New Zenith

The Monthly Newsletter of the Vectis Astronomical Society

Vol 28 Issue 6 — July 2020 *When Printed, this Newsletter costs VAS at least £1*

Society News

The Observatory is still Closed and All Monthly Meetings are Cancelled Until Further Notice

As I am sure everyone must know, we are still unable to hold meetings during the current Covid-19 virus pandemic.

The VAS Observatory is closed and all meetings are currently cancelled.

COVID News

Well, it seems that the very worst of the COVID-19 is over and the Government is slowly easing the restrictions which have affected our lives for the last few months.

There is no easing of meetings in confined spaces just yet so, no immediate return to normal for VAS. Sorry, but we really can't open up properly until there a definite "*all clear*" signal is sounded.

All the signs seem to point to July 4 as being a major milestone so, we'll just have to wait (again!) to see/hear what is decided.

An announcement will be made via email and on our website when things return to normal.

AGM Postponed

We would normally hold our AGM in August but, as there is no clearance for such public meetings, we have to postpone for at least a month - so the AGM is now tentatively booked for September 25th.

Astronomy Video Review

Please see page 7 and a request for you to review an astronomy video. It's completely free and your comments will help member Paul England and the Island Planetarium.

Stay safe and well.

Brian Curd
Observatory Director and NZ Editor

VAS Website: wightastronomy.org

Submissions or letters to New Zenith are always welcome and should be sent to:

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Tel: 07594 339950 or email: **editor@wightastronomy.org**

Material for the next issue by the 6th of the month please.

Registered Charity No 1046091

Observatory Diary

The diary is currently empty!

VAS Website: wightastronomy.org

Contents this Month

2020 Monthly Meetings

Check *http://www.wightastronomy.org/meetings/* for the latest information

All Monthly Meetings are Cancelled Until Further Notice

Sorry for the rather blunt (but nonetheless obvious) headline!

As I am sure everyone must know, we are unable to hold meetings during the current Covid-19 virus pandemic.

All meetings are currently cancelled and the VAS Observatory is closed. The government will let us know when the situation changes and, of course, we will contact members both here and via the website and social media when that situation changes.

I hope we can resume normal activities quite soon but we find ourselves affected by a very serious situation.

Stay safe and well and let's hope we're back to normal soon.

Observatory Visits Booked

All Observatory Visits are Cancelled Until Further Notice

Please see the important information above this.

IMPORTANT

Could all VAS members please ensure they notify the Membership Secretary of any change of address.

To ensure our compliance with GDPR rules, we must maintain accurate membership records.

VAS Contacts 2020

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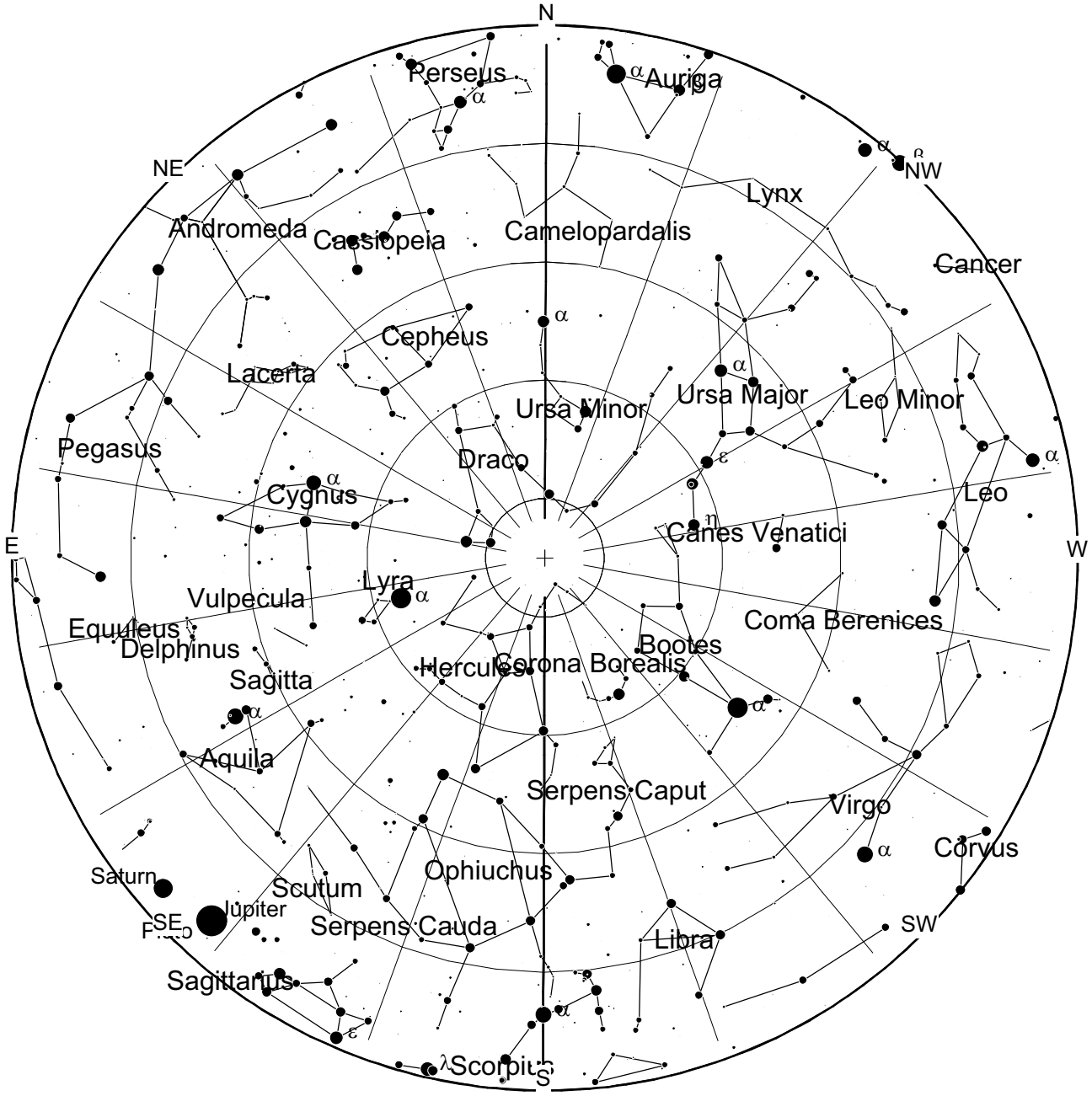
Important

Sorry, but the Observatory is still closed to all members and visitors until further notice

July 2020 Sky Map



View from Newchurch Isle of Wight UK - 2200hrs - 15 July 2020

Neptune is the eighth and farthest known planet from the Sun in the Solar System. In the Solar System, it is the fourth-largest planet by diameter, the third-most-massive planet, and the densest giant planet. Neptune is 17 times the mass of Earth, slightly more massive than its near-twin Uranus.

Neptune is denser and physically smaller than Uranus because its greater mass causes more gravitational compression of its atmosphere. Neptune orbits the Sun once every 164.8 years at an average distance of 30.1 AU (4.5 billion km; 2.8 billion mi). It is named after the Roman god of the sea and has the astronomical symbol Ψ, a stylised version of the god Neptune's trident.

July 2020 Night Sky

Moon Phases

New	First Qtr	Full	Last Qtr
			
20th	27th	5th	13th

Planets

Mercury

Mercury makes an appearance in the early morning sky during the last half of the month continuing into August. It is brightest during the first week of August when it shows a full phase, but it is then closer to the sun making the sky very much brighter.

Azimuth and Altitude for Mercury July & August at 05:15

July				August		
Date	Az	Alt		Date	Az	Alt
23rd	71	11		2nd	67	9
25th	70	11		4th	65	7
27th	69	11		6th	64	6
29th	68	10		8th	63	4
31st	67	10		10th	62	3

Venus

Low in the eastern sky from about 3am onward Venus can be seen as the Morning Star. It is bright enough to be seen if the sky is clear right up to and sometimes after sunrise.

Mars

Mars can be seen in the south east from after midnight. It is getting steadily brighter as the distance between Earth and the Red Planet decreases as we catch up on it in its orbit. Unlike the other outer planets, which if observed at the same time every night creep across towards the west, rising and setting about 3 hours earlier at the end of each month, Mars stays stubbornly fixed in its position just getting a little higher each night. This will change as we get to opposition when it will race across the sky.

Jupiter

Jupiter is very bright can be seen in the southern sky throughout the hours of darkness. It is best observed around one in the morning when it is due south and at its highest above the horizon. At this point in its orbit, at its highest, it is only about as high as the midwinter sun. Being this close to the horizon, the atmospheric turbulence will disturb any viewing opportunities.

Saturn

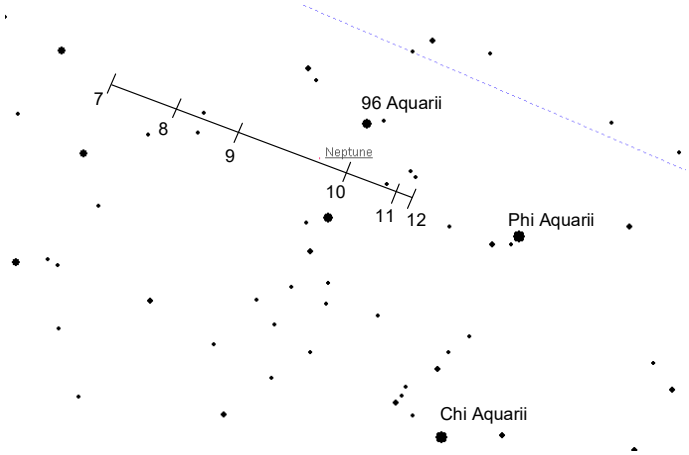
Much less bright than Jupiter, Saturn is in the same part of the sky following along behind the larger planet by a few degrees. As for Jupiter the best time for observation will be an hour or so after midnight.

Uranus

Uranus is visible for a short time in the early hours before the sky gets too bright. It is in Ares close to the border with Cetus. There are no guide stars nearby and planet will be quite low down during the viewing window which is only for about an hour. Uranus can, for this month, considered to be a challenging object.

Neptune

As it has been for the last few years Neptune is in the rather dim constellation of Aquarius. It can be found about 3 degrees east of the fourth magnitude star Phi Aquarii, the closest of the very few nearby stars brighter than magnitude 5. See the finder chart for the path of Neptune throughout the remainder of the year. The chart shows stars to magnitude 9 and the position of Neptune on the first of each month. During December Neptune retraces its steps taken during November.



Finder Chart For Neptune July to December 2020

Noctilucent Clouds

The noctilucent cloud season should be in full swing during July. Look generally towards the north during the twighlight hours and you may be lucky enough to see this phenomenon.

These are very tenuous clouds that form close to the edge of space and are seen shining against the darkening sky illuminated by the Sun that is well below the horizon. Early in the month they can be seen at almost any time of night and towards the end of the month until about 2 hours after sunset or from about 2 hours before sunrise.

Deep Sky

M17 The Omega Nebula
RA 18h 21m Dec -16° 11' mag 7

If it were not for the Orion Nebula this would be the great show piece of the sky. Binoculars show the curved shape of this giant glowing gas cloud and stellar nursery. Some times called The Swan nebula, the swan swimming upside down through the Milky Way becomes more obvious through a small telescope.

M71
RA 19 53 Dec +18° 46' mag 8.5

This small globular cluster can be found in the middle of arrow asterism of Sagitta. On a good night it can be seen in a pair of 10x50 binoculars as a small fuzzy smudge, a telescope is needed to resolve any stars. Through a telescope it looks a little like an triangular arrow head; fitting as it is in the constellation of the arrow.

M23
RA 17h 58m Dec -18° 59' mag 6.0

About the size of the full moon, this large open cluster can be easily seen in a pair of 10x50 binoculars against the Milky way background. It is relatively close at about 2100 light years away. A telescope resolves the stars into curving chains. One description likens it to three rows amphitheatre seating.

Peter Burgess

Science; it works whether you believe in it or not

A Spaceflight Engineer Recovers the Lost Software For Apollo 10's Lunar Module

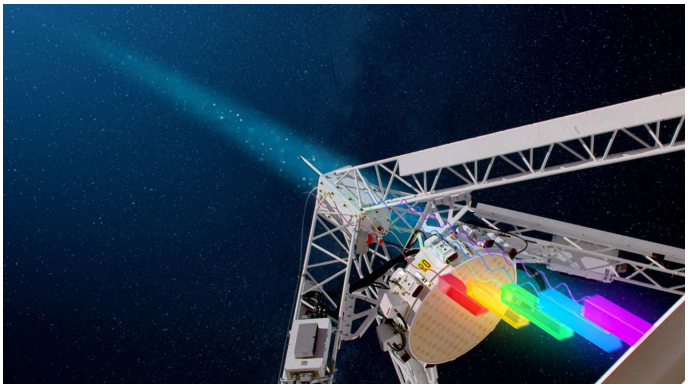
Vintage computing enthusiasts have recreated NASA's legendary "*Apollo Guidance Computer,*" the 1960s-era assembly-language onboard guidance and navigation computer for the Apollo missions to the moon. Unfortunately, the software had been lost for the Apollo 10 mission (a manned "dress rehearsal" mission which flew to the moon eight weeks before Neil Armstrong's famous moonwalk mission).

But spaceflight engineer Mike Stewart *found a clever way to recreate it*, according to one science show on YouTube. Stewart found a print-out of an earlier version of the program, and "with the help of a small army of volunteers, Mike hand-transcribed the source listing and all of its programs..." - all 1,735 pages of it. (Though what used to take 25 minutes to compile together on a Honeywell mainframe now takes less than a second on his modern laptop.) There were also NASA memos which described the change, later versions of the program which had implemented the changes - and most importantly, a recently-discovered NASA document giving the checksum for every version of every program run on the Apollo Guidance Computer. So Stewart was able to cut-and-paste carefully-chosen code and variables from later versions of the program - based on the clues in NASA's memos - until he'd recreated a program with the exact same checksum.

There's also *a separate video about the Apollo 10 code*, highlighting "lighthearted comments in very serious code." (For example, to warn off people who'd change their crucial constants, they'd actually included a Latin phrase - a play on a biblical quote which translates roughly to "Don't touch these.") The ignition routine that actually lights the descent engine for the moon landing is named BURNBABY. The comment accompanying it? "OFF TO SEE THE WIZARD."

From: *https://science.slashdot.org/*

Mysterious Radio Bursts Reveal Missing Matter in Cosmos



Fast radio bursts, imagined here in a staggered arrival of frequencies at a detector of the Australian Square Kilometre Array Pathfinder telescope.
ICRAR AND CSIRO/ALEX CHERNEY

Roughly half of the "normal" matter in the universe - the stuff that makes up stars, planets, and even us - exists as mere wisps of material floating in intergalactic space, according to cosmologists. But astronomers had no good way to confirm that, until now. A new study has used fast radio bursts (FRBs) - powerful milliseconds long pulses of radio waves coming from distant galaxies - to weigh intergalactic matter, and the results match up with predictions.

"Using FRBs as a probe has been an exciting prospect for a while," says astronomer Paul Scholz of the University of Toronto, who was not involved with the work. "Now that we've built up a sample of local FRBs, we're starting to be able to do this. It's certainly exciting."

Over the past few decades, cosmologists have compiled an inventory of the stuff that makes up the universe. Some 68% is dark energy, a mysterious force accelerating the universe's expansion. Another 27% is clumps of dark matter that hold galaxies together. Just 5% is so-called normal matter.

Cosmologists know how much normal matter there should be; they can calculate it from how much the big bang should have produced and from the microwave ripple of this cosmic event that still echoes through space. But they can only see about half of it glowing as galaxies and dense gas clouds. The rest, a rarified, intergalactic gas of just one or two atoms in the volume of a typical office room, has been almost impossible to detect.

That was until the first FRB burst on the scene in 2007. Because these sporadic blasts are so bright and short, FRBs were originally thought to come from an instrumental glitch, or a source on Earth. (Some early "FRBs" were found to come from a microwave oven at an observatory.) But as detections of FRBs piled up, astronomers realized they were coming from distant corners of the universe. Pinpointing them was difficult because of their rarity: Observers had to be pointing in the exact right direction to catch one, and they wouldn't have time to focus other scopes on the source. These days, telescopes that view large portions of the sky continuously are bagging more FRBs.

FRBs revealed their distant origins through a phenomenon known as dispersion. An FRB pulse begins as a range of bunched-up frequencies, but as it travels, "it feels every electron along its path," says astronomer Sarah Burke-Spolaor of West Virginia University, who was not involved with the work. Low frequencies experience more drag from electrons than high ones, so when the pulse reaches a radio telescope on Earth, low frequencies lag behind. The amount of lag tells astronomers how many electrons the pulse has traveled through, which can be correlated to the total amount of matter.

The technique can reveal the density of matter across the cosmos, but only if the distance to the FRB's source is known. Up until recently, only a handful of FRB sources have been pinpointed - either because they happened to be one of the rare, repeating FRBs, or because they were spotted with a telescope array that could focus multiple instruments on the source galaxy. Today in Nature, a team of astronomers report the discovery of four new FRBs with known source galaxies, identified with the Australian Square Kilometre Array Pathfinder (ASKAP), an array of 36 radio dishes in Western Australia.

Using those and one of the previously pinpointed FRBs, scientists calculated the density of normal matter across a large swath of the local universe. The researchers found that, if extrapolated across the universe, there was enough normal matter to account for the half that was missing, in line with theoretical predictions.

"To see how well the FRB experiment is working with even a small sample was both surprising and gratifying," says team member Xavier Prochaska of the University of California's Lick Observatory. "It checks off this fundamental aspect of cosmology. Crisis averted!"

The FRB technique could also be used to map variations in matter density across the universe. That could help theorists understand how matter clumps together into the "cosmic web," the network of galaxy clusters strung across the universe. So far, astronomers can see the glowing galaxies that make up the web, but not the gas between them. The ASKAP researchers hope to build up a collection of about 100 FRBs with known sources over the next year, so they will know not just that the normal matter is there, but exactly where it is hiding.

From: *https://www.sciencemag.org/*

As Many as Six Billion Earth-like Planets in Our Galaxy, According to New Estimates

There may be as many as one Earth-like planet for every five Sun-like stars in the Milky way Galaxy, according to new estimates by University of British Columbia astronomers using data from NASA's Kepler mission.

To be considered Earth-like, a planet must be rocky, roughly Earth-sized and orbiting Sun-like (G-type) stars. It also has to orbit in the habitable zones of its star - the range of distances from a star in which a rocky planet could host liquid water, and potentially life, on its surface.

"My calculations place an upper limit of 0.18 Earth-like planets per G-type star," says UBC researcher Michelle Kunimoto, co-author of the new study in The Astronomical Journal. "Estimating how common different kinds of planets are around different stars can provide important constraints on planet formation and evolution theories, and help optimize future missions dedicated to finding exoplanets."

According to UBC astronomer Jaymie Matthews: "Our Milky Way has as many as 400 billion stars, with seven per cent of them being G-type. That means less than six billion stars may have Earth-like planets in our Galaxy."

Previous estimates of the frequency of Earth-like planets range from roughly 0.02 potentially habitable planets per Sun-like star, to more than one per Sun-like star.

Typically, planets like Earth are more likely to be missed by a planet search than other types, as they are so small and orbit so far from their stars. That means that a planet catalogue represents only a small subset of the planets that are actually in orbit around the stars searched. Kunimoto used a technique known as 'forward modelling' to overcome these challenges.

"I started by simulating the full population of exoplanets around the stars Kepler searched," she explained. "I marked each planet as 'detected' or 'missed' depending on how likely it was my planet search algorithm would have found them. Then, I compared the detected planets to my actual catalogue of planets. If the simulation produced a close match, then the initial population was likely a good representation of the actual population of planets orbiting those stars."

Kunimoto's research also shed more light on one of the most outstanding questions in exoplanet science today: the 'radius gap' of planets. The radius gap demonstrates that it is uncommon for planets with orbital periods less than 100 days to have a size between 1.5 and two times that of Earth. She found that the radius gap exists over a much narrower range of orbital periods than previously thought. Her observational results can provide constraints on planet evolution models that explain the radius gap's characteristics.

Previously, Kunimoto searched archival data from 200,000 stars of NASA's Kepler mission. She discovered 17 new planets outside of the Solar System, or exoplanets, in addition to recovering thousands of already known planets.

More at: *https://www.sciencedaily.com/*

Free Planetarium Shows

Evans and Sutherland, a major planetarium manufacturer and show producer, have released a number of their planetarium shows as flat screen videos to planetariums around the world. The idea is that during this time, when we cannot go to planetariums; that club members, friends and local astro clubs are passed links to see some of their older the shows on VIMEO. Joining Vimeo (a video and planetarium promotion site used by the industry) is FREE as a basic watcher. Just Google Vimeo and sign up.

Paul England, from the Island Planetarium is sharing the link with VAS members to view and share with their friends and families. All he asks is, you do not pass the link beyond VAS members and close friends and also send him a very short review of what you think. E&S have requested feedback.from planetariums.

The first show is "**The Secret Life of Stars**" and the link is *https://vimeo.com/401359933/63fc205ecf*

Please send feedback direct to **Paul England** at *admin@islandastronomy.co.uk*

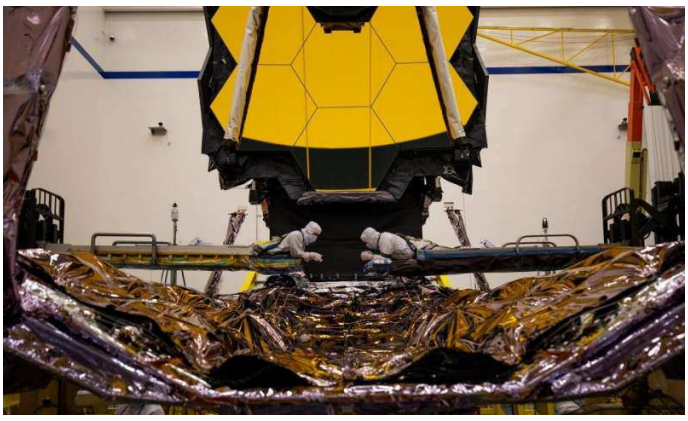
Any questions call **Paul England on 07771550893**

Tower extension test a success for NASA's James Webb Space Telescope

To test the James Webb Space Telescope's readiness for its journey in space, technicians successfully commanded it to deploy and extend a critical part of the observatory known as the Deployable Tower Assembly.

The primary purpose of the deployable tower is to create a large gap between the upper part of the observatory that houses its iconic gold mirrors and scientific instruments, and the lower section known as the spacecraft bus which holds its comparatively warm electronics and propulsion systems. By creating a space between the two, it allows for Webb's active and passive cooling systems to bring its mirrors and sensors down to staggeringly cold temperatures required to perform optimal science.

Webb was designed to look for faint traces of infrared light, which is essentially heat energy. To detect the extremely faint heat signals of astronomical objects that are incredibly far away, the telescope itself has to be very cold and stable.



Technicians inspect a critical part of the James Webb Space Telescope known as the Deployable Tower Assembly after fully extending it in the same manoeuvre it will perform in once in space. Credit: Northrop Grumman

During the test, the tower was slowly extended 48 inches (1.2 meters) upward over the course of several hours, in the same manoeuvre it will perform once in space. Simulating the zero-gravity environment Webb will operate in, engineers employed an innovative series of pulleys, counterbalances and a special crane called a gravity-negation system that perfectly offloaded all of the effects of Earth's gravity on the observatory. Now that Webb is fully assembled, the difficulty of testing and properly simulating a zero-gravity environment has increased significantly.

"The Deployable Tower Assembly worked beautifully during the test," said Alphonso Stewart the Webb deployment systems lead for NASA's Goddard Space Flight Center in Greenbelt, Maryland. "It performed exactly as predicted, and from our expectations from previous tests before the full observatory was assembled. This was the first time that this part of Webb was tested in its flight-like configuration to the highest level of fidelity we possibly could. This test provides the opportunity to assess all interfaces and interactions between the instrument and bus sections of the observatory."

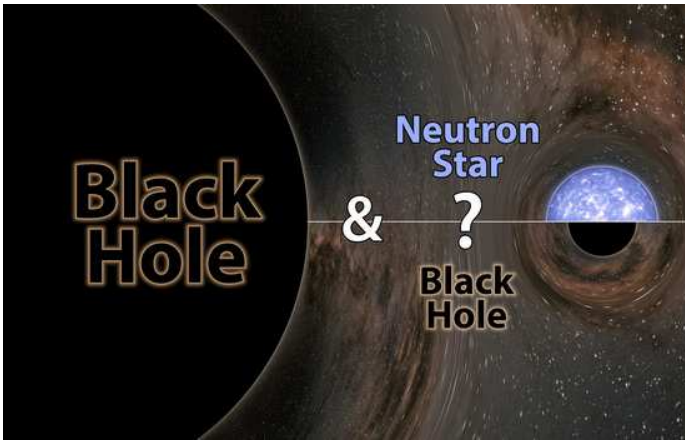
In addition to helping the observatory cool down, the Deployable Tower Assembly is also a big part of how Webb is able to pack into a much smaller size to fit inside an Ariane 5 rocket for launch. Webb is the largest space science observatory ever built, but to fit a telescope that big into a rocket, engineers had to design it to fold down into a much smaller configuration. Webb's Deployable Tower Assembly helps Webb to just barely fit inside a 17.8-foot (5.4-meter) payload fairing. Once in space, the tower will extend to give the rest of Webb's deployable parts, such as the sunshield and mirrors, the necessary amount of room needed to unpack and unfold into a fully functional infrared space observatory.

"We need to know that Webb will work the way we expect it to before we send it to space," said Stewart. "This is why we test, and when we do, we test as flight-like as possible. The way we send the commands to the spacecraft, the sequence, the individual sitting at the console, the communication that we use. We replicate all of these things to see if we are missing something, to see if there is something that needs to be changed, and to make sure that all of our planning to date has been correct."

Following augmented personal safety procedures due to COVID-19, the James Webb Space Telescope's Northrop Grumman team in California continued integration and testing work with significantly reduced on-site personnel and shifts. The NASA/Northrop Grumman team recently resumed near-full operations. NASA is evaluating potential impacts on the March 2021 launch date, and will continually assess the schedule and adjust decisions as the situation unfolds.

From: *https://phys.org/*

LIGO-Virgo Finds Mystery Object in 'Mass Gap'



When the most massive stars die, they collapse under their own gravity and leave behind black holes; when stars that are a bit less massive die, they explode in a supernova and leave behind dense, dead remnants of stars called neutron stars. For decades, astronomers have been puzzled by a gap that lies between neutron stars and black holes: the heaviest known neutron star is no more than 2.5 times the mass of our sun, or 2.5 solar masses, and the lightest known black hole is about 5 solar masses. The question remained: does anything lie in this so-called mass gap?

Now, in a new study from the National Science Foundation's Laser Interferometer Gravitational-Wave Observatory (LIGO) and the Virgo detector in Europe, scientists have announced the discovery of an object of 2.6 solar masses, placing it firmly in the mass gap. The object was found on August 14, 2019, as it merged with a black hole of 23 solar masses, generating a splash of gravitational waves detected back on Earth by LIGO and Virgo. A paper about the detection has been accepted for publication in The Astrophysical Journal Letters.

"We've been waiting decades to solve this mystery," says co-author Vicky Kalogera, a professor at Northwestern University. "We don't know if this object is the heaviest known neutron star, or the lightest known black hole, but either way it breaks a record."

"This is going to change how scientists talk about neutron stars and black holes," says co-author Patrick Brady, a professor at the University of Wisconsin, Milwaukee, and the LIGO Scientific Collaboration spokesperson. "The mass gap may in fact not exist at all but may have been due to limitations in observational capabilities. Time and more observations will tell."

The cosmic merger described in the study, an event dubbed GW190814, resulted in a final black hole about 25 times the mass of the sun (some of the merged mass was converted to a blast of energy in the form of gravitational waves). The newly formed black hole lies about 800 million light-years away from Earth.

Before the two objects merged, their masses differed by a factor of 9, making this the most extreme mass ratio known for a gravitational-wave event. Another recently reported LIGO-Virgo event, called GW190412, occurred between two black holes with a mass ratio of about 4:1.

"It's a challenge for current theoretical models to form merging pairs of compact objects with such a large mass ratio in which the low-mass partner resides in the mass gap. This discovery implies these events occur much more often than we predicted, making this a really intriguing low-mass object," explains Kalogera. "The mystery object may be a neutron star merging with a black hole, an exciting possibility expected theoretically but not yet confirmed observationally. However, at 2.6 times the mass of our sun, it exceeds modern predictions for the maximum mass of neutron stars, and may instead be the lightest black hole ever detected."

When the LIGO and Virgo scientists spotted this merger, they immediately sent out an alert to the astronomical community. Dozens of ground- and space-based telescopes followed up in search of light waves generated in the event, but none picked up any signals. So far, such light counterparts to gravitational-wave signals have been seen only once, in an event called GW170817. The event, discovered by the LIGO-Virgo network in August of 2017, involved a fiery collision between two neutron stars that was subsequently witnessed by dozens of telescopes on Earth and in space. Neutron star collisions are messy affairs with matter flung outward in all directions and are thus expected to shine with light. Conversely, black hole mergers, in most circumstances, are thought not to produce light.

According to the LIGO and Virgo scientists, the August 2019 event was not seen by light-based telescopes for a few possible reasons. First, this event was six times farther away than the merger observed in 2017, making it harder to pick up any light signals. Secondly, if the collision involved two black holes, it likely would have not shone with any light. Thirdly, if the object was in fact a neutron star, its 9-fold more massive black-hole partner might have swallowed it whole; a neutron star consumed whole by a black hole would not give off any light.

"I think of Pac-Man eating a little dot," says Kalogera. "When the masses are highly asymmetric, the smaller neutron star can be eaten in one bite."

How will researchers ever know if the mystery object was a neutron star or black hole? Future observations with LIGO, Virgo, and possibly other telescopes may catch similar events that would help reveal whether additional objects exist in the mass gap.

"This is the first glimpse of what could be a whole new population of compact binary objects," says Charlie Hoy, a member of the LIGO Scientific Collaboration and a graduate student at Cardiff University. "What is really exciting is that this is just the start. As the detectors get more and more sensitive, we will observe even more of these signals, and we will be able to pinpoint the populations of neutron stars and black holes in the universe."

"The mass gap has been an interesting puzzle for decades, and now we've detected an object that fits just inside it," says Pedro Marronetti, program director for gravitational physics at the National Science Foundation (NSF). "That cannot be explained without defying our understanding of extremely dense matter or what we know about the evolution of stars. This observation is yet another example of the transformative potential of the field of gravitational-wave astronomy, which brings novel insights to light with every new detection."

https://www.ligo.caltech.edu/

Confirmation of an Earth Around the Nearest Star

The existence of a planet the size of Earth around the closest star in the solar system, Proxima Centauri, has been confirmed by an international team of scientists including researchers from the University of Geneva (UNIGE). The results reveal that the planet in question, Proxima b, has a mass of 1.17 earth masses and is located in the habitable zone of its star, which it orbits in 11.2 days. This breakthrough has been possible thanks to radial velocity measurements of unprecedented precision using ESPRESSO, the Swiss-manufactured spectrograph - the most accurate currently in operation - which is installed on the Very Large Telescope in Chile. Proxima b was first detected four years ago by means of an older spectrograph, HARPS - also developed by the Geneva-based team - which measured a low disturbance in the star's speed, suggesting the presence of a companion.

The ESPRESSO spectrograph has performed radial velocity measurements on the star Proxima Centauri, which is only 4.2 light-years from the Sun, with an accuracy of 30 centimetres a second or about three times more precise than that obtained with HARPS, the same type of instrument but from the previous generation.

The measurements performed by ESPRESSO have clarified that the minimum mass of Proxima b is 1.17 earth masses (the previous estimate was 1.3) and that it orbits around its star in only 11.2 days.

"ESPRESSO has made it possible to measure the mass of the planet with a precision of over one-tenth of the mass of Earth", says Michel Mayor, winner of the Nobel Prize for Physics in 2019, honorary professor in the Faculty of Science and the 'architect' of all ESPRESSO-type instruments. "It's completely unheard of."

And What About Life in all This?

Although Proxima b is about 20 times closer to its star than the Earth is to the Sun, it receives comparable energy, so that its surface temperature could mean that water (if there is any) is in liquid form in places and might, therefore, harbour life.

Having said that, although Proxima b is an ideal candidate for biomarker research, there is still a long way to go before we can suggest that life has been able to develop on its surface. In fact, the Proxima star is an active red dwarf that bombards its planet with X rays, receiving about 400 times more than the Earth.

"Is there an atmosphere that protects the planet from these deadly rays?" asks Christophe Lovis, a researcher in UNIGE's Astronomy Department and responsible for ESPRESSO's scientific performance and data processing. "And if this atmosphere exists, does it contain the chemical elements that promote the development of life (oxygen, for example)? How long have these favourable conditions existed? We're going to tackle all these questions, especially with the help of future instruments like the RISTRETTO spectrometer, which we're going to build specially to detect the light emitted by Proxima b, and HIRES, which will be installed on the future ELT 39 m giant telescope that the European Southern Observatory (ESO) is building in Chile."

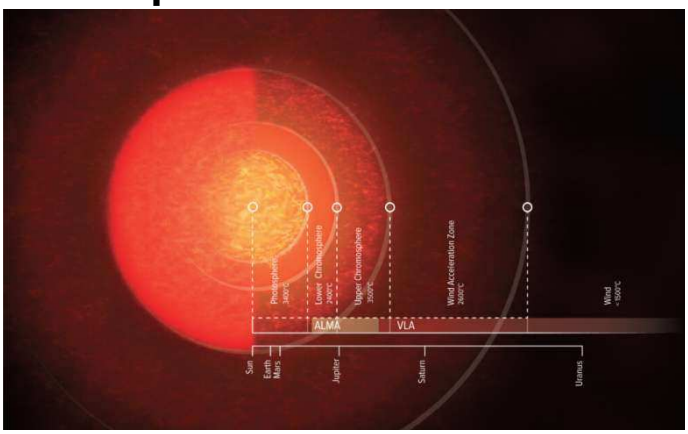
Surprise: Is There a Second Planet?

In the meantime, the precision of the measurements made by ESPRESSO could result in another surprise. The team has found evidence of a second signal in the data, without being able to establish the definitive cause behind it. "If the signal was planetary in origin, this potential other planet accompanying Proxima b would have a mass less than one third of the mass of the Earth. It would then be the smallest planet ever measured using the radial velocity method", adds Professor Pepe.

It should be noted that ESPRESSO, which became operational in 2017, is in its infancy and these initial results are already opening up undreamt of opportunities. Today ESPRESSO, with its 30 cm/s (and soon 10 after the latest adjustments) will perhaps make it possible to explore worlds that remind us of the Earth.

More at: https://www.eurekalert.org/

Supergiant Atmosphere of Antares Revealed by Radio Telescopes



An international team of astronomers has created the most detailed map yet of the atmosphere of the red supergiant star Antares. The unprecedented sensitivity and resolution of both the Atacama Large Millimeter/ submillimeter Array (ALMA) and the National Science Foundation's Karl G. Jansky Very Large Array (VLA) revealed the size and temperature of Antares' atmosphere from just above the star's surface, throughout its chromosphere, and all the way out to the wind region.

Red supergiant stars, like Antares and its more well-known cousin Betelgeuse, are huge, relatively cold stars at the end of their lifetime. They are on their way to run out of fuel, collapse, and become supernovae. Through their vast stellar winds, they launch heavy elements into space, thereby playing an important role in providing the essential building blocks for life in the universe. But it is a mystery how these enormous winds are launched. A detailed study of the atmosphere of Antares, the closest supergiant star to Earth, provides a crucial step towards an answer.

The ALMA and VLA map of Antares is the most detailed radio map yet of any star, other than the Sun. ALMA observed Antares close to its surface in shorter wavelengths, and the longer wavelengths observed by the VLA revealed the star's atmosphere further out. As seen in visible light, Antares' diameter is approximately 700 times larger than the Sun. But when ALMA and the VLA revealed its atmosphere in radio light, the supergiant turned out to be even more gigantic.

“The size of a star can vary dramatically depending on what wavelength of light it is observed with,” explained Eamon O'Gorman of the Dublin Institute for Advanced Studies in Ireland and lead author of the study published in the June 16 edition of the journal Astronomy & Astrophysics. “The longer wavelengths of the VLA revealed the supergiant's atmosphere out to nearly 12 times the star's radius.”

The radio telescopes measured the temperature of most of the gas and plasma in Antares' atmosphere. Most noticeable was the temperature in the chromosphere. This is the region above the star's surface that is heated up by magnetic fields and shock waves created by the vigorous roiling convection at the stellar surface - much like the bubbling motion in a pot of boiling water. Not much is known about chromospheres, and this is the first time that this region has been detected in radio waves.

The scientists discovered that the star's chromosphere extends out to 2.5 times the star's radius (our Sun's chromosphere is only 1/200th of its radius). They also found that the temperature of the chromosphere is lower than previous optical and ultraviolet observations have suggested. The temperature peaks at 3,500° Celsius (6,400° Fahrenheit), after which it gradually decreases. As a comparison, the Sun's chromosphere reaches temperatures of almost 20,000°Celsius.

“We found that the chromosphere is 'lukewarm' rather than hot, in stellar temperatures,” said O'Gorman. “The difference can be explained because our radio measurements are a sensitive thermometer for most of the gas and plasma in the star's atmosphere, whereas past optical and ultraviolet observations were only sensitive to very hot gas and plasma.”

In the ALMA and VLA data, astronomers for the first time saw a clear distinction between the chromosphere and the region where winds start to form. In the VLA image, a huge wind is visible, ejected from Antares and lit up by its smaller but hotter companion star Antares B.

“When I was a student, I dreamt of having data like this,” said co-author Graham Harper of the University of Colorado, Boulder. “Knowing the actual sizes and temperatures of the atmospheric zones gives us a clue of how these huge winds start to form and how much mass is being ejected.”

“Our innate understanding of the night sky is that stars are just points of light. The fact we can map the atmospheres of these supergiant stars in detail, is a true testament to technological advances in interferometry. These tour de force observations bring the universe close, right into our own backyard,” said Chris Carilli of the National Radio Astronomy Observatory, who was involved in the first observations of Betelgeuse at multiple radio wavelengths with the VLA in 1998.

From: https://phys.org/

Flat Earthers have nothing to fear...
...but sphere itself!

THE BACK PAGE

LINKS, COMMENTS AND OBSERVATIONS

APOD Celebrates 25th Anniversary

I don't know if you have a way to send an e-mail to all our VAS members, but today is the 25th anniversary of **Picture of the Day** (APOD). They have a GREAT mini film on today's offering, that various astronomers have nominated their favourite three pictures to make into the film. VERY GOOD, and well worth a look. Just go into your search engine a look for "Astronomy Picture of the Day".

When on the site, go to "Archive" at bottom left. Then click on June 16th, to obtain film.

Main site: https://apod.nasa.gov/apod/astropix.html
Direct Link: https://apod.nasa.gov/apod/ap200616.html

Monster Black Hole In The Early Universe

The second-most distant quasar ever discovered now has a Hawaiian name

Astronomers have discovered the second-most distant quasar ever found. It is the first quasar to receive an indigenous Hawaiian name, Poniua'ena. Data show the supermassive black hole powering Poniua'ena is surprisingly massive, challenging current theories of how supermassive black holes formed and grew in the young universe.

Read More: https://www.sciencedaily.com/

Sun's Motions Reveal Inner Workings of Sunspot Cycle

The sun's magnetic activity follows an 11-year cycle. Over the course of a solar cycle, the sun's magnetic activity comes and goes. During solar maximum, large sunspots and active regions appear on the sun's surface. Spectacular loops of hot plasma stretch throughout the sun's atmosphere and eruptions of particles and radiation shoot into interplanetary space. During solar minimum, the sun calms down considerably. A striking regularity appears in the so-called butterfly diagram, which describes the position of sunspots in a time-latitude plot. At the beginning of a solar cycle, sunspots emerge at mid-latitudes. As the cycle progresses, they emerge closer and closer to the equator. To explain this "butterfly diagram," solar physicists suspect that the deep magnetic field is carried toward the equator by a large-scale flow.

Read More: https://phys.org/

The Density of Cloud Cover is Directly Proportional to the Number of Astronomers Waiting on the Ground Below

At The Observatory

For your own safety, please bring a torch.
Make sure you close and lock the car park gate if you are the last to leave.

Articles Needed

NZ needs letters, articles, reviews or pictures related to astronomy. Contact details on page 1.

"In Germany they are preparing for the pandemic by stocking up with sausage and cheese. That's the Wurst Käse scenario"
O Laparoto

"Insomnia sharpens your math skills because you spend all night calculating how much sleep you'll get if you're able to fall asleep right now"
Anon

"As you get older, three things happen. The first is your memory goes, and I can't remember the other two"
Sir Norman Wisdom

"The worst part of online shopping is having to get up and find your credit card"
Anon

"Coronavirus will not last forever. Adventures are ahead"
Anon