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Kitt Peak Docent Program

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Docent Forum: <http://groups.yahoo.com/group/docentforum/>

Docent Calendar: <http://groups.yahoo.com/group/docentforum/>

Volunteering at Kitt

Peak: <http://www.noao.edu/outreach/kpoutreach.html>

www.noao.edu



Next Docent Meeting Monday, September 18

The next docent meeting will be held on Monday, September 18. The meeting will convene at 6:00 in the main conference room and will feature dinner and a speaker. Docents should visit the docent forum calendar to schedule their hours. Docents who do not have web access may contact Nick Petrosino. See the URL for the docent calendar at lower left.

«First Name» «Last Name»
«Mailing Address»
«City» «State» «Zip Code»

Kitt Peak Docent Program

DOCENT NEWS

Number 107

September 2006



XENA AWARDED "DWARF PLANET" STATUS; SOLAR SYSTEM NOW HAS EIGHT "CLASSICAL" PLANETS

The International Astronomical Union (IAU) downgraded the status of Pluto to that of a "dwarf planet," a designation that will also be applied to the spherical body discovered last year by California Institute of Technology planetary scientist Mike Brown and his colleagues.

The ruling effectively settles a year-long controversy about whether the spherical body announced last year and informally named "Xena" would rise to planetary status. Though somewhat larger than Pluto, the body has been informally known as "Xena" since the formal announcement of its discovery on July 29, 2005 by Brown and his co-discoverers, Chad Trujillo of the Gemini Observatory and David Rabinowitz of Yale University. Xena will now be known as the largest dwarf planet.

"I'm of course disappointed that Xena will not be the tenth planet, but I definitely support the IAU in this difficult and courageous decision," said Brown. "It is scientifically the right thing to do, and is a great step forward in astronomy.

Pluto was discovered in 1930. Because of its distance and size, astronomers had no idea of its composition or other characteristics at the time. But having no reason to think that many other similar bodies would eventually be found in the outer reaches of the solar system—or that a new type of body even existed in the region—they assumed that designating the new discoverer as the ninth planet was a scientifically accurate decision.

However, the famed astronomer Gerard Kuiper later postulated that a region in the outer solar system could house a gigantic number of comet-like objects too faint to be seen with the telescopes of the day. The Kuiper belt, as it came to be called, was demonstrated to exist in the 1990s, and astronomers have been finding objects of varying size in the region ever since.

Few if any astronomers had previously

called for the Kuiper-belt objects to be called planets, because most were significantly smaller than Pluto. But the announcement of Xena's discovery raised a new need for a more precise definition of which objects are planets and which are not.

According to Brown, the decision will pose a difficulty for a public that has been accustomed to thinking for the last 75 years that the solar system has nine planets.

"It's going to be a difficult thing to accept at first, but we will accept it eventually, and that's the right scientific and cultural thing to do," Brown says.

In fact, the public has had some experience with the demotion of a planet in the past, although not in living memory. Astronomers discovered the asteroid Ceres on January 1, 1801—literally at the turn of the 19th century. Having no reason to suspect that a new class of celestial object had been found, scientists designated it the eighth planet (Uranus having been discovered some 20 years earlier).

Soon, several other asteroids were discovered, and these, too, were summarily designated as newly found planets. But when astronomers continued finding numerous other asteroids in the region, the astronomical community in the early 1850s demoted Ceres and the others and coined the new term "asteroid."

Xena was discovered on January 8, 2005, at Palomar Observatory. Xena is about 2,400 kilometers in diameter and is currently about 97 astronomical units from the sun or 9 billion miles. Brown and his colleagues in late September announced that Xena has at least one moon. This body has been nicknamed Gabriella after Xena's sidekick on the television series.

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Points of Interest:

- The docent meeting is scheduled for Monday, September 18 and features dinner and a speaker.
- September 3: SMART-1 Moon impact
- September 5: Uranus at opposition
- September 7: Partial lunar eclipse, not visible from North America
- September 8: 40th anniversary of first of 1st Star Trek episode on T.V. (1966)
- September 13 to 15: Meeting: Astrobiology Strategy for the Exploration of Mars, Boulder, CO.
- September 22: Annular solar eclipse, not visible from North America
- September 23: Autumnal Equinox, 04:03 UT
- September 29: Asteroid 2000 TH1 near-Earth flyby at 0.081 AU

For additional information about these points of interest, visit <http://www2.jpl.nasa.gov/calendar/>.

ASTRONOMERS HAVE THE FIRST DIRECT PROOF THAT DARK MATTER EXISTS

Astronomers have the first direct proof that dark matter exists. University of Arizona astronomers and their colleagues got side-on views of two merging galaxy clusters in observations made with state-of-the-art optical and X-ray telescopes.

"Nature gave us this fantastic opportunity to see hypothesized dark matter separated from ordinary matter in this merging system," said UA Steward Observatory astronomer Douglas Clowe, leader of the study.

"Prior to this observation, all of our cosmological models were based on an assumption that we couldn't prove: that gravity behaves the same way on the cosmic scale as on Earth," Clowe said. "The clusters we've looked at in these images are a billion times larger than the largest scales at which we can measure gravity at present, which are on the scale of our solar system."

Clowe added, "What's amazing about this is that the process of galaxy clusters merging is thought to go on all of time. That's how galaxy clusters gain mass. But the fact that we caught this thing only 100 million years after it occurred -- so recently that it barely registers on the cosmic time scale -- is tremendous luck."

Astronomers have known since the 1930s that most of the universe must be made up of something other than normal matter, the stuff that makes stars, planets, all things and creatures. Given the way that galaxies move through space and scientists' understanding of gravity, astronomers theorize that the universe must contain about five times more dark matter than normal matter.

But for the past 70 years, no one had any direct empirical evidence that dark matter even exists. "Astronomers have been in the somewhat embarrassing position of saying that we understand the universe, although more than 80 percent of it is something we don't know anything about," said UA astronomy Professor Dennis Zaritsky, a member of the discovery team.

"Either most of the matter in the universe is in some invisible, undiscovered form we call 'dark matter' that causes galaxies to move as they do, or we just don't understand the fundamental laws of gravity," Zaritsky said.

When galaxy clusters merge, the galaxies themselves are so sparsely scattered in space that they don't collide, Clowe said. "Even if two galaxies do pass through each other, the distance between the stars is so great that even stars won't collide. Galaxies basically plow through each other almost without slowing down."

Most of a galaxy cluster's normal mass is in its diffuse hot gas. Galaxy clusters typically contain 10 times as much ordinary mass in gas as in stars. So when galaxy clusters merge, the hot gas from each cluster exerts a drag force on the other, slowing all the gas down, Clowe said. The upshot is that the galaxies themselves continue speeding through

space, leaving the gas behind.

Observations made with NASA's Chandra X-ray Observatory showed the bulk of ordinary matter is in the hot gas clouds left in the wake of the galaxies. Part of this million-degree plasma of hydrogen and helium, the part from the smaller cluster, forms a spectacular bullet-shaped cloud because a bow shock, or supersonic shock wave, is created in the 10 million mph collision.

But when the astronomers mapped the region of the sky around the galaxies in optical light, they discovered far more mass near the galaxies, ahead of the gas cloud. They analyzed gravitational lensing of distant galaxies in images taken with NASA's Hubble Space Telescope, the European Southern Observatory's 2-meter Wide-Field Imager and one of the twin 6.5-meter Magellan telescopes that a consortium that includes UA operates in Chile.

Gravitational lensing is a phenomenon caused by gravity bending distant starlight. When the astronomers analyzed the shapes and patterns of the distorted light, they discovered the mass of non-luminous, or dark, matter that causes the lensing is far greater than the mass of ordinary matter in the gas cloud.

Clowe and Zaritsky said that dark matter particles are not expected to interact with either normal matter or dark matter particles except through gravity. Hence, they would pass through the collision just as galaxies do.

"We see that dark matter has careened through the collision efficiently," Zaritsky said. "We're actually using this system to test the idea that dark matter particles are collisionless," Clowe said. "The bottom line is, there really is dark matter out there," Zaritsky said. "Now we just need to figure out what it is."

The team is publishing the research in a forthcoming issue of the Astrophysical Journal Letters. In addition to Clowe and Zaritsky of UA's Steward Observatory, team members include Marusa Bradac of the Kavli Institute for Particle Astrophysics and Cosmology in Stanford, Calif., Anthony Gonzalez of the University of Florida, and Maxim Markevitch, Scott Randall and Christine Jones of the Harvard-Smithsonian Center for Astrophysics.

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Images and animation can be downloaded at:
<http://chandra.harvard.edu>
<http://chandra.nasa.gov>

September 2006

Sun	Mon	Tue	Wed	Thu	Fri	Sat
					1 <i>Need Docent</i>	2 <i>Jim O., Kelly G. NSN, Stars and Music</i>
3 <i>Larry L.</i>	4 <i>Bill</i>	5 <i>Joyce</i>	6 <i>Sheila, Punch</i>	7 <i>Larry E.</i>	8 <i>Doug, Vance</i>	9 <i>Jim O., Eugene, Bob</i>
10 <i>Bill</i>	11 <i>Need Docent</i>	12 <i>Joyce</i>	13 <i>Sheila, Aubrey</i>	14 <i>Need Docent</i>	15 <i>Doug</i>	16 <i>Jim O.</i>
17 <i>Eugene, Anna</i>	18 <i>Bill Docent Meeting</i>	19 <i>Joyce</i>	20 <i>Sheila, Aubrey</i>	21 <i>Larry E.</i>	22 <i>Vance</i>	23 <i>Jim O., Larry L.</i>
24 <i>Ken, Anna</i>	25 <i>Need Docent</i>	26 <i>Eugene</i>	27 <i>Sheila, Aubrey</i>	28 <i>Need Docent</i>	29 <i>Joyce</i>	30 <i>Jim O., Ken</i>

PROGRAMS NEED VOLUNTEERS

September is approaching and with it comes the start of programs. Public Outreach is enjoying considerable coverage of its events and so the turnout promises to be fairly high, weather permitting.

New Scope Night on September 2nd has fourteen reservations, the highest to date. The program limit is twenty. Mark Chambers has been conducting NSN expertly for many months and is now assisted by Kelly Galvin and Vance Tanner. The assistance will be much appreciated considering the nature of the program and the number of participants.

Also on September 2nd is Stars and Music featuring the Tucson Junior Strings Quartet. Randy Quiroz volunteered to bring his telescope for the star party that follows the music, but another telescope would be welcome. The picnic area, where Stars and Music takes place, now has eight-foot-square

concrete pads for telescopes, so setting up is easier.

The plan this year for handling parking and payment is to have a docent on the main road to direct guests into the picnic area. On the road to the ramada is a clear spot where staff will set up a table at which to check in the guests and take payment. This will eliminate having to run from car to car checking in people as they park. Anyone interested in helping with this event and enjoying an hour of great music may contact the docent coordinator.

The large NOPs on October 9 and 10 still need volunteers. Four docents each night would be ideal. So far Marlene Hilligoss, Richard Grimaldi, and Joyce Park have stepped in to assist. Chuck Dugan of the NOP staff is coordinating the event, so interested docents my reply to him at cdugan@noao.edu.