



Cache Valley Clear Skies

The Journal of the Cache Valley Astronomical Society



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Vol. 5 Number 5

January 2018

www.cvas-utahskies.org

Meeting Announcement

Our December meeting will be held on the **fourth Wednesday in January, January 24, 2017 at 7pm in room 840 of the main BATC campus.** We didn't really hear any strong sentiment concerning changing the meeting night or time, so the meetings will remain on the fourth Wednesday going forward. We have room 840 for the rest of this year. Enter on the east side of the building located at 1301 North 600 West.

This is our **annual "Show and Tell" meeting.** Bring one to several of your favorite recent astronomy related acquisitions.

The President's Corner

By Dell Vance, CVAS President

Another New Year is upon us. It is great to be in this beautiful valley, cold, but great. It is also getting a bit too cold to spend much time outside with my telescope. Last night I decided to set up my telescope in our "star room" (my wife calls it a sun room and I call it a star room), to take some photos of the Super Moon as it comes up in the East. I have found if you can get something in the East that is basically straight through the glass of the window you can get some pretty good pictures with only a minor amount of distortion. In any case, I got about



30 pictures and most of them worked out well. Here is one of them.



Super Moon – 2 Jan 2018 – Newton, UT – Courtesy Dell Vance

My grandson asked what I knew about the Super Moon back in December and I told him that there would be three in a row. At that time, I took a quick picture of the one back in December with just my camera and a standard lens. It was great to get the background into the picture, but the moon was difficult to get a good picture.



Supper Moon - Newton Utah
12/4/2017 6:24 AM MST
Canon T3i camera
ISO 3200
Exposure time 2 secs.
Focal Length 27 mm
f-Stop f/8
With tripod

Super Moon - 4 Dec 2017 - Newton, UT - Courtesy Dell Vance

That is why I used the telescope for the January Super Moon. Just think the next Super Moon is at the end of this month on the morning of January 31st. That will be a “Blue Moon” because there are two in the same month and it will be a “Blood Moon” because it will be a total lunar eclipse. What a great month we are having already.

Last month we had a great presentation on the Star of Bethlehem. Dale Hooper provided us with a video of what the star event could have been. It was interesting to look back in time to see what the conditions were that could explain what they saw. With modern technology we can use computer programs like Stellarium to see what the heavens looked like in the past or the future. It is a great program and it is free for computer use at stellarium.org.

This month our meeting will be our annual Show and Tell. It is where each of us can bring a tool or device that we have tried out over the last year and tell how well it worked for us. It can be something big or small. It may even be a book or gadget that you have found. It is always inspirational to see what some of us are doing and to get ideas of things we may want to try. If you have something that you

would like to show to the group, let a member of the Executive Committee know by January 17th, and we will put you on the list. Once we know how many people have things to present we will set up the time allotment for each presenter. Don’t be bashful, we will make time for everyone that is interested to show what they have. The meeting will be on January 24th at 7:00 PM at the BATC Room 840. We hope to see you there with your friends and family.

Thanks again for your support.

Clear Skies!

Total Lunar Eclipse

By Dale Hooper

For the first time in two years, (if the skies are clear enough) we will be treated to a total lunar eclipse on the morning of January 31st.

Here are the relevant events and times (all times in MST) for our area:

Time	Event
3:51 am	Penumbra eclipse begins. You won't be able to notice any change at this point.
4:48 am	Partial Eclipse Begins. The Earth's umbral shadow begins to take a "bite" out of the moon. The color of the moon will begin to change.
5:51 am	Totality begins. Try to notice the color of the moon, it is different at each total lunar eclipse.
6:29 am	Maximum Eclipse. The Moon is closest to the center of the shadow and will be it's darkest.
7:07 am	Total Eclipse Ends. Since the Moon will be close to the horizon, if you are close to the western mountains, you will get a better view if you locate further east.
7:41 am	Moonset. The Moon sets during the partial phase for our location.

Stargazing Events for January 2018

By Tom Westre

Date(s)	Event
Jan 1	Mercury visible in eastern morning sky. The full Wolf Moon in Gemini
Jan 3-4	Quadrantid Meteor Shower Peaks. Run Dec 30th to Jan 12th. Named for a now defunct constellation near the north celestial pole called the Quadrant
Jan 5	Waning Gibbous moon near Regulus, seen in a telescope at low power
Jan 6	Mars's eastward motion takes it comes to distant Jupiter in the early Saturday pre-dawn sky. Jupiter, its moons and Mars should be visible in a low power telescope.
Jan 8	Last Quarter moon
Jan 11	Moon meets Mars and Jupiter in the Thursday predawn sky. The waning crescent moon is about 4 degrees to the upper left of Mars and Jupiter. The two planets are about 2 degrees apart. All three objects are seen in a pair of binoculars.
Jan 13	Mercury passes Saturn in the Saturday predawn sky. Mercury is about 3/4 degrees below and right of Saturn
Jan 15	Mercury and Saturn meet the thin crescent waning moon on Monday morning pre dawn sky while Saturn is about three degrees to the upper right of Mercury. All three objects can be seen in binoculars.
Jan 16	New Moon
Jan 19	Transit shadow of Jupiter by Europa at 3am Friday morning as it rises in the east.
Jan 24	First Quarter Moon
Jan 26-27	The Moon crosses Taurus the Bull's face.
Jan 31	Ceres at opposition at its brightest magnitude 6.85 and closest to the Earth for the year. Located in the Northern boundary of Cancer
Jan 31	Full Supermoon also a Blue Moon and Total Lunar Eclipse. The entire event will be seen in northwestern North

America and across the Pacific Ocean. Most of the eclipse will be seen in North America before the moon sets. A blue moon is the second full moon in one month.

CVAS Loaner Telescope

CVAS provides a 10 inch Dobsonian telescope to club members. Contact Garrett Smith to make arrangements to use this telescope. Garrett can be contacted by email at GarrettGillSmith@gmail.com.



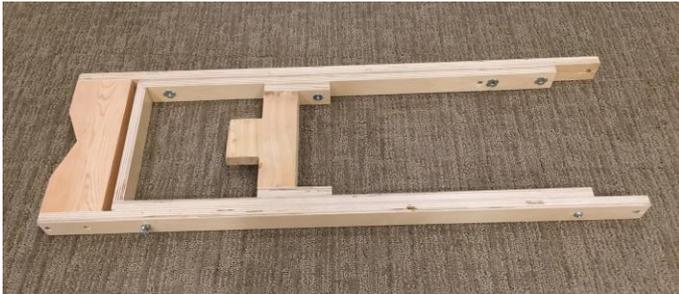
Binocular Supports

The club now has available a number of mostly completed binocular supports. These supports are being sold to club members at cost. These supports just need the binocular attachment – which is tailored to the type of binocular being mounted.

Please contact Ned Miller or Dell Vance if you are interested in purchasing a binocular support. The images below show what they look like with binoculars attached as well as an image showing them folded for storage.



**Completed Binocular Support (with binos attached) -
Courtesy Ned Miller**



**Binocular support (folded for storage) - Courtesy Ned
Miller**

CVAS Astronomy Library List

By Tom Westre

The following books are available to dues paying members of CVAS. To borrow a book from the list contact Tom Westre at 435-787-6380 or email him at: twestre45@aol.com If you contact Tom before the monthly meeting Tom will bring the book to the meeting for you to pick up for one month. It should be returned the following month. If you need it longer and there are no requests for the book contact Tom.

Asimov, Isaac. Eyes on the Universe: A history of the telescope.

Bok, Bart L. The Milky Way.

Calder, Nigel. Einsteins universe: the laypersons guide.

Carlowicz, Michael. Storms from the Sun: The emerging Science of Space Weather.

Chaisson, Eric. Astronomy Today. Prentice Hall, 1997

Carroll, Sean. From Eternity to here: the quest for the ultimate theory of time.

Corliss, William. The moon and planets: A catalog of astronomical anomalies.

Cornell, James. The First Stargazers: An introduction to the Origins of Astronomy.

Eagle, Dave. From casual stargazer to amateur astronomer: how to advance to the next level. Lots of information to help develop your skills.

Enright, Leo. The beginner's observing guide: an introduction to the night sky for the novice stargazer. For those with no or limited background with the stars and constellations.

Fix, John. Astronomy: journey to the Cosmic Frontier. McGraw Hill, 2008 5th Ed.

Greene, Brian. The Elegant universe: superstrings, hidden dimensions, and the quest for the ultimate theory . Vintage, 1999

Finlay, W.H. Concise catalog of deep sky objects: concise information for 500 galaxies, clusters, and Nebulae.

Frazier, Kendrick. Our Turbulent Sun

Greene, Brian. The fabric of the cosmos: Space, time, and the texture of reality

Hadingham, Evan. Early man and the Cosmos. (ancient astronomy, Stonehenge, death and the sun in ancient Britian, the Moon and the megaliths, Riddle of the Fairy Stone, Moon calendars of the American Indian, Sun Priests of the Southwest, Myan astronomy, Astronomy and ancient Peru, Hovenweap)

Halpern, Paul. Edge of the universe: the voyage to the cosmic horizon and beyond.

Hamburg, Michael. Astronomy made simple. Doubleday, 1995

Harrington, Philip. Starware: the amateur astronomer's ultimate guide to choosing, buying, and using telescopes and accessories.

Harriston, Edward R. Cosmology: the science of the universe.

Kaku, Michio. Beyond Einstein: the cosmic quest for the theory of the universe.

Kaku, Michio. Hyperspace: a scientific odyssey through parallel universes, time warps, and the 10th dimension.

Kaler, James. *The Ever-changing Sky: a guide to the celestial sphere.* Cambridge, 1996.

Kaufmann, William. *Black Holes and warped spacetime.*
King, Henry C. *The History of the Telescope.*

Krupp, E.C. *In Search of Ancient Astronomers: Stonehenge, to Von Daniken, Archeoastronomy discovers our sophisticated ancestors.*

Luginbuhl, Christian. *Observing handbook and catalog of deep-sky objects. 1,500 objects by constellation most often observed by amateurs.*

Maffei, Paolo. *Beyond the Moon. (solar system, nearby stars, variable stars, birthplace of stars, star clusters, the galaxy, Beyond the galaxy, among the galaxies, the limits of time and space.*

Moring, Gary F. *The complete idiots guide to the theories of the universe.* Pearson, 2002

Moche, Dinah L. *Astronomy: A Self-teaching guide.*

North, Gerald. *Astronomy Explained.*

Owens, Steve. *Stargazing for dummies.* This book contains all you need to learn constellations, find planets, hunt down galaxies with binoculars and telescopes.

Pasachoff, Jay. *Astronomy: From the Earth to the Universe.*

Raymo, Chet. *The soul of the night: an astronomical pilgrimage.*

Rees, Martin. *Before the beginning” our universe and others.*

Rees, Martin. *Just six numbers: the deep forces that shape the universe.*

Rukl, Antonin. *Atlas of the Moon.* Kalmbach, 1990.

Sagan, Carl. *Comet.*

Schaaf, Fred. *The Starry room: Naked eye astronomy in the intimate universe.*

Trefil, James S. *Space, Time, Infinity: The Smithsonian Views the Universe.*

The Universe. (essays about our galaxy, stars, supernovae, pulsars, black holes, galaxies and clusters quasars, intergalactic matter, cosmology, other planets.

Webb Society. *Web Society Deep Sky Observers Handbook.* 4 volumes.

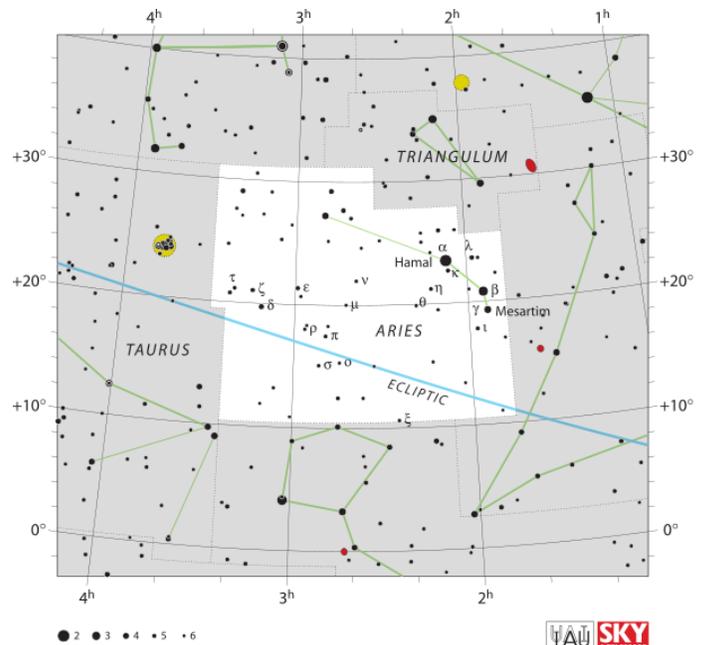
Zubrin, Robert. *The Case for Mars; the plan to settle the red planet and why we must*

Spotlight on Aries, the Ram

By Dale Hooper

Admittedly, Aries is a rather diminutive constellation both in its size and the number of bright stars. It contains two stars brighter than third magnitude (magnitude 2.0 Hamal and magnitude 2.66 β Arietis). But it does have a few nice double stars and several reasonably bright galaxies. Its main claim to fame is that it is a zodiacal constellation.

Objects which rank at least three stars in *The Night Sky Observer's Guide* (Aries is in Volume 1) have been included. As usual, the table is organized according to increasing Right Ascension values.



IAU and Sky & Tel - Roger Sinnott & Rick Fienberg

Object	R.A.	Dec.
NGC 680 (Galaxy)	01h49.8m	+21°58'
Σ 174 (Double star)	01h50.1m	+22°17'
NGC 691 (Galaxy)	01h50.7m	+21°46'

NGC 697 (Galaxy)	01h51.3m	+22°21'
Mesartim (Double star)	01h53.5m	+19°18'
λ Arietis (Double star)	01h57.9m	+23°36'
NGC 772 (Galaxy)	01h59.3m	+19°01'
NGC 821 (Galaxy)	02h08.4m	+11°00'
NGC 877 (Galaxy)	02h18.0m	+14°33'
NGC 972 (Galaxy)	02h34.2m	+29°19'
30 Arietis (Double star)	02h37.0m	+24°39'
33 Arietis (Double star)	02h40.7m	+27°04'
Σ 326 (Double star)	02h55.6m	+26°52'
ε Arietis (Double star)	02h59.2m	+21°20'
NGC 1156 (Galaxy)	02h59.7m	+25°14'

CVAS Minutes – December 2017

The December CVAS meeting was held on December 13 at BATC. Our main presentation was what has become an annual event. This year we watched a video presentation of The Star of Bethlehem, featuring Rick Larson. Mr. Larson used planetarium software accompanied by Biblical references along with additional research. He infers that King Herod died in 1 BC which would allow for the possibility of the star being a series of planetary conjunctions around 2 and 3 BC.

Tom Westre also spoke about some other interesting conjunctions which should be considered. He also mentioned that people could download Stellarium for free to investigate the events.

Upcoming Star Parties

There are currently no CVAS star parties planned for January 2018.

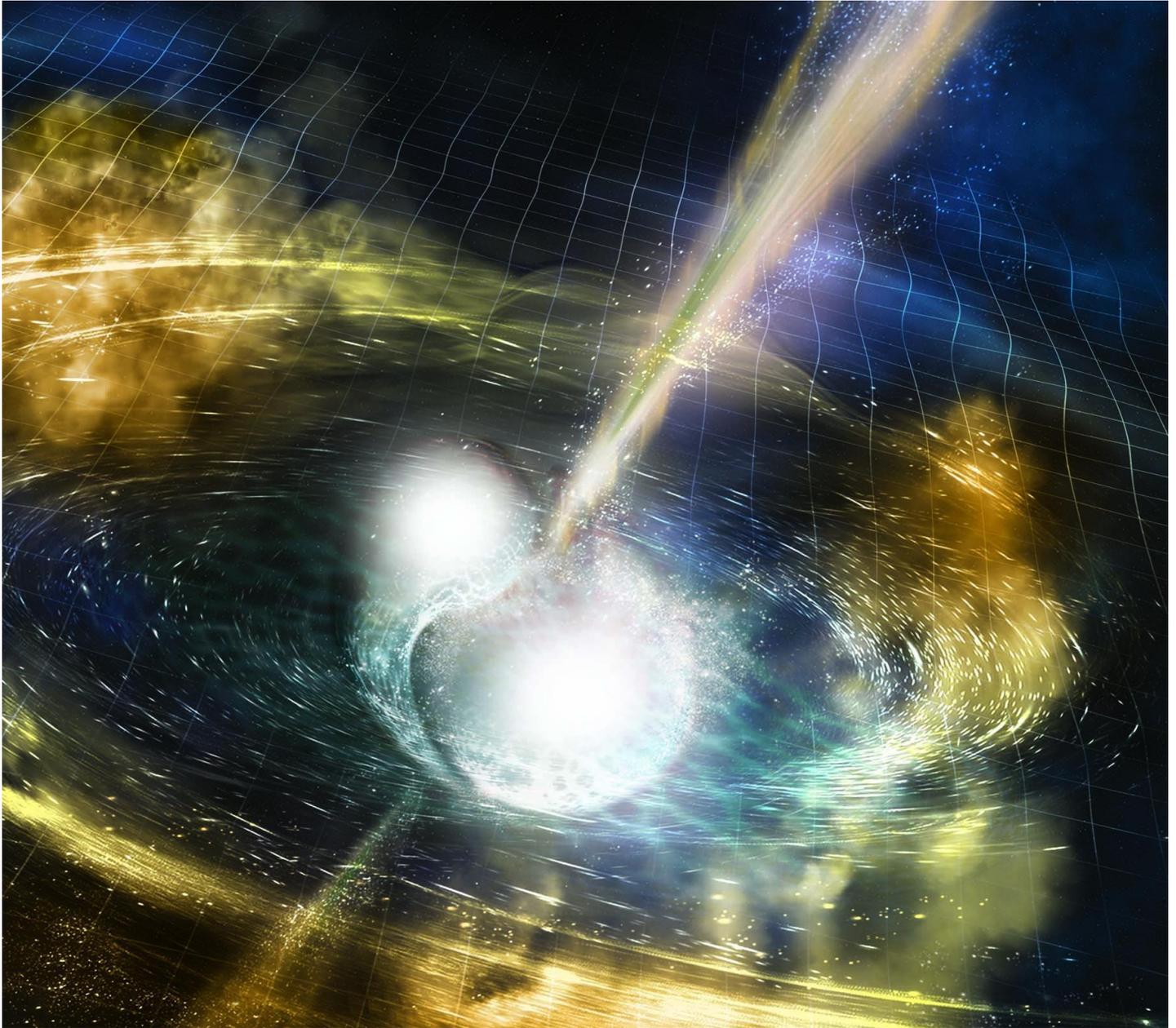
Upcoming Events

- 01 Jan New Year's Day
Full Moon
Mercury at greatest western elongation (23°)
Giuseppe Piazzi discovers asteroid Ceres (1801)
- 02 Jan Luna 1 first spacecraft to leave Earth's gravity (1959)
- 03 Jan Earth at Perihelion
Spirit rover lands on Mars (2004)

- Quadrantid meteors
- 04 Jan Quadrantid meteors
- 05 Jan Regulus 0.9° south of Moon
- 06 Jan Mars 0.2° south of Jupiter
- 07 Jan Galileo discovers Jupiter's moons Io, Europa, and Callisto (1610)
- 08 Jan Last Quarter Moon
- 10 Jan U.S. Army Corps bounces first radar signal off of the Moon (1946)
- 11 Jan Jupiter 4° south of Moon
Mars 5° south of Moon
Vesta 0.4° north of Moon
William Herschel discovers Uranus's moons Titania and Oberon (1787)
- 13 Jan Mercury 0.6° south of Saturn
Galileo discovers Jupiter's moon Ganymede (1610)
- 14 Jan Saturn 3° south of Moon
Huygens lands on Saturn's moon Titan (2005)
- 15 Jan Martin Luther King Day
Mercury 3° south of Moon
- 16 Jan New Moon
- 20 Jan Neptune 1.6° north of Moon
- 23 Jan Uranus 5° north of Moon
- 24 Jan **CVAS Monthly Meeting, 7pm
BATC room 840**
- 25 Jan Opportunity rover lands on Mars (2004)
- 27 Jan Aldebaran 0.7° south of Moon
Launch pad fire kills Apollo 1 crew (1967)
- 28 Jan Johannes Hevelius born (1611)
Space shuttle Challenger explodes 73 seconds into flight, killing the crew (1986)
- 31 Jan Full Moon
Total Lunar Eclipse (see details on page 2 of this newsletter)
First American orbiting spacecraft, Explorer 1, launched (1958)
- 01 Feb Regulus 1° south of Moon
Space shuttle Columbia disintegrates on re-entry (2003)
- 02 Feb Groundhog Day
- 03 Feb Luna 9, first craft to soft-land on Moon (1966)
- 04 Feb Clyde Tombaugh born (1906)
- 07 Feb Last Quarter Moon
Jupiter 4° south of Moon
Bruce McCandless, first untethered space walk (1984)

Neutron star collision gives rise to 'multi-messenger' astronomy

16 October 2017



Scientists have confirmed that gold and platinum are formed in neutron star collisions. Image credit – NSF/LIGO/Sonoma State University/Aurore Simonnet

Astronomers have witnessed a collision between two neutron stars for the first time, thanks to a tie-in between gravitational wave observatories and 70 telescopes around the world.

The event, which allowed scientists to confirm that gold and platinum are formed in such collisions, marks a new approach to astronomy where different forms of observation are used to create a detailed picture of what's happening.

In this case the collision was observed through both gravitational waves and electromagnetic waves including light.

'With this detection is born what is called multi-messenger astronomy,' said Dr Michele Punturo, former detector coordinator of the VIRGO gravitational wave observatory and researcher at the National Institute for Nuclear Physics, both in Italy. 'It is the new nature of the detectors that are pushing for that.'

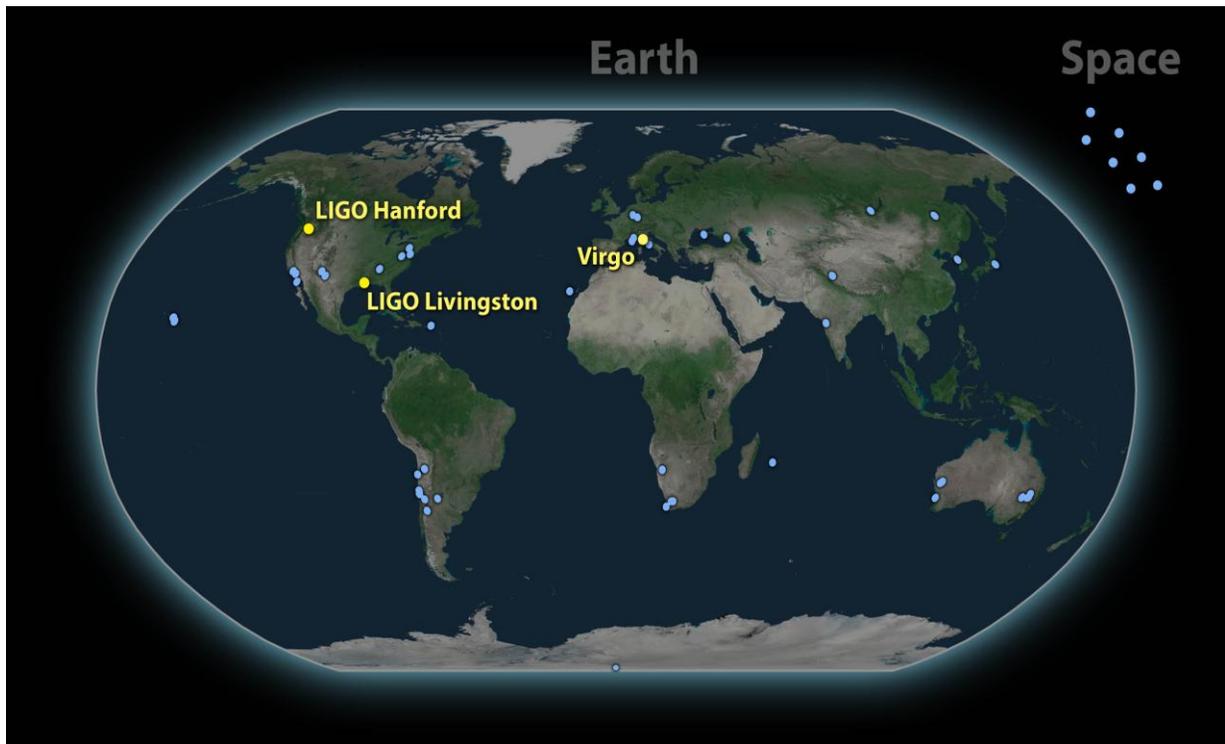
A neutron star is a small relic of a collapsed star, tens of kilometres across but with a mass equivalent of one to two suns. Because of its small size, the matter in a neutron star is extremely dense, packed so tightly that even one sugar-cube-sized chunk of it would weigh a billion tonnes, or as much as Mount Everest.

The collision, or coalescing, of two neutron stars, which took place 130 million years ago, was first detected by VIRGO and the US-based LIGO gravitational wave observatories.

On 17 August scientists detected a clear and unusual signal which was long lasting and indicated a mass far less than that of a black hole. They were able to triangulate the origin of the signal to a particular region of the southern sky.

At around the same time, NASA's space-based gamma ray observatory Fermi detected a strong gamma ray burst from the same region of the sky.

Subsequently, an array of 70 telescopes and detectors around the world, including NASA's Hubble telescope, pivoted towards the source of the signal to confirm the rare event. It was also verified by the Very Large Telescope at the European Southern Observatory, which has been partly funded by the EU to the tune of EUR 14 million.



Gravitational wave observatories (in yellow) and 70 telescopes and detectors (in blue) worked together to detect the neutron star collision.
Image credit – LIGO/VIRGO

Range of data

The telescopes collected a range of data as well as gravity waves and gamma rays, including visible light, X-rays, radio waves and other signals.

The results, which are [published today](#) in the journal *Physical Review Letters*, are co-signed by 11 researchers whose PhDs have been funded through the EU's GraWIToN project.

Dr Punturo, who coordinates GraWIToN, a [Marie Skłodowska-Curie project](#), said that gravitational wave detection has opened up new opportunities for observatories. 'For the first time we are listening (to the universe),' he said.

'I think all the scientists working with telescopes understood ... the importance of the novelty introduced by gravitational waves and this paid off for everybody because now we have 70 telescopes that participated in one of the largest discoveries of the past years.'

“

This is a wonderful achievement. But it's really the beginning of something new.

Dr Michele Punturo, VIRGO gravitational wave observatory, Italy

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While astronomers believe it may take years to sift through the treasure trove of cosmic data obtained during the event, a number of key discoveries have already emerged.

Gold and platinum

For one thing, in the fiery aftermath of the collision between these two ultra-dense neutron stars, astronomers observed the signatures of gold and platinum being formed.

Cosmological theory suggests that the only event with enough energy to create many elements heavier than iron is a neutron star collision. That theory has now been confirmed by observation.

The event is the latest stunning success for the 21st-century's newest form of astronomy, gravitational wave detection. The existence of gravitational waves, which have been described as ripples in space-time, was first confirmed in 2015, and the discovery led to this year's Nobel Prize in Physics being awarded to three key contributors to the LIGO-VIRGO collaboration.

Gravitational wave detectors feature long tunnels arranged in an L-shape with ultra-sensitive detection and measuring equipment which can pick up the almost imperceptible signs of a gravity wave.



The VIRGO observatory in Italy has ultra-sensitive detection and measuring equipment to spot gravitational waves. Image credit – 'VirgoDetectorAerialView' by The Virgo collaboration is in the public domain

The existence of gravitational waves as predicted by Einstein's theory of relativity was confirmed by observing a collision between two black holes.

The neutron star collision, dubbed GW170817, was the first observation of a gravitational wave jointly obtained with VIRGO following recent upgrades to the observatories' equipment. An event of this magnitude is only expected to arise once in 80 000 years.

The next stage in the life cycle of the gravitational wave observatories is to upgrade the LIGO and VIRGO instrumentation to improve sensitivity yet again.

Dr Punturo is looking forward to the next phase already. 'This is a wonderful achievement,' he said. 'But it's really the beginning of something new.'

The GraWIToN researchers who co-signed the research paper are Matthieu Gosselin, Daniel Töyrä, Jose M. González Castro, Imran Khan, Shubhanshu Tiwari, Gang Wang, Serena Vinciguerra, Akshat Singhal, Zeno Tornasi, Omar De Varona and Marina Trad Nery.

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CACHE VALLEY ASTRONOMICAL SOCIETY MEMBERSHIP APPLICATION FORM

Member # _____

NAME: _____
 First Middle Initial Last

Address: _____
 Street City State Zip Code

Home Phone: _____ Cell Phone: _____

Work Phone : _____ Occupation : _____

Email Address: _____

How did you learn about CVAS?

_____ Website _____ Star Party _____ CVAS Member _____ Other _____

Membership: \$20 a year

Tell us about yourself: Do you have a special interest in astronomy? Do you have special skills? Are you willing to volunteer on CVAS projects or attend public outreach star parties? Astro equipment owned.

By signing this application, I acknowledge I have access to the CVAS website, cvas-utahskies.org, and the CVAS Constitution. I agree to abide by the constitution.

Signature: _____ Date: _____

Bring this form to the meeting or Mail Application to:

Brad Kropp, CVAS Treasurer
1573 E 1425 N
Logan, UT 84341

For any questions contact our Treasurer at brad.kropp@usu.edu or our Secretary Dale Hooper at dchooper5@gmail.com