite the cloudy skies during the day. It cleared beautifully at 6:30 PM and stayed that way until we packed up at 9:30 PM. It was cold but a few hearty souls did come out to view the real super bowl, as the celestial hemisphere is known to stellar types. The photos to the left and on pg. 1 were obtained at the session. Additional good news on Wed. is that the City Commission has voted against closing the Prairie Park Nature Center, site of our monthly sessions. It would be great if the AAL use of the site helped increase the profile of the center and had even a small impact on keeping it alive. Hope you can make it out for the next session on March 1. Every little bit helps. Bring a friend.

In keeping with the theme of the International Year of Astronomy and the anniversary of Galileo’s use of the telescope, we have a history news report in this issue and two of the talks scheduled for this semester focus on the state of modern astronomical observing. The next presentation on Feb. 20 by Dr. Anthony-Twarog will be an update on three major telescope projects in the works planned for completion over the next five years. On the schedule for April is a talk by Prof. Steve Hawley, former astronaut and now faculty member at KU, on the Hubble repair mission now scheduled for May. Steve has had first hand experience, having been part of two previous shuttle missions to Hubble.

If anyone has any ideas, suggestions, or input on how we can make the club better, please contact Rick (rcjbm@sbcglobal.net).

Look forward to seeing everyone at the March 01 Open House and/or the Feb. 20 meeting (2001 Malott—7:30 PM).

(Continued from page 1)

Launché Space Telescope classroom collage activity that integrates art, science and language arts. Students in participating classes can select their favorite Hubble images and assemble them in a collage. Students in each class will also choose their favorite object from the image voting contest and write essays about why they made their selections.

Launched in April 1990, the Hubble Space Telescope has spent 18 years peering into the depths of the cosmos to return stunning images and helping scientists better understand the history of the universe. NASA has launched four shuttle missions to fix and upgrade Hubble. The fifth and final overhaul by astronauts is due to launch on May 12 aboard the shuttle Atlantis.

Commanded by veteran spaceflyer Scott Altman, Atlantis’ STS-125 Hubble servicing crew plans to fly an 11-day mission and stage five spacewalks to add new instruments, batteries, gyroscopes and other gear to extend the space telescope’s mission through at least 2013.

(Continued from page 1)
Galileo Galilei is often credited with being the first person to look through a telescope and make drawings of the celestial objects he observed. While the Italian indeed was a pioneer in this realm, he was not the first.

Englishman Thomas Harriot made the first drawing of the moon after looking through a telescope several months before Galileo, in July 1609. Historian Allan Chapman of the University of Oxford details that 400-year-old breakthrough in astronomy in the February 2009 edition of *Astronomy and Geophysics*, a journal of the Royal Astronomical Society. Chapman explains how Harriot preceded Galileo and went on to make other maps of the moon's surface that would not be bettered for decades.

Harriot lived from 1560 to 1621. He studied at St Mary's Hall (now part of Oriel College), Oxford, achieving his BA in 1580. He then became a mathematical teacher and companion to the explorer Sir Walter Raleigh. In the early 1590s Raleigh fell from royal favor and was imprisoned in the Tower of London. Harriot was passed to the patronage of Henry Percy, the Ninth Earl of Northumberland who was himself imprisoned as one of the Gunpowder Plotter in 1605 but continued to support Harriot in his residence at Sion (now Syon) Park, in what is now west London.

Harriot became a leading force in mathematics, Chapman explains, working on algebraic theory and corresponding with scientists across Europe. By 1609, Harriot had acquired his first "Dutch trunke" (telescope), which had been invented in The Netherlands in 1608. He turned it on the moon on July 26, becoming the first astronomer to draw an astronomical object after viewing it through a telescope. The crude lunar sketch shows a rough outline of the lunar terminator (the line marking the division between night and day on the moon, as seen from the Earth) and includes a handful of features like the dark areas Mare Crisium, Mare Tranquilitatis and Mare Foecunditatis.

Harriot went on to produce more maps from 1610 to 1613, Chapman said in a statement released today. Not all of these are dated, but they show an increasing level of detail. By 1613 he had created two maps of the whole moon, with many identifiable features such as lunar craters that crucially are depicted in their correct relative positions.

The earliest telescopes of the kind used by Harriot (and Galileo) had a narrow field of view, meaning that only a small portion of the moon could be seen at any one time and making this work all the more impressive. No better maps would be published for several decades. Despite his innovative work, Harriot remains relatively unknown. Unlike Galileo, he did not publish his drawings. Unlike Galileo, Harriot is not being widely celebrated during 2009, dubbed the International Year of Astronomy as a commemoration of the telescope's 400th year.

Chapman attributes this to his comfortable position as a "well-maintained philosopher to a great and wealthy nobleman" with a generous salary, said to be "several times the level of the Warden of Wadham College, Oxford." Harriot had comfortable housing and a specially provided observing chamber on top of Sion House, all of which contrasted with Galileo's financial pressures.

Galileo, interestingly, was unable to buy a telescope. So he figured out the optics of it and built his own. He also examined the moon, and then found that the Milky Way was composed of individual stars. Galileo also discovered four moons around Jupiter and spent much time observing and drawing sunspots.

"Thomas Harriot is an unsung hero of science," Chapman said. "His drawings mark the beginning of the era of modern astronomy we now live in, where telescopes large and small give us extraordinary information about the universe we inhabit."
Did you know a solar flare can make your toilet stop working?

That's the surprising conclusion of a NASA-funded study by the National Academy of Sciences entitled *Severe Space Weather Events—Understanding Societal and Economic Impacts*. In the 132-page report, experts detailed what might happen to our modern, high-tech society in the event of a “super solar flare” followed by an extreme geomagnetic storm. They found that almost nothing is immune from space weather—not even the water in your bathroom.

The problem begins with the electric power grid. Ground currents induced during an extreme geomagnetic storm can melt the copper windings of huge, multi-ton transformers at the heart of power distribution systems. Because modern power grids are interconnected, a cascade of failures could sweep across the country, rapidly cutting power to tens or even hundreds of millions of people. According to the report, this loss of electricity would have a ripple effect with “water distribution affected within several hours; perishable foods and medications lost in 12-24 hours; loss of heating/air conditioning, sewage disposal, phone service, fuel re-supply and so on.”

“...extensive social and economic disruptions,” the report warns. Widespread failures could include telecommunications, GPS navigation, banking and finance, and transportation. The total economic impact in the first year alone could reach $2 trillion (some 20 times greater than the costs of Hurricane Katrina).

The report concluded with a call for infrastructure designed to better withstand geomagnetic disturbances and improvements in space weather forecasting. Indeed, no one knows when the next super solar storm will erupt. It could be 100 years away or just 100 days. It’s something to think about ... the next time you flush. One of the jobs of the Geostationary Operational Environmental Satellites (GOES) and the Polar-orbiting Operational Environmental Satellites (POES) operated by NOAA is to keep an eye on space weather and provide early warning of solar events that could cause trouble for Earth.

You can keep an eye on space weather yourself at the National Weather Service’s Space Weather Prediction Center, [www.swpc.noaa.gov](http://www.swpc.noaa.gov). And for young people, space weather is explained and illustrated simply and clearly at the SciJinks Weather Laboratory, [scijinks.gov/weather/howwhy/spaceweather](http://scijinks.gov/weather/howwhy/spaceweather). This article was provided by the Jet Propulsion Laboratory, California Institute of Technology, under a contract with the National Aeronautics and Space Administration.
Asteroid 'Bites the Dust' Around Dead Star
Spitzer Press Release

Astronomers have turned to an unexpected place to study the evolution of planets -- dead stars.

Observations made with NASA's Spitzer Space Telescope reveal six dead "white dwarf" stars littered with the remains of shredded asteroids. This might sound pretty bleak, but it turns out the chewed-up asteroids are teaching astronomers about the building materials of planets around other stars. So far, the results suggest that the same materials that make up Earth and our solar system's other rocky bodies could be common in the universe. If the materials are common, then rocky planets could be, too.

"If you ground up our asteroids and rocky planets, you would get the same type of dust we are seeing in these star systems," said Michael Jura of the University of California, Los Angeles, who presented the results today at the American Astronomical Society meeting in Long Beach, Calif. "This tells us that the stars have asteroids like ours -- and therefore could also have rocky planets." Jura is the lead author of a paper on the findings accepted for publication in the Astronomical Journal. Asteroids and planets form out of dusty material that swirls around young stars. The dust sticks together, forming clumps and eventually full-grown planets. Asteroids are the leftover debris. When a star like our sun nears the end of its life, it puffs up into a red giant that consumes its innermost planets, while jostling the orbits of remaining asteroids and outer planets. As the star continues to die, it blows off its outer layers and shrinks down into a skeleton of its former self -- a white dwarf.

Sometimes, a jostled asteroid wanders too close to a white dwarf and meets its demise -- the gravity of the white dwarf shreds the asteroid to pieces. A similar thing happened to Comet Shoemaker Levy 9 when Jupiter's gravity tore it up, before the comet ultimately smashed into the planet in 1994.

Spitzer observed shredded asteroid pieces around white dwarfs with its infrared spectrograph, an instrument that breaks light apart into a rainbow of wavelengths, revealing imprints of chemicals. Previously, Spitzer analyzed the asteroid dust around two so-called polluted white dwarfs; the new observations bring the total to eight. "Now, we've got a bigger sample of these polluted white dwarfs, so we know these types of events are not extremely rare," said Jura. In all eight systems observed, Spitzer found that the dust contains a glassy silicate mineral similar to olivine and commonly found on Earth. "This is one clue that the rocky material around these stars has evolved very much like our own," said Jura. The Spitzer data also suggest there is no carbon in the rocky debris -- again like the asteroids and rocky planets in our solar system, which have relatively little carbon. A single asteroid is thought to have broken apart within the last million years or so in each of the eight white-dwarf systems. The biggest of the bunch was once about 200 kilometers (124 miles) in diameter, a bit larger than Los Angeles County.

Jura says the real power of observing these white dwarf systems is still to come. When an asteroid "bites the dust" around a dead star, it breaks into very tiny pieces. Asteroid dust around living stars, by contrast, is made of larger particles. By continuing to use spectrographs to analyze the visible light from this fine dust, astronomers will be able to see exquisite details -- including information about what elements are present and in what abundance. This will reveal much more about how other star systems sort and process their planetary materials.

"It's as if the white dwarfs separate the dust apart for us," said Jura.
FUTURE ASTRONOMY: PAN-STARRS LSST & TMT

Dr. Barbara Anthony-Twarog
2001 Malott Hall
University of Kansas

FRIDAY
FEBRUARY 20, 2009
7:30 PM

FREE AND OPEN TO THE PUBLIC
Recent images of Titan from NASA’s Cassini spacecraft affirm the presence of lakes of liquid hydrocarbons by capturing changes in the lakes brought on by rainfall.

For several years, Cassini scientists have suspected that dark areas near the north and south poles of Saturn’s largest satellite might be liquid-filled lakes. An analysis published today in the journal Geophysical Research Letters of recent pictures of Titan’s south polar region reveals new lake features not seen in images of the same region taken a year earlier. The presence of extensive cloud systems covering the area in the intervening year suggests that the new lakes could be the result of a large rainstorm and that some lakes may thus owe their presence, size and distribution across Titan’s surface to the moon’s weather and changing seasons.

The high-resolution cameras of Cassini’s Imaging Science Subsystem (ISS) have now surveyed nearly all of Titan’s surface at a global scale. An updated Titan map, being released today by the Cassini Imaging Team, includes the first near-infrared images of the leading hemisphere portion of Titan’s northern “lake district” captured on Aug. 15-16, 2008. (The leading hemisphere of a moon is that which always points in the direction of motion as the moon orbits the planet.) These ISS images complement existing high-resolution data from Cassini’s Visible and Infrared Mapping Spectrometer (VIMS) and RADAR instruments.

Such observations have documented greater stores of liquid methane in the northern hemisphere than in the southern hemisphere. And, as the northern hemisphere moves toward summer, Cassini scientists predict large convective cloud systems will form there and precipitation greater than that inferred in the south could further fill the northern lakes with hydrocarbons. Some of the north polar lakes are large. If full, Kraken Mare - at 400,000 square kilometers -- would be almost five times the size of North America’s Lake Superior. All the north polar dark ‘lake’ areas observed by ISS total more than 510,000 square kilometers -- almost 40 percent larger than Earth’s largest “lake,” the Caspian Sea.

However, evaporation from these large surface reservoirs is not great enough to replenish the methane lost from the atmosphere by rainfall and by the formation and eventual deposition on the surface of methane-derived haze particles.

“A recent study suggested that there’s not enough liquid methane on Titan’s surface to resupply the atmosphere over long geologic timescales,” said Dr. Elizabeth Turtle, Cassini imaging team associate at the Johns Hopkins University Applied Physics Lab in Laurel, Md., and lead author of today’s publication. “Our new map provides more coverage of Titan’s poles, but even if all of the features we see there were filled with liquid methane, there’s still not enough to sustain the atmosphere for more than 10 million years.”

Combined with previous analyses, the new observations suggest that underground methane reservoirs must exist.

Titan is the only satellite in the solar system with a thick atmosphere in which a complex organic chemistry occurs. "It’s unique," Turtle said. "How long Titan’s atmosphere has existed or can continue to exist is still an open question."

That question and others related to the moon’s meteorology and its seasonal cycles may be better explained by the distribution of liquids on the surface. Scientists also are investigating why liquids collect at the poles rather than low latitudes, where dunes are common instead.

"Titan’s tropics may be fairly dry because they only experience brief episodes of rainfall in the spring and fall as peak sunlight shifts between the hemispheres," said Dr. Tony DelGenio of NASA’s Goddard Institute for Space Studies in New York, a co-author and a member of the Cassini imaging team. "It will be interesting to find out whether or not clouds and temporary lakes form near the equator in the next few years."

Titan and the transformations on its surface brought about by the changing seasons will continue to be a major target of investigation throughout Cassini’s Equinox mission.
Oddball 'Blue Stragglers' Are Stellar Cannibals
Andrea Thompson, Space.com

Astronomers have found what they say is the strongest evidence yet that a mysterious class of stars known as "blue stragglers" are the result of stellar cannibalism.

Blue stragglers are found throughout the universe in globular clusters — which typically are collections of about 100,000 stars, tightly bound by gravity. Because all the stars in these clusters are thought to have been born at the same time, they should all be the same age, but blue stragglers appear to be younger than their cluster peers. The origin of these strange, massive stars has been a longstanding mystery, said study leader Christian Knigge of Southampton University in England.

"The only thing that was clear is that at least two stars must be involved in the creation of every single blue straggler, because isolated stars this massive simply should not exist in these clusters," Knigge added. Since these oddball stars were first discovered more than half a century ago, two competing explanations for their formation emerged: "that blue stragglers were created through collisions with other stars; or that one star in a binary system was 'reborn' by pulling matter off its companion," said study team member Alison Sills of the McMaster University in Canada.

A 2006 study examined the chemical signatures of 43 blue stragglers in the globular cluster 47 Tucanae, and found that six of the unusual stars had less carbon and oxygen than the others. The anomaly indicated that their surface material had been sucked from the deep interior of a parent star in a binary system. The new study, detailed in the Jan. 15 issue of the journal Nature, provides even more evidence in favor of the stellar cannibalism idea.

The researchers looked at blue stragglers in 56 globular clusters and found that the total number of blue stragglers in a given cluster didn't match the predicted collision rate — dispelling the theory that blue stragglers are created through collisions with other stars. But there was a connection between the total mass contained in the core of the globular cluster and the number of blue stragglers observed within it. Since more massive cores also contain more binary stars, the researchers could infer a relationship between blue stragglers and binaries in globular clusters. This conclusion is also supported by preliminary observations that directly measured the abundance of binary stars in cluster cores.

"This is the strongest and most direct evidence to date that most blue stragglers, even those found in the cluster cores, are the offspring of two binary stars," Knigge said. Though there is still plenty of research on these stars to do.

"In our future work we will want to determine whether the binary parents of blue stragglers evolve mostly in isolation, or whether dynamical encounters with other stars in the clusters are required somewhere along the line in order to explain our results," Knigge said.
Astronomers this year are about to get a windfall of new and improved telescopes of unprecedented power with which to explore the universe. The bonanza arrives 400 years after Galileo spied craters on the moon through the world's first telescope. Instruments coming online in 2009 will let researchers see farther and more clearly than ever - perhaps even detect signs of life on another planet, or an asteroid swooping dangerously close to Earth.

The telescopes will open new windows on the heavens by using different technologies and different wavelengths of light. They'll be able to see things in the far ranges of ultraviolet, infrared or radio waves that are invisible in the narrow band of optical light. "This year's going to be huge," said Julianne Dalcanton, an astronomer at the University of Washington in Seattle. "The new capabilities are going to be absolutely fabulous."

The International Astronomical Union, an organization of about 10,000 professional astronomers, has named 2009 the International Year of Astronomy. That's in honor of Galileo, who was accused of heresy by the Roman Catholic Church for insisting that the Earth moves around the sun.

"In 2009, we would like everybody on Earth to think at least once about the wonders of the universe," said IAU President Catherine Cesarsky, a French astrophysicist.

Among telescopes projects under way in 2009 are:

* A major upgrade of the 19-year-old Hubble Space Telescope, including two advanced detectors that will vastly improve its vision for another five years.
* A bigger European rival to Hubble called the Herschel Space Observatory.
* ALMA, an array of 50-plus telescopes on a lofty desert in Chile that will be the most powerful ground-based observation system to date.
* Kepler, an orbiting telescope designed specifically to look for inhabitable planets around distant stars.
* Pan-STARRS, a set of four interconnected telescopes to detect fast-moving hazardous objects, such as satellites or space rocks.
* IceCube, an upside-down space particle observatory buried under the ice at the South Pole.
* The Allen Telescope Array, a set of 42 of radio telescopes listening for extra-terrestrial messages from possible civilizations around another star.

Waiting for future financing are even larger, more powerful machines, including two giant telescopes with light-collecting mirrors three to four times bigger than any existing telescope. The larger of the two, the 140-foot-wide European Extremely Large Telescope, could make pictures of clouds, mountains and seas on distant planets. It's now in the design stage, and construction might begin in 2010. Despite its huge size, it's a scaled-down version of a 330-foot Overwhelmingly Large (OWL) telescope that was canceled for technical and cost reasons.

Another ground-based instrument, the Large Synoptic Survey Telescope (LSST) will take about 1,000 images of each spot in the entire sky over its lifetime. Taken together, the repeated images will produce color movies of celestial objects as they change or move, including potentially hazardous asteroids.

The LSST can also trace changes in the expansion of the universe caused by the mysterious force known as dark energy. Work on the telescope mirror is under way, and it should start taking images in 2015.

The James Webb Space Telescope, NASA's successor to Hubble, is under construction and scheduled for launch in 2013. Its main mirror, 21 feet in diameter, has to be folded up to fit in the launch vehicle, along with a sunshield that opens up to the size of a tennis court. JWST will orbit almost a million miles from Earth, where it will study the first stars and galaxies formed after the birth of the universe, 13.7 billion years ago. Unlike Hubble, JWST mostly will work in infrared light.
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