**COMING EVENTS**

**Special Event**

**Discovering Pluto**

**Tuesday April 19, 2011**

6:30 - 9:30 PM

Kansas Union Ballroom

**PUBLIC OBSERVING**

**Sunday May 01**

9:00 - 10:00

Prairie Park Nature Center

**Astronomy Day**

**Sat. May 7, 2011**

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**A Digital Messier Marathon**

**Eric Bogatin**  
(AAL, ASKC)

Do you think it's a challenge just trying to view each of the 110 Messier objects during the annual Messier Madness Marathon in March? Try photographing every one of them, all in one night.

That was the goal for Tracy Tuttle, assistant professor of physics at Bethel College, in Newton, Mass, a little north of Wichita, KS. To assist in this effort, he decided to enlist the help of astronomers and observers across the country to participate and post their images on a collective web site.

Six different groups signed up to collaborate on this imaging marathon, including Ryan Uptmore from the Birdhouse Observatory, Derby, KS, Todd Tuttle, North Central Kansas Astronomical Society (NCKAS), Luke Schmidt, PhD candidate and Dan Klinglesmith, faculty advisor, Etcorn Observatory, New Mexico Tech, Socorro, NM, C.W. Robertson, SETEC Observatory, Goddard, KS, Eric Bogatin and Dave Lane, Astronomical Society of Kansas City (ASKC), Olathe, KS and Tracy Tuttle, Outhouse Observatory, Newton, KS. (information about each group is posted at: [http://messier.nckas.org/?page_id=311](http://messier.nckas.org/?page_id=311).

On Friday night, March 4, 2011, Kansas was pretty well socked in, but Luke Schmidt and Dan Klinglesmith in New Mexico had spectacular skies. They broke their record from last year, and were able to image 104 of the 110 Messier objects. They started shooting at 8 pm and posted the last image at 7 am on Saturday morning. You can see their collection of Messier images at: [http://messier.nckas.org/](http://messier.nckas.org/)

Using a 14-inch Celestron, a five minute exposure was enough for most images. This is a record in the number of Messier objects photographed in one evening. The only six they were not able to image were M55, M75, M72, M73, M2 and M30. All of these objects peaked above the horizon after 6 am, and even then, never got high enough

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**Report from the Officers:**

At our last meeting in March, we had a DVD presentation about the individual who partially initiated the public debate on the status of Pluto, Neil Tyson. As always, Neil was both informative and entertaining, though it was somewhat disappointing that almost no mention was made of Clyde’s association with KU. We will finally follow up with the *Discovering Pluto* event in April, so spread the word.

Kudos to Bill Wachspress for plugging the club in his response to a question from the Journal-World about what he was reading, as noted in the Sunday paper a couple of weeks ago. Bill responded with the book on the pos-
Again, the weather hasn't been kind to our public observing sessions as and the forecast for this weekend’s event doesn't seem promising either. We will try again on Tuesday April 19 at the Kansas Union after the Michael Byers event. Let us know if you can help. A pair of Astronomical League events are listed below. Please check out the web sites if you have the time and interest. All AAL members are also Astronomical League members.

Many thanks to those of you who have responded to the dues notice. Hope to see all of you in two weeks at the Pluto event! Any suggestions for improving the club or newsletter are always welcome.

### MSRAL - 2011


### ALCON 2011

Bryce Canyon National Park Utah June 29 - July 2, 2011

The Astronomical League is pleased to announce that ALCon 2011 will be held during the dark of the moon from June 29 through July 2, 2011 at Ruby's Inn which is near the entrance to Bryce Canyon National Park. Along with the talks and workshops given during the day, nightly dark sky observing will be offered at Rainbow Point. Bryce Canyon National Park features some of the darkest skies in the United States. Naturally, the League will hold a nightly public star gaze at the Bryce Canyon Visitor's Center for both park visitors and ALCon attendees. This year, we will be under the stars for our conference! For info, visit: [http://alcon.astroleague.org/](http://alcon.astroleague.org/)

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 rjcjm@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](http://www.ku.edu/~aal).

Copies of the *Celestial Mechanic* can also be found on the web at [http://www.ku.edu/~aal/celestialmechanic](http://www.ku.edu/~aal/celestialmechanic).
The region around the center of our Milky Way galaxy glows colorfully in this new version of an image taken by NASA’s Spitzer Space Telescope.

The data were previously released as part of a long, 120-degree view of the plane our galaxy (see http://www.spitzer.caltech.edu/images/2680-ssc2008-11a-Spitzer-Finds-Clarity-in-the-Inner-Milky-Way). Now, data from the very center of that picture are being presented at a different contrast to better highlight this jam-packed region. In visible-light pictures, it is all but impossible to see the heart of our galaxy, but infrared light penetrates the shroud of dust giving us this unprecedented view.

In this Spitzer image, the myriad of stars crowding the center of our galaxy creates the blue haze that brightens towards the center of the image. The green features are from carbon-rich dust molecules, called polycyclic aromatic hydrocarbons, which are illuminated by the surrounding starlight as they swirl around the galaxy’s core. The yellow-red patches are the thermal glow from warm dust. The polycyclic aromatic hydrocarbons and dust are associated with bustling hubs of young stars. These materials, mixed with gas, are required for making new stars.

The brightest white feature at the center of the image is the central star cluster in our galaxy. At a distance of 26,000 light (Continued on page 8)
On April 5, 2010, something eerie happened to the Galaxy 15 telecommunications satellite: It turned into a zombie. The day began as usual, with industry-owned Galaxy 15 relaying TV signals to millions of viewers in North America, when suddenly the geosynchronous satellite stopped taking commands from Earth. It was brain dead! Like any good zombie, however, its body continued to function. Within days, Galaxy 15 began to meander among other satellites in geosynchronous orbit, transmitting its own signal on top of the others. Satellite operators scrambled to deal with the interference, all the while wondering what happened?

In horror movies, zombies are usually produced by viruses.

“In this case, the culprit was probably the sun,” says Bill Denig of the National Geophysical Data Center in Boulder, Colorado. He and colleague Janet Green of NOAA’s Space Weather Prediction Center recently led a study of the Galaxy 15 anomaly, and here are their conclusions:

On April 3rd, a relatively minor solar flare launched a cloud of plasma toward Earth. Galaxy 15 had experienced many such events before, but this time there was a difference.

“Galaxy 15 was just emerging from the shadow of Earth when the cloud arrived and triggered a geomagnetic storm,” explains Denig. Suddenly exposed to sunlight and the ongoing storm, “the spacecraft began to heat up and charge [up].” Electrons swirling around Galaxy 15 stuck to and penetrated the spacecraft’s surface. As more and more charged particles accumulated, voltages began to rise, and—zap!—an electrostatic discharge occurred. A zombie was born.

“At least, this is what we suspect happened based on data collected by GOES satellites in the vicinity,” he says. “We’ll be able to diagnose events like this much better, however, after GOES-R is launched by NASA in 2015.” GOES-R is NOAA’s next-generation Geostationary Operational Environmental Satellite. One of the instruments it will carry, a low-energy electron counter, is crucial to “zombie fighting.” Low-energy-electrons are the ones most likely to stick to a spacecraft’s surface and cause brain-frying discharges. By monitoring these particles in Earth orbit, GOES-R will provide better post-mortems for future zombie outbreaks. This could help satellite designers figure out how to build spacecraft less susceptible to discharges. Also, GOES-R will be able to issue alerts when dangerous electrons appear. Satellite operators could then take protective action—for example, putting their birds in "safe mode"—to keep the zombie population at bay.

Meanwhile, Galaxy 15 is a zombie no more. In late December 2010, after 9 months of terrorizing nearby spacecraft, the comsat was re-booted, and began responding to commands from Earth again.

All’s well that ends well? True zombie fighters know better than to relax. Says Denig, “we’re looking forward to GOES-R.”

You and the kids in your life can learn about space weather at http://scijinks.gov/space-weather-and-us. This article was provided by the Jet Propulsion Laboratory, California Institute of Technology, under a contract with the National Aeronautics and Space Administration.
TUESDAY, APRIL 19, 2011

Discovering Pluto

Celebrating Kansan CLYDE TOMBAUGH and the discovery of Pluto

An Evening with MICHAEL BYERS
Author of Percival's Planet - A Novel

Co-sponsored by KU Bookstore, KU Memorial Unions, KU Department of Physics & Astronomy, KU Hall Center for the Humanities, and The Commons

6:30 - 9:30 pm - Kansas Union Ballroom

- Pluto Book Signing
- Birthday Cake for Clyde Tombaugh, Discoverer of Pluto
- Telescope Observing Session: Union 6th floor deck

Guided Display by the KU Astronomy Department

Presentation begins:
6:30pm

Introduction by Steven A. Hawley, KU Professor of Physics & Astronomy, former NASA Astronaut

Michael Byers Presentation
NASA’S HUBBLE RULES OUT ONE ALTERNATIVE TO DARK ENERGY

Astronomers using NASA’s Hubble Space Telescope have ruled out an alternate theory on the nature of dark energy (Continued on page 8)
SUPPORT CLYDE & PLUTO

T-shirts available at the KU Bookstore & on-line
Wear it to

Discovering Pluto
Kansas Union Ballroom
TUES. APRIL 19, 2011
6:30 - 9:30 PM
after recalculating the expansion rate of the universe to unprecedented accuracy. The universe appears to be expanding at an increasing rate. Some believe that is because the universe is filled with a dark energy that works in the opposite way of gravity. One alternative to that hypothesis is that an enormous bubble of relatively empty space eight billion light-years across surrounds our galactic neighborhood. If we lived near the center of this void, observations of galaxies being pushed away from each other at accelerating speeds would be an illusion.

This hypothesis has been invalidated because astronomers have refined their understanding of the universe's present expansion rate. Adam Riess of the Space Telescope Science Institute (STScI) and Johns Hopkins University in Baltimore, Md., led the research. The Hubble observations were conducted by the SHOES (Supernova H0 for the Equation of State) team that works to refine the accuracy of the Hubble constant to a precision that allows for a better characterization of dark energy's behavior. The observations helped determine a figure for the universe's current expansion rate to an uncertainty of just 3.3 percent. The new measurement reduces the error margin by 30 percent over Hubble's previous best measurement in 2009. Riess's results appear in the April 1 issue of The Astrophysical Journal.

"We are using the new camera on Hubble like a policeman's radar gun to catch the universe speeding," Riess said. "It looks more like it's dark energy that's pressing the gas pedal."

Riess' team first had to determine accurate distances to galaxies near and far from Earth. The team compared those distances with the speed at which the galaxies are apparently receding because of the expansion of space. They used those two values to calculate the Hubble constant, the number that relates the speed at which a galaxy appears to recede to its distance from the Milky Way. Because astronomers cannot physically measure the distances to galaxies, researchers had to find stars or other objects that serve as reliable cosmic yardsticks. These are objects with an intrinsic brightness, brightness that hasn't been dimmed by distance, an atmosphere, or stellar dust, that is known. Their distances, therefore, can be inferred by comparing their true brightness with their apparent brightness as seen from Earth.

To calculate longer distances, Riess' team chose a special class of exploding stars called Type 1a supernovae. These stellar explosions all flare with similar luminosity and are brilliant enough to be seen far across the universe. By comparing the apparent brightness of Type 1a supernovae and pulsating Cepheid stars, the astronomers could measure accurately their intrinsic brightness and therefore calculate distances to Type 1a supernovae in far-flung galaxies. Using the sharpness of the new Wide Field Camera 3 (WFC3) to study more stars in visible and near-infrared light, scientists eliminated systematic errors introduced by comparing measurements from different telescopes.

"WFC3 is the best camera ever flown on Hubble for making these measurements, improving the precision of prior measurements in a small fraction of the time it previously took," said Lucas Macri, a collaborator on the SHOES Team from Texas A&M in College Station.

Knowing the precise value of the universe's expansion rate further restricts the range of dark energy's strength and helps astronomers tighten up their estimates of other cosmic properties, including the universe's shape and its roster of neutrinos, or ghostly particles, that filled the early universe.

"Thomas Edison once said 'every wrong attempt discarded is a step forward,' and this principle still governs how scientists approach the mysteries of the cosmos," said Jon Morse, astrophysics division director at NASA Headquarters in Washington. "By falsifying the bubble hypothesis of the accelerating expansion, NASA missions like Hubble bring us closer to the ultimate goal of understanding this remarkable property of our universe."

(Continued from page 6)

8 years away from Earth, it is so distant that, to Spitzer's view, most of the light from the thousands of individual stars is blurred into a single glowing blotch. Astronomers have determined that these stars are orbiting a massive black hole that lies at the very center of the galaxy.

The region pictured here is immense, with a horizontal span of 2,400 light-years (5.3 degrees) and a vertical span of 1,360 light-years (3 degrees). Though most of the objects seen in this image are located near the galactic center, the features above and below the galactic plane tend to lie closer to Earth.

The image is a three-color composite, showing infrared observations from two of Spitzer instruments. Blue represents 3.6-micron light and green shows 8-micron light, both captured by Spitzer's infrared array camera. Red is 24-micron light detected by Spitzer's multiband imaging photometer. The data is a combination of observations from the Galactic Legacy Infrared Mid-Plane Survey Extraordinaire (GLIMPSE) project, and the Multiband Imaging Photometer for Spitzer Galactic survey (MIPSGAL).
The discovery of X-ray "stripes" in the remains of an exploded star may help astronomers learn how some of the highest-energy particles in our galaxy reach their incredible speeds, a new study suggests. NASA's Chandra X-ray Observatory spacecraft detected a surprisingly regular pattern of X-rays in a well-known supernova remnant called Tycho. The new observations provide the first direct evidence that a cosmic event can rocket particles to energies 100 times higher than those achieved by Earth's most powerful accelerators, researchers said. The find may also help scientists figure out how some of those super-speedy particles — which are known as cosmic rays, and constantly bombard Earth — are produced, they added.

"We've seen lots of intriguing structures in supernova remnants, but we've never seen stripes before," said study leader Kristoffer Eriksen of Rutgers University in a statement. "This made us think very hard about what's happening in the blast wave of this powerful explosion." The Tycho supernova remnant is located in our own Milky Way galaxy, about 13,000 light-years from Earth in the constellation Cassiopeia. It's named for the Danish astronomer Tycho Brahe, who reported observing the supernova in 1572. The event likely occurred when a white dwarf star grew so much in mass that it eventually exploded in a so-called Type Ia supernova, researchers said. Chandra peered at the supernova remnant for more than 200 hours back in 2009. Over these extended observations, the spacecraft picked up some strange X-ray stripes in Tycho. These stripes provide support for a theory about how exploding stars accelerate charged particles to incredible energies, researchers said. The stripes could also help researchers understand how some of the highest-energy cosmic rays — which are mostly protons — are spawned.

The spacing of the X-ray stripes likely indicates proton energies about 100 times higher than those reached in Earth's most powerful particle accelerator, the Large Hadron Collider — and they're equivalent to the highest-energy cosmic rays thought to be produced in our galaxy, researchers said. That result also supports previous theory, as supernova remnants have long been considered a good candidate for producing the Milky Way's most energetic cosmic rays.

(Continued on page 10)
Protons can reach energies hundreds of times higher than the highest-energy electrons, but since they do not radiate X-rays efficiently like electrons do, direct evidence for the acceleration of cosmic ray protons in supernova remnants has been lacking, researchers said. The new results also support the prediction that magnetic fields in interstellar space are greatly amplified in supernova remnants. The difference between the observed and predicted structures, however, means that other interpretations cannot be ruled out.

"We were excited to discover these stripes because they might allow us to directly track, for the first time, the origin of the most energetic particles produced in our galaxy," Eriksen said. "But we're not claiming victory yet."