Calendar of Events

MARAC2006 UMKC
FRIDAY APRIL 7, 8PM
Royall Hall
Dr. John Rigden
Einstein: Standard of Greatness

April Meeting
FRIDAY, APRIL 21, 2006
1001 Malott Hall, 7:30 PM
March 2006 Solar Eclipse
William Winkler
PUBLIC OBSERVING
Cancelled until further notice

President:
Hannah Swift
hkswift@ku.edu
Treasurer:
Dr. Steve Shawl
Shawl@ku.edu
University Advisor:
Dr. Bruce Twarog
btwarog@ku.edu
Webmaster:
Gary Webber
gwebber@ku.edu
Events Coordinator
Rick Heschmeyer
rcjbm@sbcglobal.net

March 12, 2006
Thanks to a wind storm that swept through the KU campus early Sunday morning, the Campus Observing Station at Memorial Stadium is no more. The high winds demolished and scattered the equipment sheds containing the portable telescopes, mounts, and support equipment, while damaging some of the telescopes and their electronics. Pieces of the storage sheds ended up in the stadium seats near the endzone over 150 yards away. The KU campus continues to recover from the storm, which officials initially estimated inflicted $6 million in damages to the campus. However, a thorough canvassing of all campus buildings is still under way. Damaged roofs, broken windows and downed trees constitute the bulk of the damage. Because of the damage to the site and the equipment, scheduled labs and observing sessions at Memorial Stadium have been cancelled until further notice.

Report From the Officers on the March Meeting:

It has been an eventful month in many ways because of things that were supposed to happen but didn’t and things that weren’t supposed to happen that did. Foremost from an astronomical standpoint, the local observing station at Memorial Stadium (see below) was wiped out. It provides more evidence of the need to have a permanent observing site with a real observing facility on campus, but this is an issue that remains unresolved for financial reasons 6 years after the closure of the facilities on Lindley Hall. We hope to get back into operation before the end of the Spring semester, but can’t say for sure until the condition of the roof at the stadium is returned to working order.

For the March meeting, we showed the second part of the two-part special from NOVA: Einstein’s Famous Equation—\( E = mc^2 \). Though we were forced to use a different room because of a scheduling conflict, all went well and the attendees saw an excellent look into the development of the key ideas that serve as a foundation for much of modern physics, as well as the personalities that often influence the development of new ideas.

While on the topic of Einstein, there is a special event associated with the 36th Annual MARAC meeting in Kansas City (March 7/8). MARAC is a regional astrophysics conference that brings together astrophysicists and amateur astronomers from the Midwest to present talks on their research and to discuss science education and astronomical developments. Information on the meeting can be found at the meeting web site: http://www.physics.ku.edu/marac/marac.shtml. As part of the meeting, a public lecture will be given Friday, April

Volume 32 Number 04 April 2006

INSIDE THIS ISSUE
From the Officers 2
MRO Pictures 3
APRIL MEETING POSTER 4
MARAC LECTURE 5
NASA Science Free Fall 6
Saturn’s Rings 7
Binary Brown Dwarf 8
Planets in Strange Places 9
From the Officers, continued

(Continued from page 1)

7 at Royall Hall, UMKC. A poster on the talk is included in the newsletter. While a trip to KC may be more than you are interested in, the speaker this year is Dr. John Rigden of Washington University, St. Louis. His topic is EINSTEIN: The Standard for Greatness. Dr. Rigden has been one of the official public lecturers for the American Institute of Physics celebration of the International Year of Physics 2005— in honor of Einstein’s spectacular achievements in 2005. He should be quite good, and an excellent live followup to the two Einstein episodes at our last 2 meetings.

For our next meeting, the speaker will be our own William Winkler, who took part in the Sky & Telescope cruise to the Mediterranean and Libya to witness the total solar eclipse. We will be back in our usual room, 1001 Malott, but the meeting will be Friday, April 21, a week later than usual. There was a special event planned for March 28th, organized by Rick Heschmeyer. Unfortunately, the teacher in charge had to cancel at the last minute. Rick will be rescheduling the event and will keep us posted about the new date when he has it. Thanks to those of you who volunteered to help—we will keep you in mind for next time.

While we are having our issues with equipment, the weather, and finances, the state of professional astronomy is even worse. We highly recommend that you look at the article in the newsletter detailing planned budget cuts to astronomy triggered by the NASA emphasis on manned missions to the Moon and Mars. While there may be value in these, they are being carried out at the expense of an entire generation of astronomers whose careers are being gutted by the cancellation of NASA missions and support for fundamental astronomy.

The Texas Astronomical Society of Dallas (TAS) is pleased to host the 2006 Astronomical League Convention and Exhibits (ALCON/EXPO) August 4-5, 2006 (see http://www.alconexpo.com/). To repeat an item from last month, we have received brochures and info on the Heart of America Star Party, sponsored by the Astronomical Society of Kansas City. The HASP takes place from June 22 through the 25 at a site 75 miles south of Kansas City. If you have questions, contact Dan Johnson (gdj102356@hotmail.com) or Paul Thompson (pjtom@highstream.net).

The Astronomical League has many activities to encourage amateur astronomy including Observing Clubs. The Observing Clubs offer certificates of accomplishment for demonstrating observing skills with a variety of instruments and objects. Each Club offers a certificate based upon achieving certain observing goals. These are usually in the form of a specific number of objects of a specific group with a given type of instrument. Occasionally there are multiple levels of accomplishment within the club. There is no time limit for completing the required observing, but good record keeping is required. When you have reached the requisite number of objects, your observing logs are examined by the appropriate authority and you will receive a certificate and pin to proclaim to all that you have reached your goal. Many local astronomical societies even post lists of those who have obtained their certificates. This month we feature the details on the PLANETARY OBSERVERS CLUB. The P.O.C. is a list of twenty-seven selected projects designed to introduce you to the pleasures of planetary observing. Observing skills come only with experience. An eye trained by observing will see more, regardless of what type of optical aid is used. Good observing skills reinforce the desire to observe. Observing trains the eye to see. It is a cycle that has to be willed to happen. Given the time and effort it WILL happen. Once it happens, astronomy will become a joyful lifelong experience. For details, go to http://www.astroleague.org/al/obclubs/planter/plnobscl.html. Whether you decide to go on to serious data collection or simply observe for your own edification - enjoy yourself. The sky is there for all. It is a great equalizer. Beneath its huge expanse we are all reduced to nearly infinitesimal size, but in trying to understand it we grow.

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 later this month at the regular monthly meeting in APRIL or at the public talk in KC. ALL for now.

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: Hannah Swift at hswift@ku.edu, Gary Webber at gwebber@ku.edu, our faculty advisor, Prof. Bruce Twarog at btwarog@ku.edu, or 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
First Picture from Mars Reconnaissance Orbiter
By Alan M. MacRobert, Skypub.com

NASA's Mars Reconnaissance Orbiter (MRO), which successfully braked into Martian orbit on March 10th, has passed another test with flying colors. Even though the spacecraft is still in a very high, elongated orbit, its handlers gave its super-power camera, the High Resolution Imaging Science Experiment HiRISE, a tryout. "The quality of this test image is spectacular, with no hint to the eye of any smear or blurring," said the MRO team in a press statement. "A high signal-to-noise ratio reveals fine details even in the shadows."

The HiRISE camera can take 40,000-by-20,000-pixel (about 800-megapixel) images through its 0.5-meter (20-inch) f/24 telescope. The craft will spend the next six months delicately aero-braking its way down to a low orbit. It will then begin mapping in earnest.

MRO is far more capable than any previous Mars mapper. The test images were shot from an altitude of 2,489 kilometers (1,547 miles); once in its final orbit at about a tenth this height, MRO should have a resolution of 30 centimeters (1 foot) per pixel on the ground. And its extremely large view will cover much more land area at high resolution than possible before. Great improvements are sure to result in our knowledge of Mars's geology, history, and a wide variety of surface conditions all over the planet.

"These images provide the first opportunity to test camera settings and the spacecraft's ability to point the camera with Mars filling the instruments' field of view," said Steve Saunders, the mission's program scientist, in a press statement. "The information learned will be used to prepare for the primary mission next fall." The test will help the camera team develop calibration and image-processing procedures, such the precise corrections needed for color imaging and for high-resolution surface measurements from stereo pairs of images.

For more information and the full-resolution view, see NASA's news release. More images from the test run should be released in the coming days.
THE ASTRONOMY ASSOCIATES OF LAWRENCE present

WILLIAM WINKLER

THE
SOLAR ECLIPSE
MARCH 2006

TOTAL SOLAR ECLIPSE OVER LIBYA

FRIDAY, April 21, 2006
7:30 PM, 1001 Malott Hall
University of Kansas
The 36th MidAmerican Regional Astrophysics Conference presents

EINSTEIN: The Standard of Greatness

DR. JOHN S. RIGDEN
Honorary Professor of Physics, Washington University, St. Louis

FRIDAY, APRIL 07, 2006
8:00 PM, Royall Hall
University of Missouri, Kansas City
Free & Open to the Public
NASA's astronomy program is in a state of crisis as a growing number of space missions are falling to the budgetary ax. Smaller programs are suffering most in the 2006 budget as funding is siphoned toward human spaceflight. Additional cancellations are projected in the 2007 budget partly to help finance the James Webb Space Telescope and Hubble Space Telescope cost overruns. The coup de grâce is a whopping 15 percent overall cut in 2009.

In January, NASA officials canceled the high-energy X-ray Nuclear Spectroscopic Telescope Array (NuStar) Explorer mission. On March 2nd NASA's new head of science, Mary Cleave, terminated the Dawn asteroid mission. That craft had only a few months of work left to go before becoming launch ready. Cleave’s announcement about Dawn came shortly after she testified to a hostile Congressional panel about the cuts.

Congressional leaders challenged both the internal and external priorities affecting the budget. The science community questioned whether large, overbudget missions should be protected at the expense of losing both the research jobs needed to analyze the data and the small missions needed to round out a healthy science program.

It's very unusual for missions to be cancelled so close to launch. The Dawn termination apparently saves only $30 million out of a $370 million project, and Dawn's cost overrun was mostly due to the impact of previous delays imposed by NASA headquarters rather than technical issues. The NuStar cancellation might be the most troubling, however. Here was a mission that was approved, on budget, and without technical problems. Killing something in such good shape is pretty much unheard of and belies earlier statements by NASA administrator Mike Griffin that missions were only to be delayed rather than canceled.

Funds earmarked for managers and users of existing space observatories, like the infrared Spitzer Space Telescope, have also been cut by millions. This has raised further threats of layoffs and job shortages. This is even true for Hubble, where the influx of extra money in the 2007 budget to support the proposed servicing mission won't, by and large, be going toward astronomers' salaries.

The 2007 budget also axed the Terrestrial Planet Finder, delayed the SIM interferometry testbed, and slated the SOFIA airborne infrared observatory for almost-certain cancellation. SOFIA was in the final stages of construction. The Beyond Einstein series of high-energy missions, including Constellation-X and the Laser Interferometer Space Antenna (LISA), is being kept alive with only a trickle of funding. Even ground-based projects such as the long-planned Keck Interferometer outrigger telescopes have been sent to a premature grave.

Morale is plummeting in the US space science community as senior scientists see years of work evaporate with a stroke of the financial pen, and young astronomy PhDs are wondering whether a career in the field is even possible. How US astronomy will take shape in the coming months and years remains in question as the food fight over how to reslice the shrinking funding pie begins.
Oddly shaped gaps found in Saturn's rings hint at the existence of long sought "moonlets" and support the theory that the rings are the broken remains of an icy moon shattered long ago in a violent collision, scientists say. Scientists think a comet or asteroid collided with one of Saturn's moons about 100 million years ago. Such an impact would have created debris in a range of sizes, but until now, scientists only had evidence for chunks of rock that were miles in diameter and smaller particles that were about 65 feet (20 km) across or less. The medium-sized moonlets—so named because their size would be between that of a moon and smaller particles—predicted by theory were missing.

But in July 2004, NASA's Cassini spacecraft was hovering directly above Saturn's ring system when it detected strange gaps resembling S-shaped propellers in the planet's bright A-ring. Scientists think the gaps were formed by chunks of rock 300 feet (100 m) wide as they plowed through smaller particles in the ring. The finding is detailed in the March 30 issue of the journal Nature.

The propellers are the result of differences in the speed of material orbiting in Saturn's rings and because of the average size of the moonlets themselves, scientists think. Because the strength of gravity decreases with distance, material circling closer to a planet moves faster than material that is orbiting farther away.

As a result, small ring particles flanking the two sides of an orbiting moonlet would appear to be moving in opposite directions to a viewer standing on a moonlet. Picture three trains moving on parallel tracks but at different speeds. The train on the far left is moving fast; the middle train is moving slightly slower and the train on the far right is moving slowest of all. If an observer in the middle train were to look out her window, the train on her left would appear to be moving forward while the train on her right would look like it was trailing behind. The moonlets in Saturn's rings are like the middle train. But because they are so large, the moonlets impede the movement of smaller ring particles to the left and right of them. This creates gaps on their left and right sides.

"Disturbances on one side [of the moonlet] get carried ahead but those on the other get carried behind," explained study leader Matthew Tiscareno from Cornell University. "That's what draws it out into the propeller shape."

The gaps taper off farther away from the moonlets as smaller ring particles gradually refill the empty space. Scientists think that only intermediate sized rocks can create the propeller shapes. Small particles aren't massive enough to have any effect on their neighbors, while Saturnian moons like Encke and Pan—which are 4 miles (7 km) and 19 miles (30 km) wide, respectively—are so large that their gravity prevents the gaps from closing back up. Through their sheer size, the moons achieve what the moonlets can't: they harrow out rings of empty space that stretch around the entire planet. The propellers were predicted from computer models but had never been observed in nature before now. They're probably found under other conditions as well, scientists think. In fact, Saturn itself might have created such gaps around the Sun as it formed in the early solar system.

According to the standard theory, planets form from swirling discs of gas, dust and debris around nascent stars. Large chunks of rock and ice in the disc collide and clump together, forming protoplanets and eventually planets.

"The planets in our solar system, the precursors anyway, probably went through this stage," said study team member Derek Richardson from the University of Maryland.

Galaxies like our own Milky Way are also swirling discs of matter that have large objects, such as stars and planets, embedded within them, so could propellers also form in galaxies? Probably not, Richardson said. "The analogy in a galactic disc would be a large star with lots of little stars getting strongly perturbed by it," he said. "You don't really see that kind of process operating in galaxies. Stars are far apart."
Astronomers Measure Precise Mass of a Binary Brown Dwarf

HST Press Release

For the first time, astronomers have succeeded in weighing a binary pair of brown dwarfs and precisely measuring their diameters. These kinds of exact measurements are not possible when observing a single brown dwarf. Because their orbits are inclined edge-on to Earth, the dwarfs pass in front of each other, creating eclipses. This is the first brown dwarf-eclipsing binary ever discovered. The pair offers an unusual opportunity for accurately determining the masses and diameters of the dwarfs, providing crucial tests of theoretical models.

A brown dwarf is a little understood intermediate class of celestial object that is too small to sustain hydrogen fusion reactions, like those that power our Sun. However, brown dwarfs are dozens of times more massive than the Solar System's largest planet, Jupiter, and so are too large to be a planet. The discovery of the paired brown dwarfs and the critical measurements are reported today in the scientific journal Nature by a team of astronomers: Jeff Valenti of the Space Telescope Science Institute (STScI), Robert Mathieu of the University of Wisconsin-Madison, and Keivan Stassun of Vanderbilt University. One dwarf is 55 times Jupiter's mass; the other is 35 times heftier than Jupiter (with a 10 percent margin of error). To qualify as a star and burn hydrogen through nuclear fusion, the dwarfs would have to be 80 times more massive than Jupiter. For comparison, the Sun is 1,000 times more massive than Jupiter.

The astronomers are surprised to discover that the more massive brown dwarf is the cooler of the pair, contrary to all predictions about brown dwarfs of the same age. Either the two are not the same age and may be captured bodies, or the theoretical models are wrong, say astronomers. The brown dwarf pair orbits each other so closely that they look like a single object when viewed from Earth. Because their racetrack orbit is edge-on, the two objects periodically pass in front of, or eclipse, each other. These eclipses cause regular dips in the brightness of the combined light coming from both objects. By precisely timing these occultations the astronomers were able to determine the orbits of the two objects. With this information, the astronomers used Newton's laws of motion to calculate the mass of the two dwarfs.

In addition, the astronomers calculated the size of the two dwarfs by measuring the duration of the dips in their light curve. Because they are so young, the dwarfs are remarkably large for their mass: about the same diameter as the Sun. Because the pair is located in the Orion Nebula, which is a nearby stellar nursery with stars less than 10 million years old. An analysis of the light coming from the dwarf pair indicates that the dwarfs have a reddish cast. Current models also predict that brown dwarfs should have "weather" — cloud-like bands and spots similar to those visible on Jupiter and Saturn.

By measuring variations in the light spectrum coming from the pair, the astronomers also determined the dwarfs' surface temperatures. Theory predicts that the more massive member of a pair of brown dwarfs should have a higher surface temperature. But they found just the opposite. The heavier of the two has a temperature of 4,310 degrees Fahrenheit (2,650 degrees Kelvin) and the smaller, 4,562 degrees F (2,790 degrees K). These compare to the Sun's surface temperature of 9,980 degrees F (5,800 degrees K).

"One possible explanation is that the two objects have different origins and ages," Stassun says. If that is the case, then it supports one of the outcomes of the latest efforts to simulate the star-formation process. These simulations predict that brown dwarfs are created so close together that they are likely to disrupt each other's formation. The new observations confirm the theoretical prediction that brown dwarfs start out as star-sized objects, but shrink and cool and become increasingly planet-sized as they age. Before now, the only brown dwarf whose mass had been directly measured was much older and dimmer. Many astronomers think that brown dwarfs may actually be the most common product of the stellar-formation process. So, information about brown dwarfs can provide valuable new insights into the dynamic processes that produce stars out of collapsing whirlpools of interstellar dust and gas.

Because old brown dwarfs are smaller and dimmer than true stars, it is only in recent years that improvements in telescope technology have allowed astronomers to catalog hundreds of faint objects that they think may be brown dwarfs. But to pick out the brown dwarfs from other types of faint objects, they need a way to estimate their masses, because mass is destiny for stars and star-like objects. The existence of brown dwarfs was first proposed in the 1980s, but it wasn't until 2000 that a brown dwarf was detected unambiguously. While brown dwarfs were hypothetical objects, astronomers differentiated them from planets by the manner in which they formed. Brown dwarfs and stars are formed in the same way, from a collapsing cloud of interstellar dust and gas. Planets are built from the disks of dust and gas that surround forming stars. Once astronomers discovered the first candidate brown dwarf, they realized that dwarfs are very difficult to differentiate from planets, particularly when they have stellar companions. So a growing group of astronomers favor defining brown dwarfs as objects between 13 to 80 times more massive than Jupiter.

The researchers made the observations with two sets of telescopes located in the Chilean Andes, about 100 miles north of Santiago: the Small and Moderate Aperture Research Telescope System (SMARTS), operated by a consortium including the Space Telescope Science Institute and Vanderbilt University, and the International Gemini Observatory, operated by the National Science Foundation.
Planets in Strange Places
By Trudy E. Bell

Red star, blue star, big star, small star—planets may form around virtually any type or size of star throughout the universe, not just around mid-sized middle-aged yellow stars like the Sun. That’s the surprising implication of two recent discoveries from the 0.85-meter-diameter Spitzer Space Telescope, which is exploring the universe from orbit at infrared (heat) wavelengths blocked by the Earth’s atmosphere.

At one extreme are two blazing, blue “hypergiant” stars 180,000 light-years away in the Large Magellanic Cloud, one of the two companion galaxies to our Milky Way. The stars, called R 66 and R 126, are respectively 30 and 70 times the mass of the Sun, “about as massive as stars can get,” said Joel Kastner, professor of imaging science at the Rochester Institute of Technology in New York. R 126 is so luminous that if it were placed 10 parsecs (32.6 light-years) away—a distance at which the Sun would be one of the dimmest stars visible in the sky—the hypergiant would be as bright as the full moon, “definitely a daytime object,” Kastner remarked.

Such hot stars have fierce solar winds, so Kastner and his team are mystified why any dust in the neighborhood hasn’t long since been blown away. But there it is: an unmistakable spectral signature that both hypergiants are surrounded by mammoth disks of what might be planet-forming dust and even sand.

At the other extreme is a tiny brown dwarf star called Cha 110913-773444, relatively nearby (500 light-years) in the Milky Way. One of the smallest brown dwarfs known, it has less than 1 percent the mass of the Sun. It’s not even massive enough to kindle thermonuclear reactions for fusing hydrogen into helium. Yet this miniature “failed star,” as brown dwarfs are often called, is also surrounded by a flat disk of dust that may eventually clump into planets. (Note: This brown dwarf discovery was made by a group led by Kevin Luhman of Pennsylvania State University.)

Although actual planets have not been detected (in part because of the stars’ great distances), the spectra of the hypergiants show that their dust is composed of forsterite, olivine, aromatic hydrocarbons, and other geological substances found on Earth.

These newfound disks represent “extremes of the environments in which planets might form,” Kastner said. “Not what you’d expect if you think our solar system is the rule.”

Hypergiants and dwarfs? The Milky Way could be crowded with worlds circling every kind of star imaginable—very strange, indeed.

Keep up with the latest findings from the Spitzer at www.spitzer.caltech.edu/ . For kids, the Infrared Photo Album at The Space Place (spaceplace.nasa.gov/en/kids/sirtf1/sirtf_action.shtml) introduces the electromagnetic spectrum and compares the appearance of common scenes in visible versus infrared light.

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