

The Ursa Minor Report



Newsletter of the Kutztown University
Planetarium & Observatory

Volume 1, Issue 1

Spring 2015

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New Planetarium & Observatory Websites

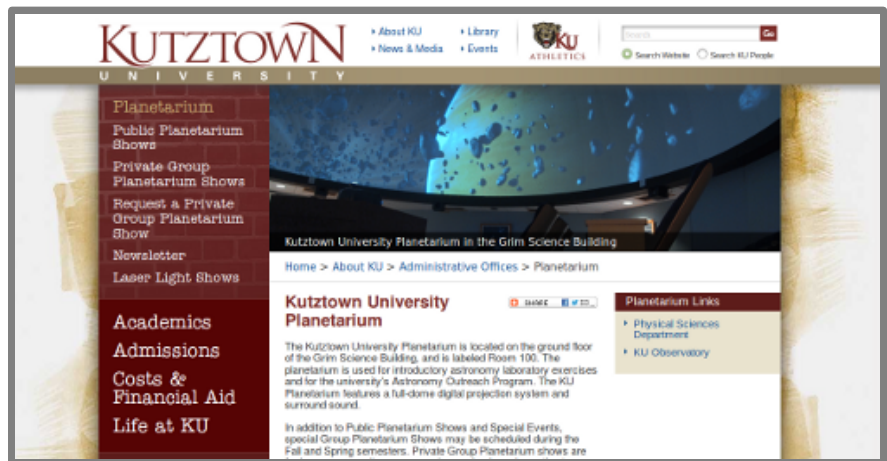
Resistance is Futile ...



The KU Planetarium & Observatory websites have assimilated!

The websites are now integrated with the University's design. Event schedules, special announcements, photos, newsletters, and more information can be found on the new websites.

You can also follow the KU Planetarium & Observatory on Facebook (KUPlanetarium).



The new KU Planetarium website: <http://www.kutztown.edu/planetarium>

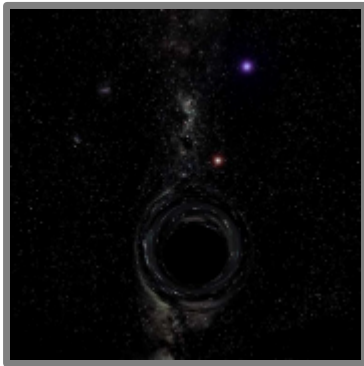


The new KU Observatory website: <http://www.kutztown.edu/observatory>



Spring 2015 Schedule of Public Planetarium Shows

DATE	TIME	EVENT	COST
Wednesday, February 4	7:00 pm	"Black Holes: Journey into the Unknown"	FREE
Thursday, February 19	7:00 pm	"Saturn: Jewel of the Heavens"	FREE
Wednesday, March 4	7:00 pm	"Astronomy: 3000 Years of Stargazing"	FREE
Thursday, March 19	7:00 pm	Spectroscopy Workshop	FREE
Wednesday, April 1	7:00 pm	"Saturn: Jewel of the Heavens"	FREE
Thursday, April 16	7:00 pm	"Ultimate Universe"	FREE
Wednesday, April 29	7:00 pm	New Horizons & <u>The Pluto Files</u> Raffle	FREE

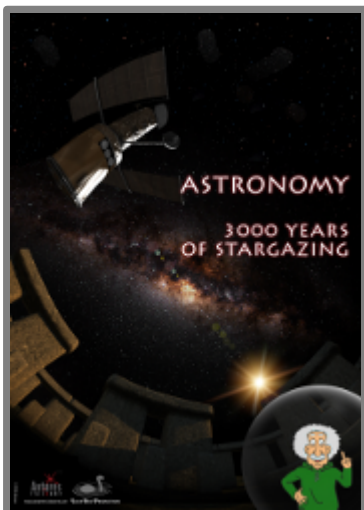
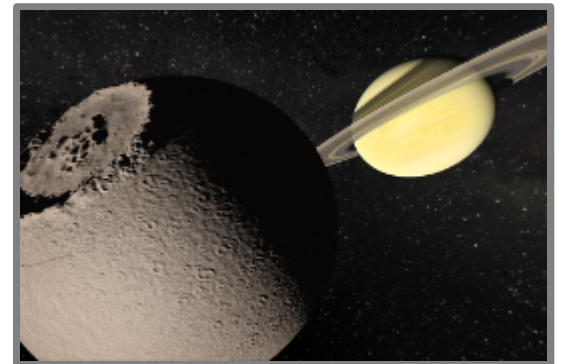


"Black Holes: Journey into the Unknown" Planetarium Show

Black holes are mysterious celestial objects where all the known laws of nature break down. Near a black hole, space is warped and time seems to stand still. "Black Holes: Journey into the Unknown", narrated by Geoffrey Rush, introduces Einstein's theory of General Relativity and explains the discovery, both theoretical and observational, of black holes. There are scores of black holes in our Milky Way Galaxy, and a supermassive black hole lying at the center of most large galaxies, including our own. This planetarium show helps us imagine what it might be like to experience one of these gravitational monsters up close.

"Saturn: Jewel of the Heavens" Planetarium Show

Once, it was the most distant planet we knew of ... a mysterious world seemingly beyond our reach. But now, using sophisticated robotic pioneers, we have finally been able to reach out to this great ringed giant. We've sailed by the trillions of chunks of ice that make up its glorious rings ... we've uncovered the bizarre faces of its unique moons ... and we've peered down into its turbulent atmosphere through massive and violent hurricanes.



"Astronomy: 3,000 Years of Stargazing" Planetarium Show

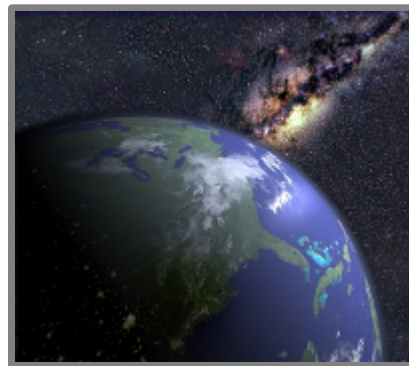
Astronomy is the oldest science and represents humanity's quest to understand the Universe in which we live. This planetarium show is an overview of the most fundamental concepts of Astronomy.

From ancient astronomers, to the first telescopes, to the most advanced tools of today and the future, "Astronomy: 3000 Years of Stargazing" explains how we learned so much about the Universe, and what we can expect to learn as we continue exploring.

"Ultimate Universe" Planetarium Show

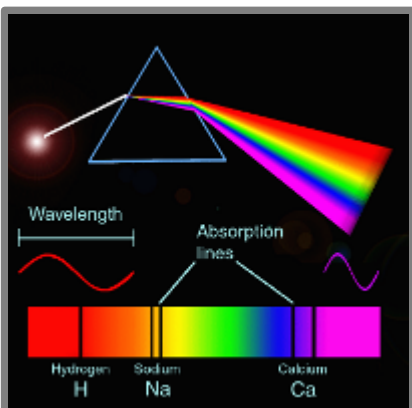
From the edge of space and time, through vast fields of wondrous galaxies, to the majesty of our solar system, this show will take audiences on a grand tour of the universe and let them experience its most provocative secrets.

"The Ultimate Universe" is a journey from the edge of the universe through space and time to reach our home planet, witnessing the major components of the cosmos along the way. See the transformation of galaxies in collision, experience the devastation of a star's death, and feel the immense power of erupting volcanoes on Jupiter's moon, Io.



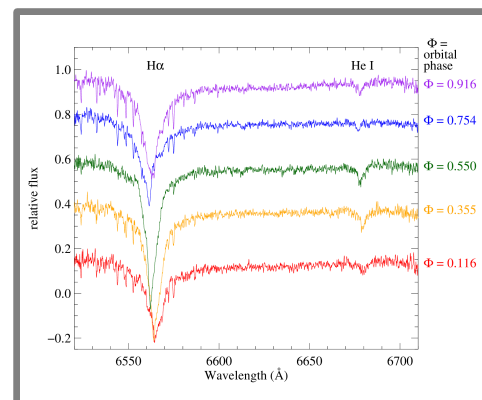
Spectroscopy Workshop

(March 19 at 7:00 pm)
(International Year of Light 2015)

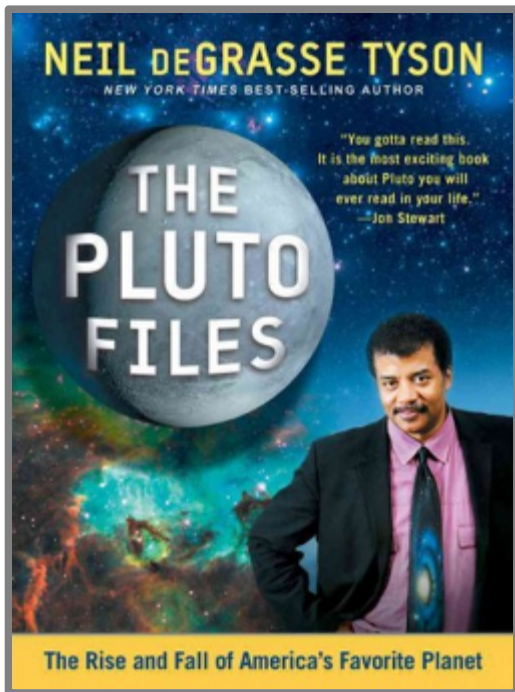


This educational workshop is free and open to the public. Attendees will learn how light behaves and how astronomers use light to determine the composition of a star and to detect a star's motion. Spectroscopy is used to measure stellar rotation rates and sizes, and to discover binary stars and extrasolar planets.

The participants of this workshop will build their own personal spectrometers and will learn how to turn their smart-phones (or any other camera) into a digital spectroscope. This workshop will take place in the KU Planetarium on Thursday, March 19 at 7:00pm. Weather permitting, the KU Observatory will be open for this event.



The Pluto Files (autographed by Neil deGrasse Tyson) Raffle



The KU Planetarium has obtained, directly from the Hayden Planetarium at the American Museum of Natural History in New York City, an autographed copy of The Pluto Files by Neil deGrasse Tyson. To celebrate the New Horizons Mission to Pluto, we will be giving the book away to a lucky visitor at the KU Planetarium!

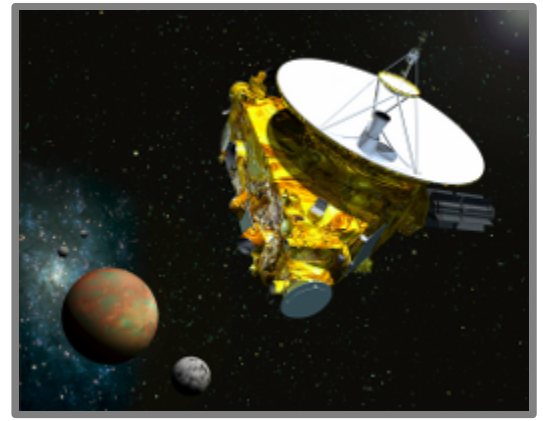
Here's how the raffle will work:

- Attend a public event at the KU Planetarium and Observatory during the Spring 2015 Semester.
- Throughout the Spring 2015 Semester, everyone attending a public event at the KU Planetarium and Observatory will be given a raffle ticket (there is no cost).
- The more events you attend, the more raffle tickets you will get.
- On Wednesday, April 29, the winning raffle ticket will be picked at random. This will occur in the KU Planetarium at a special New Horizons planetarium show.
- You do not have to be present on April 29 to win, but you might have to wait all Summer to claim your prize if you are not there.

New Horizons, the spacecraft pictured to the right, was launched on January 19, 2006. After nine hours it was farther from Earth than the Moon, and in just over a year it reached Jupiter for a “gravity assist” maneuver that propelled it faster through space toward Pluto. Its closest approach to Pluto will occur on July 14, 2015, only 9 ½ years after launch, at which time New Horizons will be 7,770 miles from Pluto.

During the flyby, New Horizons will map some of Pluto's surface with images that can resolve surface features as small as 230 feet! New Horizons will study in detail the atmospheres of Pluto and Charon (Pluto's largest moon) and it will detect any interactions of the Solar wind with Pluto's atmosphere. New Horizons will also be able to detect any small moons that might be orbiting Pluto in addition to its five known moons: Charon, Styx, Nix, Kerberos, and Hydra.

Once past Pluto, New Horizons will continue its mission by studying other objects (asteroids & comets) in the Kuiper Belt region of the Solar system. Due to the distance between Earth and Pluto, and the slow data transfer speed from New Horizons (2,000 bits per second), it will take more than a year to download all of the expected data and images of Pluto.



An illustration of the New Horizons spacecraft as it approaches the Pluto system this July.
(Courtesy:NASA/JHUAPL/SwRI)

Update on the Observatory

You probably know that the KU Observatory got a new telescope in 2012, but do you know what KU's astronomers have done with it since then? The following is an overview of some nice observing projects conducted by KU students, faculty, and guests over the past two years, and includes astrophotography projects as well as scientific research.

Astrophotography:

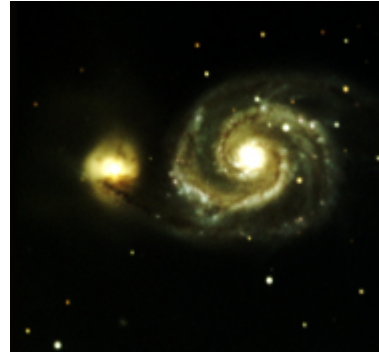
Many KU students and community members have used the new telescope to capture beautiful images of celestial objects. Here are just a few examples:



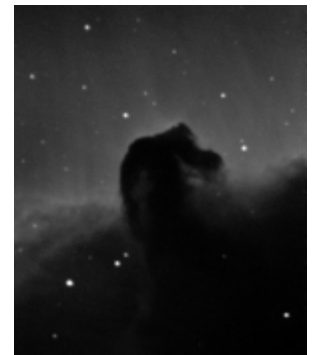
A close-up video of the Moon's surface was captured by a visiting boy scout troop using an ordinary Olympus digital camera.



The core of the Orion Nebula (M42) was imaged by a KU art student using the Fine Arts Department's Canon Mark III DSLR camera.



A pair of interacting galaxies was imaged by some KU Physics & Astronomy majors using a monochromatic camera and red, green, & blue filters.



The Horsehead Nebula was imaged by a KU German Studies major using a monochromatic camera and a Hydrogen-alpha filter.

In total, about 150 such photographs have been taken so far by a variety of people using a variety of cameras mounted to the KU telescope.

Scientific Research:

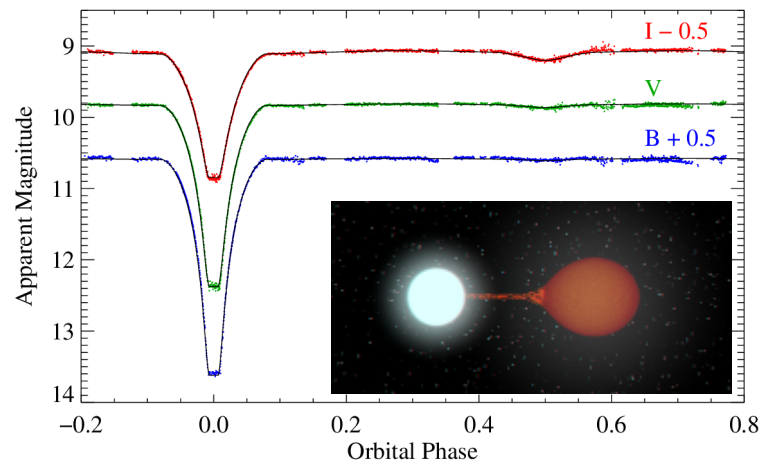
Observational research is the primary mission of the KU Observatory. It comes in the form of projects that are integrated in the undergraduate Astronomy courses at KU and faculty-led professional research that is presented (by students & faculty) at scientific conferences and is published in peer-reviewed journals. The KU Observatory has also been host to groups visiting from other schools including Lehigh University and Moravian College. Here are just a couple examples of the many research projects that have been completed at the KU Observatory with the new telescope:

Among the first research projects completed with the new telescope was the observation and modeling of an eclipsing binary star called *BO Monocerotis*. This work revealed that there is a steady transfer of mass from the evolved red (cooler) star to the more normal blue (hotter) star at a rate of about 2 trillion tons per second. In addition, it provided strong evidence for a 28-year magnetic activity cycle on the evolved star, similar to the 11-year cycle of our own Sun.

Shown here is the observed light curve (plot of brightness changes over time) using three different filters: Blue (*B*), Visual (*V* – yellow/green), and Infrared (*I*). At the bottom right is a computer generated model of the star system that portrays the actual up-close appearance of the two stars and the mass transfer stream between them.

This project was published in *The Astronomical Journal* and was co-authored by a KU undergraduate Physics major. This work was also presented at a national conference in Anchorage, Alaska in June 2013.

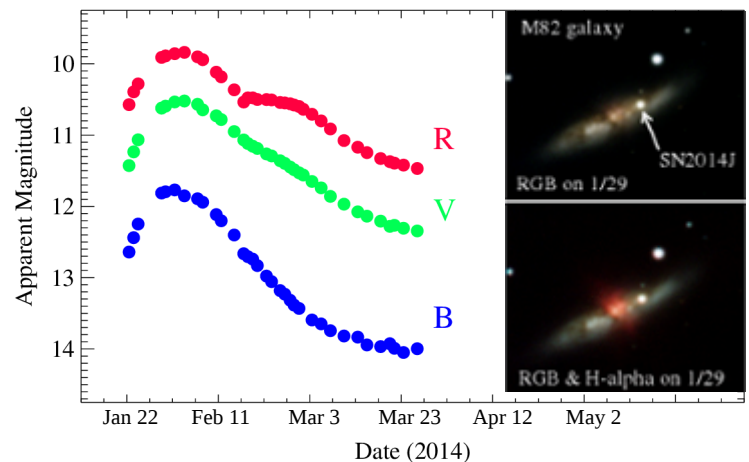
PHOTOMETRIC PROPERTIES OF THE INTERACTING BINARY STAR BO MONOCEROTIS: EVIDENCE FOR MAGNETIC ACTIVITY



As a class project, to undergo training and gain experience using a research observatory, students in a KU undergraduate Astronomy class observed the explosion and afterglow of a new supernova (SN) that went off in the galaxy M82. Their observations confirmed that the SN is type Ia, which is caused by the explosion of a white dwarf star. The light curve was observed in three different wavelength regions: Blue (*B*), Visual (*V* – yellow/green), and Red (*R*), and is shown to the right. This work reveals the timing of the radioactive decay of cobalt-56 (the changing slope of the light curve at about 20 days past the peak brightness) and also shows the reddening of the SN as it fades away. The two photographs were also taken using the KU telescope – the SN is the bright spot just to the right of the galaxy's core.

One of the students presented this work at a regional conference in Pennsylvania in April 2014.

A MULTICOLOR LIGHT CURVE OF THE RECENT SUPERNOVA SN2014J



In addition to conducting their own research, KU Astronomers are collaborating with others around the world. Our collaboration with the Gothard Astrophysical Observatory in Hungary is studying stellar pulsations and another with San Diego State University is accurately determining fundamental properties of stars and learning more about asteroseismology (“star quakes”). The KU Observatory is also continuing its search for new extrasolar planets (planets orbiting stars other than the Sun) in collaboration with The Ohio State University, Lehigh University, Vanderbilt University, and others.