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ASTRONOMY CLUB OF TULSA

OBSERVER

APRIL 2016

This month's image: M42 by Tony Blakesley



M42 by Tony Blakesley





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THE ASTRONOMY CLUB TULSA
IS A PROUD MEMBER OF



THE ASTRONOMICAL LEAGUE

APRIL 2016

SUN	MON	TUE	WED	THU	FRI	SAT
					1	2
3	4	5	6	7 	8	9
10	11	12	13 	14	15	16
17	18	19	20	21	22 	23
24	25	26	27	28	29 	30

MOON PHASES AND HOLIDAYS:

APRIL FOOLS' DAY	FRI APR 1
NEW MOON	THUR APR 7
FIRST QUARTER	WED APR 13
FULL (Pink) MOON	FRI APR 22
EARTH DAY	FRI APR 22
ADMINISTRATIVE PROFESSIONALS' DAY	WED APR 27
LAST QUARTER	FRI APR 29





UPCOMING EVENTS:

MEMBERS' NIGHT**	FRI APR 1	7:45 PM	ACT OBSERVATORY
GENERAL MEETING	FRI APR 15	7:00 PM	JENKS HS PLANETARIUM
SIDEWALK ASTRONOMY	SAT APR 16	7:00 PM	BASS PRO
PUBLIC STAR PARTY	SAT APR 30	8:00 PM	ACT OBSERVATORY
MEMBERS' NIGHT**	FRI MAY 6	8:15 PM	ACT OBSERVATORY
MERCURY TRANSIT VIEWING	MON MAY 9	6:12 AM	JENKS HS PLANETARIUM—SEE PAGE 3 OF THIS ISSUE
GENERAL MEETING	FRI MAY 13	7:00 PM	JENKS HS PLANETARIUM
SIDEWALK ASTRONOMY	SAT MAY 14	7:30 PM	BASS PRO
PUBLIC STAR PARTY	SAT MAY 28	8:30 PM	ACT OBSERVATORY

**MEMBERS AND FAMILY ONLY PLEASE.

MAY 2016

SUN	MON	TUE	WED	THU	FRI	SAT
1	2	3	4	5	6 	7
8	9	10	11	12	13 	14
15	16	17	18	19	20	21 
22	23	24	25	26	27	28
29 	30	31				

MOON PHASES & HOLIDAYS:

NEW MOON	FRI MAY 6
MOTHERS' DAY	SUN MAY 8
MERCURY TRANSIT	MON MAY 9
FIRST QUARTER	FRI MAY 13
ARMED FORCES DAY	SAT MAY 21
FULL (Flower) MOON	SAT MAY 21
LAST QUARTER	SUN MAY 29
MEMORIAL DAY	MON MAY 30



SPECIAL EVENT: THE TRANSIT OF MERCURY 2016

MONDAY, MAY 9, 2016

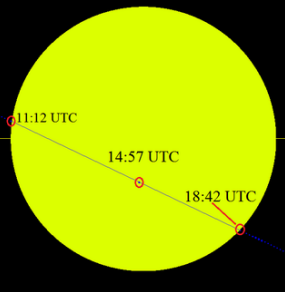


Image Credit: Wikipedia

From Wikipedia: A [transit](#) of Mercury across the Sun takes place when the [planet Mercury](#) comes between the [Sun](#) and the [Earth](#), and Mercury is seen as a small black dot moving across the face of the Sun.

Transits of Mercury with respect to Earth are much more frequent than [transits of Venus](#), with about 13 or 14 per century, in part because Mercury is closer to the Sun and orbits it more rapidly.

Transits of Mercury occur in May or November. The last three transits occurred in 1999, 2003 and 2006; the next will occur on May 9, 2016.

https://en.wikipedia.org/wiki/Transit_of_Mercury

The Astronomy Club of Tulsa and the Jenks Planetarium are teaming up on the early morning of Monday, May 9, 2016 to share this special event with the public. Volunteers with either solar telescopes or telescopes with Baader film filters are needed. We will probably start at **6:00 AM**. Here are the times for each stage of the transit:

6:12 AM—Transit begins.

6:23 AM—Sunrise.

9:57 AM—Middle of transit.

1:42 PM—End of transit.

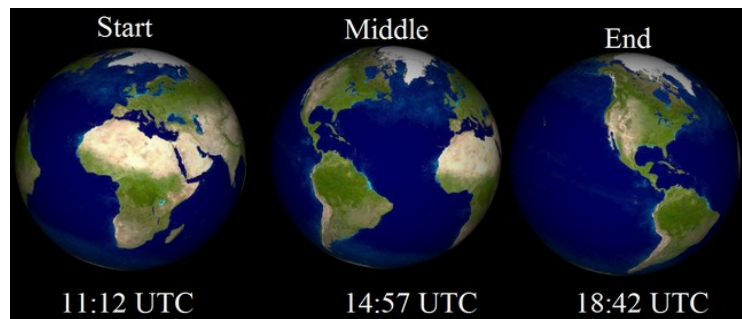


Image Credit: Wikipedia

We realize that this is a weird time to have a public astronomy event, but oftentimes interesting astronomical events take place at weird times! We expect to not only have members of the public come to view this event, but also the students of Jenks High School, since this takes place during school hours! We hope you can come out and volunteer to help make this viewing event a success. We hope to see you there!

PRESIDENT'S MESSAGE

BY RICHARD BRADY



Hi everyone!

The seasons are definitely changing, not only weather-wise but sky-wise too. The Andromeda Galaxy is no longer visible and Orion is getting lower each night. But there are now other things to look at. Jupiter was at opposition on March 8th, so it is basically up all night. Saturn and Mars are in the south in the morning. Mars rises at 12:03 AM and Saturn rises at 12:42 AM on April 1st. Mars and Saturn will be well placed in the evening sky later this summer. And in August all 5 naked eye planets will be visible at one time again, but this time in the evening soon after sundown.

Several of us went down to TUVA for the Messier Marathon on Saturday, March 5th. It turned out to only be a "half marathon" (at least that's what I'm calling it) because the clouds came in soon after midnight. Still a couple of observers were able to get over 50 objects. Not bad for a half marathon. A good time was had by all who came down.

At the General Meeting on Friday, April 15th (hopefully you will have your taxes done by then and so can come to our meeting), Dr. James Maxin from TU will be speaking on "the Cosmology of our Universe, from the beginning (and even before that) to the present, and also touch on the possibility of other universes".

On Wednesday, March 16, NSN had another webinar, this one about "New Horizons and Pluto". Dr. Orkan Umurhan of the NASA Ames Research Center provided some of the latest findings from the data returned so far. Included was some information that had not been released to the general public yet. When I first tried to download the slides some of the pictures were blanked out (their word: embargoed). They are all there now at http://nightsky.jpl.nasa.gov/download-view.cfm?Doc_ID=573. You can also view the webinar on YouTube using a link on that page.

The next webinar is scheduled for Monday, April 18. The topic will be "Updates from Mercury Messenger" by Dr. Larry Nittler. It is scheduled for 8 PM CT. Go to the NSN website for details at http://nightsky.jpl.nasa.gov/event-view.cfm?Event_ID=73058. You must be signed in to view the webinar. If you've never signed in to NSN, please do so a day or two before the webinar. If you have problems let me know and I will try to help you.

On Tuesday, April 12th, at 8:30 PM, the Jenks Planetarium is hosting "How to Use My Telescope". Dan will let us know how many signed up beforehand. Let me know if you can help out. It's nice to have one volunteer for each telescope there.

Also, the transit of Mercury is coming up Monday, May 9 from 6:12 AM (9 minutes before sunrise in Tulsa) to 1:42 PM. The club will be hosting an event at the Jenks Planetarium. Anyone who can come and help out will be greatly appreciated. This is a school day, and Dan said there will be several classes showing up. Please let me know beforehand if you plan on being there. Dan will make arrangements with Jenks security to rope off parking for us, so we need to know who all is coming.

Clear Skies!
Richard Brady

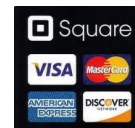
TREASURER'S AND MEMBERSHIP REPORT

BY TIM DAVIS



Astronomy Club of Tulsa: 178 members, including 29 new members in 2016.

Welcome to our new members this month: Allen Irvan, Mike Morgan, Arthur Wing, Tzion Wing, Marlin Garrett, James Arthur, Philip Sutton, George Warner, Theresa Warner, Austin Banks, Rachella Marshall, Mike Dearing and Andrea Dearing.



Club Accounts as of March 31, 2016:

Checking: \$8,752.67; Savings: \$4,775.20; Investment accounts: \$18,443.47 (*Value Fluctuates with Market*); PayPal: \$ 0.00

The club now has **PayPal** available for you to start or renew memberships and subscriptions using your credit or debit cards. Fill out the registration form at <http://astrotulsa.com/page.aspx?pageid=16> Click **Submit** and you will be given the choice of either **mailing in your dues** with a check or **using PayPal** which accepts most major credit cards. A modest processing fee is added to PayPal transactions.

You may also renew your membership or join at one of our club events using your credit card by seeing one of our officers. We can take payments with the Square card reader. A small fee is also added on to these transactions.

ALSO NOTE: For our current members who are renewing their memberships, you can now go to a new link on the website to start your renewal process. On the home page, hover over the "Member" tab on the ribbon menu near the top of the page. Then select the "Membership Renewal" link and this will take to a page to fill out your information. Fill this out, submit it, then pay your dues by whatever method you choose.

NEWS NOTE: Both Sky & Telescope and Astronomy have free Digital subscriptions available with print subscriptions, or Digital subscriptions may be purchased separately. Contact their websites for details.

Membership rates for 2016 are as follows:

Adults: \$45.00 per year, includes Astronomical League Membership.

Sr. Adult: \$35.00 per year for those 65 or older, includes Astro League Membership.

Students: \$30.00 with League membership; **Students: \$25.00** without League membership.

Additional Family membership: \$20.00 with voting rights and League membership, **\$15.00** with voting rights but without League Membership.

The regular membership allows all members in the family to participate in club events, but only **ONE** Voting Membership and one Astronomical League membership.

Join Online – Add or renew magazine subscriptions. <http://www.astrotulsa.com/page.aspx?pageid=16>

Magazine Subscriptions: If your magazines are coming up for renewal, try to save the mailing label or renewal form you get in the mail. Forms are available on the club website.



Astronomy is \$34 for 1 year, or \$60 for 2 years. www.astronomy.com

To get the club discount you must go through the club group rate.



Sky & Telescope is \$33 per year www.skyandtelescope.com

Sky & Telescope also offers a 10% discount on their products.

Note: You may renew your Sky & Telescope subscription directly by calling the number on the renewal form, be sure to ask for the club rate.

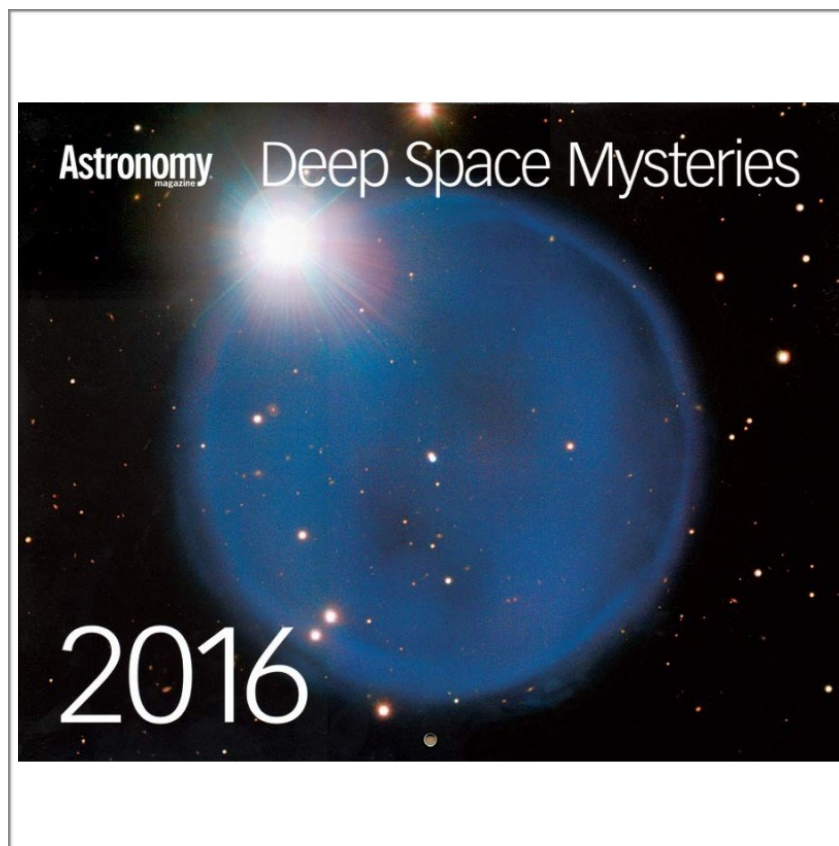
NEW SUBSCRIPTIONS must still be sent to the club

2016 Wall Calendar

The 2016 Astronomy Magazine Wall Calendars are here and are now available. If you would like to reserve one, send me an email at astrotulsa.tres@gmail.com, or call me at 918-665-8134 and let me know how many you would like. Otherwise, they will be available on a first come, first served basis at our upcoming events. We still have some available for \$8.00 each, cash, check or credit cards accepted.

Calendars must be picked up in person at a club event, we can not ship these to you. If you reserve one, just let me know at which event you will pick it up.

Get yours while they last!



Tim Davis

Act Treasurer

SECRETARY'S CORNER

BY TERESA DAVIS



This month our officers and board of directors has been working on a few items through virtual meetings (email correspondence). In addition to our ongoing work with updating our roster and keeping each other informed on needs and work at the observatory, we also took care of the following business:

In the first week of March the taxes were completed and mailed.

Our treasurer also mailed in the renewal for continuing as a charitable organization.

We received the current 178th membership, bringing us to ACT's record high for membership.

As we our aware there will be pipeline installed near the observatory, the board made contacts to monitor any and all work that will be going on close to the observatory grounds. We are prepared to send notice to members to let anyone know if there is any temporary interference to the grounds.

The donated 12" Meade Light Bridge at the observatory was in bad need of being resurfaced. On March 15, 2016 at 3:11pm, John Land made a motion to send the mirror and diagonal to be resurfaced. Chris Proctor seconded the motion. After a few emails of discussion on costs being \$190, all officers and board members were included in the email and each one replied with approval by March 16, 2016. John Land sent notice of sending the telescope to the agreed company on March 31, 2016 and paying for the shipping the total was \$201.86.

The last public meeting minutes were recorded by Tamara Green, ACT's Vice President. She took the following notes by my request as I could not make it to the meeting.

GENERAL MEETING

FRIDAY, MAR 11

PRESENT:

Richard Brady, President

Tamara Green, Vice President

Tim Davis, Treasurer

John Land, Board

Skip Whitehurst, Board

NOT PRESENT:

Teresa Davis, Secretary

James Taggart, Board

James Liley, Board

Christopher Proctor, Board

Richard called the meeting to order at 7:07 PM and welcomed all, including new members. There were about 4 or 5 new members present. 23 people total attended the meeting.

Since Teresa was not here, Tamara took notes with the intention of e-mailing them to Teresa, at Teresa's request.

The first item on the agenda was the Astronomy calendars. We still have them for sale for \$8 apiece.

SECRETARY'S CORNER

BY TERESA DAVIS, CT'D.

Next, was the "Things That Caught My Eye" portion, in which he talked about the following: Eta Carinae, which he saw an article on in Wikipedia (it was on the main page); a news item from Sky & Telescope about a transiting exoplanet, K2-25b, which is around the star K2-25, near Gamma Tauri, which is in the Hyades star cluster. It is 3 ½ times the size of Earth, about the size of Neptune; another news item from S&T on Hubble finding the most distant galaxy yet, which has a redshift of 11.1; a news item from S&T on "A Cold New View of the Milky Way Galaxy", an image by APEX Telescope Large Area Survey of the Galaxy; and an item about the APOD image of the ISS transiting Saturn, which was the image of the day on January 15, 2016. It turns out that this is fake. This was actually a composite of images mixed together and submitted as a real image. It fooled a lot of people. APOD has removed this image and replaced it with another one. After that, Richard talked about Pluto's "floating hills" and showed a video of a "fly-over" of Charon, and then showed a short video of the solar eclipse in Indonesia. The vid was taken by an astronomer on board Alaska Airlines Flight 870, which was postponed by 25 minutes intentionally, so the plane could fly through the shadow of the eclipse. It was a short vid that showed the eclipse from a window of the plane.

Then he talked for a bit about the Messier Marathon, which took place on Saturday, Mar 5. It turned out to be a "half-marathon", as the skies began to get cloudy after Midnight. He had Tamara talk about some pictures that she had taken at the event and sent to him to share with everyone. Tamara got the most amount of objects that night, 66, followed by Tom McDonough, who got 65, and Steve Chapman, who got 53. Tamara won the Big Toe award (The David Stine Award) this year.

He then discussed the upcoming events:

Sidewalk Astronomy	Bass Pro	Sat Mar 12	6:30 PM (Weather permitting)
Public Night	Observatory	Sat Mar 26	7:30 PM (Weather permitting)
Members' Night	Observatory	Fri Apr 1	7:45 PM (Weather permitting)
General Meeting	Jenks Planetarium	Fri Apr 15	7:00 PM

Dr. James Maxin from TU will speak on the Cosmology of our Universe from the beginning (and even before that) to the present, and also touch on the possibility of other universes.

Owen Green mentioned that in the event of Sidewalk being cancelled due to weather, he would post the cancellation by 4:00 PM.

There was then discussion about the last public night, which saw over 225 attendees. Richard called for volunteers for next public night.

He then talked about an upcoming NSN Webinar, which will be on Wed, Mar 16 at 8:00 PM CDT. Orkan Umurhan will be giving a presentation called "Peering Into Distant Lands: New Horizons and the Geology of Pluto and Charon". NSN password will be needed. Richard will send out an email about it later.

Daylight Saving Time starts Sunday, Mar 13.

He then talked about upcoming Planetarium shows and showed a slide with the titles, dates and times for the shows.

He then called for volunteers for two upcoming special events: "How to Use My Telescope", at the Jenks Planetarium on Tues, Apr 12 at 8:30 PM and the Transit of Mercury event, also at the Jenks Planetarium on Monday, May 9.

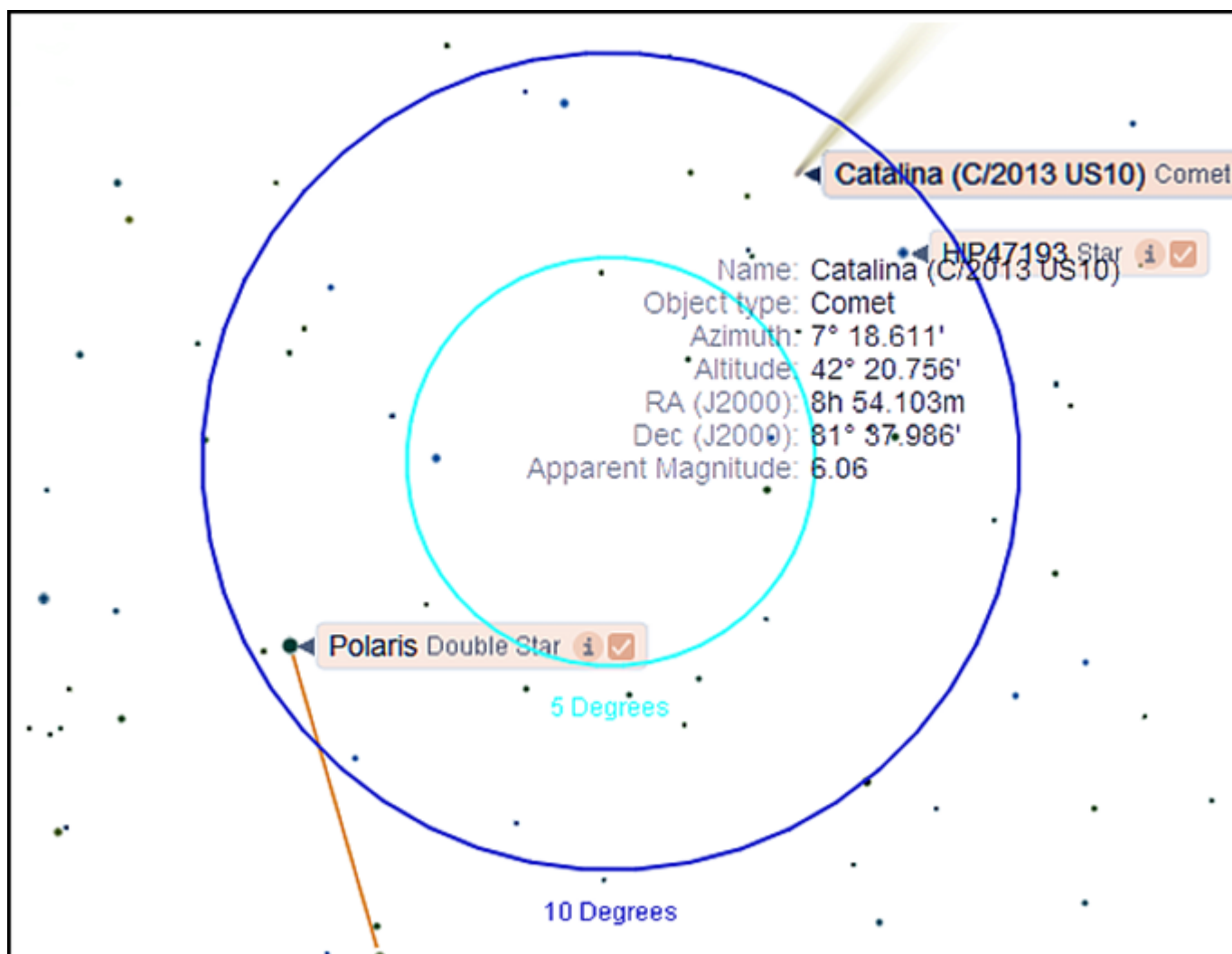
Following that was our premiere of the new planetarium show, "My House Has Stars", which is about ¾ completed. Dan Zielenski invited critique afterwards, so he can tweak the show when completed to make it just right.

Richard adjourned the meeting at 8:46 PM.

A FINDER CHART FOR COMET CATALINA

SUBMITTED BY JOHN LAND

Below is a finder chart that John Land emailed to me. I thought I would use it in the newsletter, as many of us will be wanting to look for it in the upcoming weeks.



Also, there is a very good article with more finder charts from Sky and Telescope!

<http://www.skyandtelescope.com/observing/comet-catalina-sails-into-northern-skies111120151111/>

NASA Space Place Astronomy Club Article

March 2016

This article is provided by NASA Space Place.

With articles, activities, crafts, games, and lesson plans, NASA Space Place encourages everyone to get excited about science and technology.

Visit spaceplace.nasa.gov to explore space and Earth science!



Gravitational Wave Astronomy Will Be The Next Great Scientific Frontier

By Ethan Siegel

Imagine a world very different from our own: permanently shrouded in clouds, where the sky was never seen. Never had anyone see the Sun, the Moon, the stars or planets, until one night, a single bright object shone through. Imagine that you saw not only a bright point of light against a dark backdrop of sky, but that you could see a banded structure, a ringed system around it and perhaps even a bright satellite: a moon. That's the magnitude of what LIGO (the Laser Interferometer Gravitational-wave Observatory) saw, when it directly detected gravitational waves for the first time.

An unavoidable prediction of Einstein's General Relativity, gravitational waves emerge whenever a mass gets accelerated. For most systems -- like Earth orbiting the Sun -- the waves are so weak that it would take many times the age of the Universe to notice. But when very massive objects orbit at very short distances, the orbits decay noticeably and rapidly, producing potentially observable gravitational waves. Systems such as the binary pulsar PSR B1913+16 [the subtlety here is that binary pulsars may contain a single neutron star, so it's best to be specific], where two neutron stars orbit one another at very short distances, had previously shown this phenomenon of orbital decay, but gravitational waves had never been directly detected until now.

When a gravitational wave passes through an objects, it simultaneously stretches and compresses space along mutually perpendicular directions: first horizontally, then vertically, in an oscillating fashion. The LIGO detectors work by splitting a laser beam into perpendicular "arms," letting the beams reflect back and forth in each arm hundreds of times (for an effective path lengths of hundreds of km), and then recombining them at a photodetector. The interference pattern seen there will shift, predictably, if gravitational waves pass through and change the effective path lengths of the arms. Over a span of 20 milliseconds on September 14, 2015, both LIGO detectors (in Louisiana and Washington) saw identical stretching-and-compressing patterns. From that tiny amount of data, scientists were able to conclude that two black holes, of 36 and 29 solar masses apiece, merged together, emitting 5% of their total mass into gravitational wave energy, via Einstein's $E = mc^2$.

During that event, more energy was emitted in gravitational waves than by all the stars in the observable Universe combined. The entire Earth was compressed by less than the width of a proton during this event, yet thanks to LIGO's incredible precision, we were able to detect it. At least a handful of these events are expected every year. In the future, different observatories, such as NANOGrav (which uses radiotelescopes to the delay caused by gravitational waves on pulsar radiation) and the space mission LISA will detect gravitational waves from supermassive black holes and many other sources. We've just seen our first event using a new type of astronomy, and can now test black holes and gravity like never before.

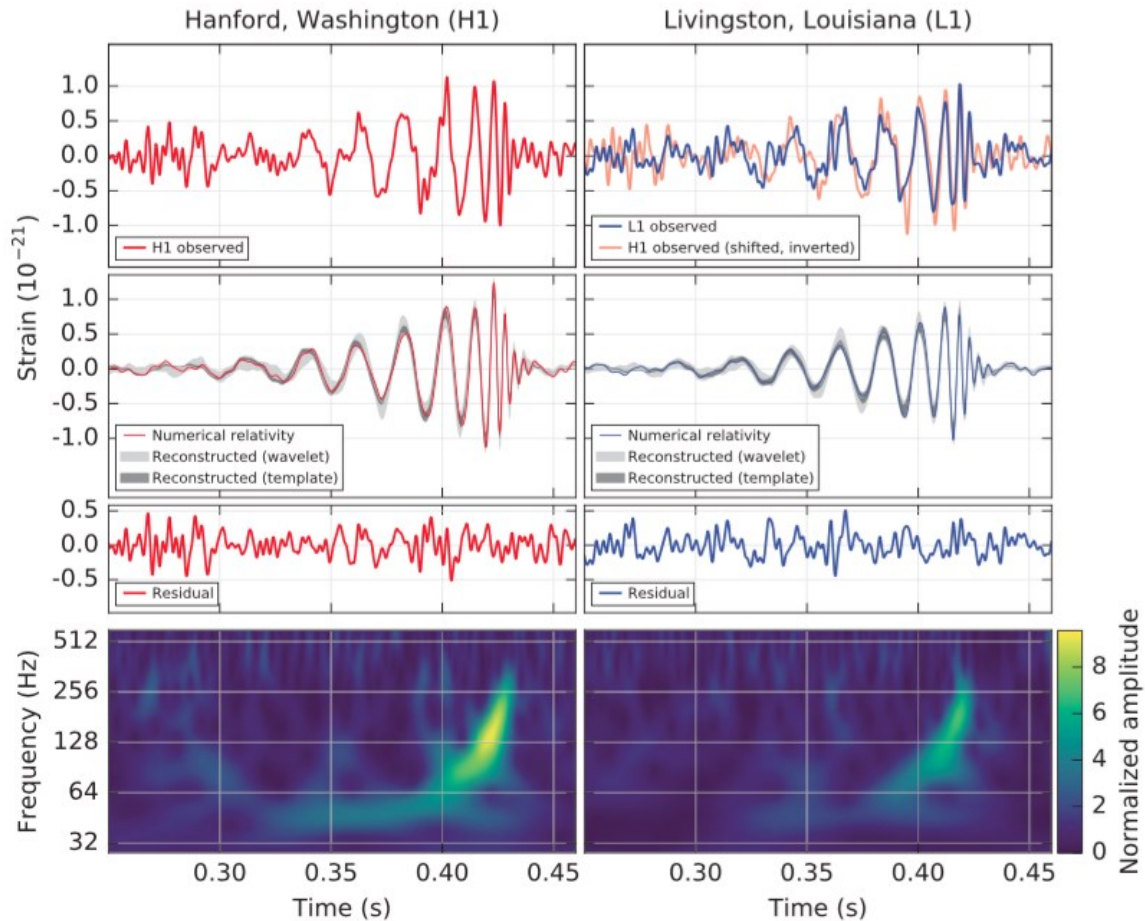


Image credit: Observation of Gravitational Waves from a Binary Black Hole Merger B. P. Abbott et al., (LIGO Scientific Collaboration and Virgo Collaboration), Physical Review Letters 116, 061102 (2016). This figure shows the data (top panels) at the Washington and Louisiana LIGO stations, the predicted signal from Einstein's theory (middle panels), and the inferred signals (bottom panels). The signals matched perfectly in both detectors.



National Aeronautics and
Space Administration



NASA Space Place

Educator Newsletter

March-April 2016/Vol. 9, Issue 2

NEWS AND NOTES FOR FORMAL AND INFORMAL EDUCATORS

Space Place is a NASA website for elementary school-aged kids, their teachers, and their parents.

It's colorful!
It's dynamic!
It's fun!
It's rich with science, technology, engineering, and math content!
It's informal.
It's meaty.
It's easy to read and understand.
It's also in Spanish.
And it's free!

It has over 150 separate modules for kids, including hands-on projects, interactive games, animated cartoons, and amazing facts about space and Earth science and technology.

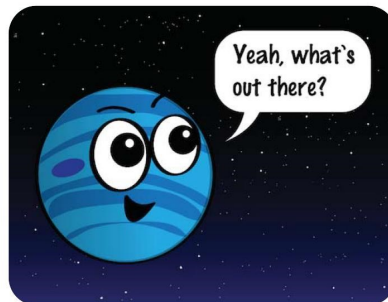
NASA Space Place has a new look! We've now made our content more accessible – check it out here: www.spaceplace.nasa.gov. To keep up with all the latest, follow us on Facebook and Twitter @nasaspaceplace. If you'd like to be added to our e-newsletter, email us at info@spaceplace.nasa.gov.

New!

What is the Kuiper Belt?

Explore what else is out there past Neptune! The Kuiper Belt, a ring of icy bodies where you'll find dwarf planet Pluto and other interesting objects like Eris and Haumea, is still a mysterious place. The New Horizons spacecraft will continue to explore this belt in the near future!

<http://spaceplace.nasa.gov/kuiper-belt/>



New!

Stretchy Universe Slime

Our universe has been stretching out in all directions ever since it began about 13.8 billion years ago, which can be seen through telescopes! In fact, the

farthest galaxies are actually moving faster than those near us. Make your own stretchy universe slime and hold the universe in the palm of your hand!
<http://spaceplace.nasa.gov/universe-slime/>



Out-of-School Time

Are you stuck inside because of bad weather, or are you simply staying home for



the weekend? Why not try some of our make-and-do activities! Here is one of our favorites: Earth Fan - Did you know that there is a lot going on beneath the surface of Earth? We pretty much spend all our time on Earth's crust, but if you dig deeper you'll find the mantle, the outer core and the inner core. Learn more about Earth's layers by making an Earth fan!

<http://spaceplace.nasa.gov/earth-fan/>

Explore Earth and space at spaceplace.nasa.gov



Science Fair Project Ideas

It's that time of year again! Are your students looking for project ideas? Do they know the necessary steps to follow? Here are a few suggestions for where to start!

<http://spaceplace.nasa.gov/science-fair/>

Educational Posters

NASA Space Place has downloadable posters featuring brief summaries and graphics of popular space topics. Click on the "download the poster" link on each page!

Where does the solar system end?

<http://spaceplace.nasa.gov/oort-cloud/>

What is a black hole?

<http://spaceplace.nasa.gov/black-holes/>

How did the solar system form?

<http://spaceplace.nasa.gov/solar-system-formation/>

Where does the sun's energy come from?

<http://spaceplace.nasa.gov/sun-heat/>

Tectonic Forces

<http://spaceplace.nasa.gov/tectonics-snap/>

GPS and the Quest for Pizza

<http://spaceplace.nasa.gov/gps-pizza/>

Special Days

Noteworthy days in NASA and space history you can observe in your classroom.

March 5 – In 1979, the Voyager 1 spacecraft flew past Jupiter.

Learn more fun facts about Jupiter, like how this gas giant has rings that are very hard to see.
<http://spaceplace.nasa.gov/all-about-jupiter/>

March 13 – Uranus was discovered this day in 1781.

Did you know that Uranus rotates on its side?
<http://spaceplace.nasa.gov/all-about-uranus/>

March 18 – In 1965, the first walk in space took place!

Hopefully there was no bad weather up there. Protect Earth's satellites from harmful space weather in our Shields Up game.
<http://spaceplace.nasa.gov/shields-up/>

April 9 – In 1959, the first group of astronauts was announced.

Check out our gallery of astronauts.
<http://spaceplace.nasa.gov/gallery-technology/>

April 11 – Apollo 13, the third mission intended to land on the moon, was launched on this day in 1970.

Why is the Moon so scarred with craters anyway?
<http://spaceplace.nasa.gov/craters/>

April 22 – Happy Earth Day!

Earth has many different layers in its atmosphere. Explore them all!
<http://spaceplace.nasa.gov/atmosphere/>



WHERE WE MEET

JENKS HS PLANETARIUM



**Our Club General meetings are held at the
Jenks Public Schools Planetarium
105 East B St, Jenks, OK**

When you enter the building lobby, take the elevator to the 3rd floor.

Meetings begin at 7:00 PM

Printable Detailed map available at http://astrotulsa.com/cms_files/

We hope to see you there!

MEMBERSHIP INFORMATION

ASTRONOMY CLUB OF TULSA OFFICERS:

PRESIDENT RICHARD BRADY

astrotulsa.pres@gmail.com

VICE PRESIDENT TAMARA GREEN

astrotulsa.vp@gmail.com

SECRETARY TERESA DAVIS

astrotulsa.sec@gmail.com

TREASURER TIM DAVIS

astrotulsa.tres@gmail.com

BOARD MEMBERS-AT-LARGE:

JOHN LAND

CHRISTOPHER PROCTOR

JAMES TAGGART

SKIP WHITEHURST

JAMES LILEY

STAFF:

NEWSLETTER EDITOR TAMARA GREEN

astrotulsa.vp@gmail.com

WEBMASTER JENNIFER JONES

jjones@seedtechnologies.com

MEMBERSHIP CHAIRMAN JOHN LAND

astroclubbiz@windstream.net

OBSERVING CHAIRS OWEN AND TAMARA GREEN

darthnewo@yahoo.com, astrotulsa.vp@gmail.com

SIDEWALK ASTRONOMY OWEN GREEN

darthnewo@yahoo.com

PR AND OUTREACH OWEN GREEN

darthnewo@yahoo.com

GROUP DIRECTOR TERESA DAVIS

astrotulsa.sec@gmail.com

NIGHT SKY NETWORK RICHARD BRADY

astrotulsa.pres@gmail.com

FACILITIES MANAGER JAMES TAGGART

astrotulsa.obs@gmail.com

MEMBERSHIP RATES FOR 2016 WILL BE AS FOLLOWS:

ADULTS - \$45 PER YEAR. INCLUDES ASTRONOMICAL LEAGUE MEMBERSHIP.

SENIOR ADULTS - \$35 PER YEAR. **FOR THOSE AGED 65 AND OLDER.** INCLUDES ASTRONOMICAL LEAGUE MEMBERSHIP.

STUDENTS - \$30 PER YEAR. INCLUDES ASTRONOMICAL LEAGUE MEMBERSHIP.

STUDENTS - \$25 PER YEAR. **DOES NOT INCLUDE ASTRONOMICAL LEAGUE MEMBERSHIP.**

THE REGULAR MEMBERSHIP ALLOWS ALL MEMBERS OF THE FAMILY TO PARTICIPATE IN CLUB EVENTS, BUT ONLY ONE VOTING MEMBERSHIP AND ONE ASTRONOMICAL LEAGUE MEMBERSHIP PER FAMILY.

ADDITIONAL FAMILY MEMBERSHIP - \$15 WITH ASTRONOMY CLUB OF TULSA VOTING RIGHTS, \$20 WITH CLUB VOTING RIGHTS AND ASTRONOMICAL LEAGUE MEMBERSHIP.

THOSE WISHING TO EARN ASTRONOMICAL LEAGUE OBSERVING CERTIFICATES NEED TO HAVE A LEAGUE MEMBERSHIP.

MAGAZINE SUBSCRIPTIONS:

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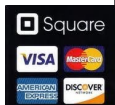
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AREA. TODAY OUR MISSION REMAINS
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TERESA DAVIS

JOHN LAND

TAMARA GREEN




Photo: Winter stars in the Southern Sky, taken at the Astronomy Club of
Tulsa Observatory, Jan 30, 2016. **Photo by Tamara Green.**




PHOTO: The Great Square of Pegasus setting. Taken at the Astronomy
Club of Tulsa Observatory Jan 30, 2016. **Photo by Tamara Green.**