The Spectrogram

Newsletter for the Society of Telescopy, Astronomy, and Radio

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S*T*A*R
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November Meeting

The next meeting of S*T*A*R will be held Thursday November 6. The speaker will be former S*T*A*R president Dr. Steve Walters, who will present "Needle in a Haystack: The Search for 1A Supernova." Steve will explain what a class 1A Supernova (SN) is, why astronomers yearn to find them, the procedure for locating them, and why they are hard to find. He will discuss the role of amateurs, professionals, and software in finding them. He will also demonstrate a real-time software application, soon to be made available to amateurs and small colleges, that detects SN in images being taken by unattended imaging systems. He will finish by discussing the impact he hopes the software will have on amateurs and SN searches.

The meeting will begin at 8:00pm at Monmouth Museum on the campus of Brookdale Community College in Lincroft, NJ.

Calendar

November 6, 2014 – S*T*A*R meeting

November 14, 2014 – star party Pine Brook School

October Meeting Minutes

By Steve Fedor

The October 2nd, 2014 meeting of S*T*A*R Astronomy club began at 8:19 p.m. The meeting was attended by 30 people. President Kevin Gallagher chaired the meeting and began by welcoming two new members and reminding all members that their club dues are due. He also mentioned that S*T*A*R tee shirts are available and encouraged all members to be fashionable and support the club with a purchase.

The evening's talk was presented by STAR's very own Gordon Waite, owner of Waite Research- maker of precision telescope mirrors and innovative telescopes. The main topic was Gordon's discussion was his line of next generation fast telescopes and progress on the rebuilding the club's 25 inch Obsession Telescope. Gordon's discussed the pros and cons of fast scopes with f-ratios around 3.1. He also discussed his unique grinding techniques and how he fabricates his grinding tools. The club thoroughly enjoyed the talk and especially appreciated Gordon bringing and demonstrating a "Renegade" fast scope and the clubs Obsession. The talk ended at 9:28 for coffee break.

The meeting resumed at 9:49 with Ken Legal presenting "October Sky Happenings." Ken discussed the lunar eclipse on 10/8, the moon occulting Saturn midday on 10/25 and the partial solar eclipse on 10/23 and the Orionids meteor shower on 10/21.

Upcoming observing events were then discussed:
11/14 – Penn Brook , Manalapn
11/25- Summerfield School, Neptune
2/25/15 Mill Lake School, Monroe

Upcoming Dorbrook Night 10/24. It was proposed that new rules be implemented to discourage the use of lights and cell phones. Also a better parking arrangement would be determined so headlights don't interfere with viewing.

Fall meeting Speaker Schedule:
Nov.: Steve Walters – Search for 1A Supernovae
Dec.: ken Legal – The H-R Diagram
Jan. 8th – Winter Social to be held at Kevin's

Steve Rich solicited for members to purchase the Observer's Handbook for $27.
Mike K. asked if twe still pay the museum if the Jan meeting is at Kevin's house. The answer was no.

Charlie Byrne mentioned his son received an award from the JPL for his work on a communication relay for the Curiosity rover. The meeting was then adjourned.

Astronomers solve puzzle about bizarre object at the center of our galaxy

Telescopes from Hawaii's W.M. Keck Observatory use a powerful technology called adaptive optics, which enabled UCLA astronomers to discover that G2 is a pair of binary stars that merged together, cloaked in gas and dust. Credit: Ethan Tweedie

(Phys.org) —For years, astronomers have been puzzled by a bizarre object in the center of the Milky Way that was believed to be a hydrogen gas cloud headed toward our galaxy's enormous black hole.

Having studied it during its closest approach to the black hole this summer, UCLA astronomers believe that they have solved the riddle of the object widely known as G2.

A team led by Andrea Ghez, professor of physics and astronomy in the UCLA College, determined that G2 is most likely a pair of binary stars that had been orbiting the black hole in tandem and merged together into an extremely large star, cloaked in gas and dust—its movements choreographed by the black hole's powerful gravitational field. The research is published today in the journal *Astrophysical Journal Letters*.

Astronomers had figured that if G2 had been a hydrogen cloud, it could have been torn apart by the black hole, and that the resulting celestial fireworks would have dramatically changed the state of the black hole.

"G2 survived and continued happily on its orbit; a simple gas cloud would not have done that," said Ghez, who holds the Lauren B. Leichtman and Arthur E. Levine Chair in

Astrophysics. "G2 was basically unaffected by the black hole. There were no fireworks."
Black holes, which form out of the collapse of matter, have such high density that nothing can escape their gravitational pull—not even light. They cannot be seen directly, but their influence on nearby stars is visible and provides a signature, said Ghez, a 2008 MacArthur Fellow.

Ghez, who studies thousands of stars in the neighborhood of the supermassive black hole, said G2 appears to be just one of an emerging class of stars near the black hole that are created because the black hole's powerful gravity drives binary stars to merge into one. She also noted that, in our galaxy, massive stars primarily come in pairs. She says the star suffered an abrasion to its outer layer but otherwise will be fine.

Ghez and her colleagues—who include lead author Gunther Witzel, a UCLA postdoctoral scholar, and Mark Morris and Eric Becklin, both UCLA professors of physics and astronomy—conducted the research at Hawaii's W.M. Keck Observatory, which houses the world's two largest optical and infrared telescopes.

When two stars near the black hole merge into one, the star expands for more than 1 million years before it settles back down, said Ghez, who directs the UCLA Galactic Center Group. "This may be happening more than we thought. The stars at the center of the galaxy are massive and mostly binaries. It's possible that many of the stars we've been watching and not understanding may be the end product of mergers that are calm now."

Ghez and her colleagues also determined that G2 appears to be in that inflated stage now. The body has fascinated many astronomers in recent years, particularly during the year leading up to its approach to the black hole. "It was one of the most watched events in astronomy in my career," Ghez said.

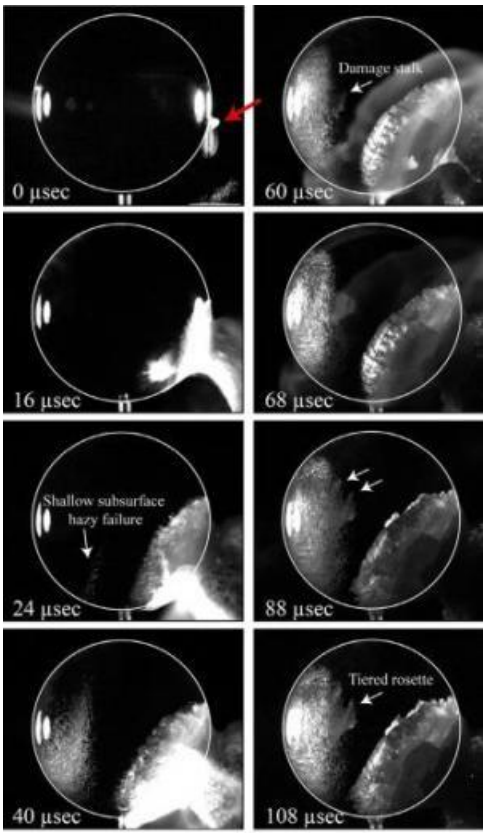
Ghez said G2 now is undergoing what she calls a "spaghetti-fication"—a common phenomenon near black holes in which large objects become elongated. At the same time, the gas at G2's surface is being heated by stars around it, creating an enormous cloud of gas and dust that has shrouded most of the massive star.

Witzel said the researchers wouldn't have been able to arrive at their conclusions without the Keck's advanced technology. "It is a result that in its precision was possible only with these incredible tools, the Keck Observatory's 10-meter telescopes," Witzel said.

The telescopes use adaptive optics, a powerful technology pioneered in part by Ghez that corrects the distorting effects of the Earth's atmosphere in real time to more clearly reveal the space around the supermassive black hole. The technique has helped Ghez and her colleagues elucidate many previously unexplained facets of the environments surrounding supermassive black holes.

"We are seeing phenomena about black holes that you can't watch anywhere else in the universe," Ghez added. "We are starting to understand the physics of black holes in a way that has never been possible before."

How a giant impact formed asteroid Vesta's 'belt'



A high-speed camera recorded a laboratory simulation of colliding heavenly bodies. An analysis of shock propagation suggests what may have caused the tilted canyon-like grooves around the equator of the asteroid Vesta. Credit: Angela Stickle and Peter Schultz

(Phys.org) When NASA's Dawn spacecraft visited the asteroid Vesta in 2011, it showed that deep grooves that circle the asteroid's equator like a cosmic belt were probably caused by a massive impact on Vesta's south pole. Now, using a super high-speed cannon at NASA's Ames Research Center, Brown University researchers have shed new light on the violent chain of events deep in Vesta's interior that formed those surface grooves, some of which are wider than the Grand Canyon.

"Vesta got hammered," said Peter Schultz, professor of earth, environmental, and planetary sciences at Brown and the paper's senior author. "The whole interior was reverberating, and what we see on the surface is the manifestation of what happened in the interior."

The research suggests that the Rheasilvia basin on Vesta's south pole was created by an impactor that came in at an angle, rather than straight on. But that glancing blow still did an almost unimaginable amount of damage. The study shows that just seconds after the collision, rocks deep inside the asteroid began to crack and crumble under the stress. Within two minutes major faults reached near the surface, forming deep the canyons seen today near Vesta's equator, far from the impact point.

The research, led by Angela Stickle, a former graduate student at Brown and now a researcher at the Johns Hopkins University Applied Physics Laboratory, will appear in the February issue of the journal *Icarus* and is now available online.
"As soon as Pete and I saw the images coming down from the Dawn mission at Vesta, we were really excited," Stickle said. "The large fractures looked just like things we saw in our experiments. So we decided to look into them in more detail, and run the models, and we found really interesting relationships."

For the study, the researchers used the Ames Vertical Gun Range, a cannon with a 14-foot barrel used to simulate collisions on celestial bodies. The gun uses gunpowder and compressed hydrogen gas to launch projectiles at blinding speed, up to 16,000 miles per hour. For this latest research, Schultz and his colleagues launched small projectiles at softball-sized spheres made of an acrylic material called PMMA. When struck, the normally clear material turns opaque at points of high stress. By watching the impact with high-speed cameras that take a million shots per second, the researchers can see how these stresses propagate through the material.

The experiments showed that that damage from the impact starts where one would expect: at the impact point. But shortly after, failure patterns begin to form inside the sphere, opposite the point of impact. Those failures grow inward toward the sphere's center and then propagate outward toward the edges of the sphere like a blooming flower.

Using numerical models to scale the lab collision up to the size of Vesta, the second-largest object in the asteroid belt, the researchers showed that the outward-blooming "rosette" of damage extending to the surface is responsible for the troughs that form a belt around Vesta's equator.

The results answer some questions about Vesta's belt that had long been puzzling. Chief among them is the orientation of the belt with respect to the crater. The belt's angle isn't exactly what would be expected if it were caused by the Rheasilvia impact.
"The belt is askew," Schultz said, "as if Vesta were making a fashion statement."

These new experiments suggest that the crooked belt is the result of the angle of impact. An oblique impact causes the damage plane to be tilted with respect the crater. The orientation of Vesta's belt sheds light on the nature of the impact. The researchers conclude that the object that created Rheasilvia came in at an angle less than 40 degrees, traveling at about 11,000 miles per hour.
"Vesta was lucky," Schultz said. "If this collision had been straight on, there would have been one less large asteroid and only a family of fragments left behind."

The research shows that even a glancing blow can have tremendous consequences.
"When big things happen to small bodies," Schultz said, "it shakes them to the core."

Are you a S*T*A*R Member?

S*T*A*R meets the first Thursday of each month, except July and August, at 8:00 p.m. at Monmouth Museum on the campus of Brookdale Community College in Lincroft, NJ. Meetings usually include a presentation of about one hour by a guest speaker, a break for refreshments and socializing, a description of interesting objects to view, and a discussion of club business.

Memberships:
( )Individual...$35
( ) Family...$45
( ) Student…$15

Name_____

Address_____

City_____State___Zip_____

Phone_____

Email_____
Make checks payable to: STAR Astronomy Society, Inc. and mail to P.O. Box 863, Red Bank, NJ 07701

The club owns 8" f/8, and 13" f/4.5 Dobsonian telescopes which are available for use by members. To borrow a telescope, please contact the Vice President.

The officers of S*T*A*R are:
President Kevin Gallagher
Vice President Rob Nunn
Secretary Michelle Paci
Treasurer Arturo Cisneros
Member at Large Dave Britz

S*T*A*R members can join the Astronomical League (AL) for a small fee. Members receive the AL publication Reflector.

In the Eyepiece

Here is a list of objects for this month. This is reproduced from www.skyhound.com with the kind permission of its creator and author of SkyTools Greg Crinklaw.

Object(s)	Class	Con	RA	Dec	Mag
Iota Cas	Multiple Star	Cassiopeia	02h29m04.0s	+67°24'09"	4.5
6 Tri	Multiple Star	Triangulum	02h12m22.3s	+30°18'11"	4.9
Almaak	Multiple Star	Andromeda	02h03m53.9s	+42°19'47"	2.1
h and Chi Perseus	Open Clusters	Perseus	02h19m01.8s	+57°08'47"	4.3
NGC 1097	Galaxy	Fornax	02h46m18.9s	-30°16'21"	10.2
M 103	Open Cluster	Cassiopeia	01h33m13.8s	+60°42'23"	6.9
Little Dumbbell (M76)	Planetary Nebula	Perseus	01h42m19.3s	+51°34'30"	12.2
NGC 891	Galaxy	Andromeda	02h22m32.9s	+42°20'46"	10.8
NGC 1023	Galaxy	Perseus	02h40m27.7s	+39°04'04"	10.2
AGC 347	Galaxy Group	Andromeda	02h25m48.0s	+41°52'00"	--
IC 1747	Planetary Nebula	Cassiopeia	01h57m35.8s	+63°19'19"	13.6
NGC 470 & 474	Interacting Galaxy Pair	Pisces	01h19m44.9s	+03°24'35"	12.6
NGC 925	Galaxy	Triangulum	02h27m16.8s	+33°34'45"	10.9
NGC 784	Galaxy	Triangulum	02h01m16.8s	+28°50'14"	12.5

Coordinates are epoch 2000.0