New Zenith

The Monthly Newsletter of the Vectis Astronomical Society

Vol 27 Issue 8 — September 2019 *When Printed, this Newsletter costs VAS at least £1*

Society News

September Meeting

There has been a change to the speaker for our September meeting on Friday 27th. I can confirm that **Dr David Williamson** (Southampton University) will speak. His subject will be active galactic nuclei.

Title: What Have Black Holes Ever Done For Us?

Summary: *Why and how do supermassive black holes have such a big effect on the universe? Even though every big galaxy seems to have one (and maybe small galaxies too!), each one is typically less than 0.1% of the total mass of the galaxy in stars. Despite this, supermassive black holes can outshine an entire galaxy as an "active galactic nucleus", and we can see their effects on a cosmological scale. In this talk, I will give an overview of the current understanding of supermassive black holes and active galactic nuclei, and highlight some new exciting discoveries, as well as research currently ongoing at the University of Southampton.*

Observatory Visits

Now the evenings are starting to get darker, I am getting more enquiries for observatory visits. I suspect, as usual, we are in for quite a few bookings leading up to the end of the year.

VAS depends on the donations these visits generate and it is important that the observatory is always presentable. Could all members ensure the observatory is left clean and tidy at all times.

Parking Problems

Dividing the Pavilion car park has not always been a successful as I'd hoped. The NPS&CA are aware of the difficulties and are working on better planning and enforcement to ensure all users of the Watery Lane facilities are able to reach them easily. If you have parking or access problems at any time, please take a few photographs to help me in my efforts to get this problem sorted.

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:

The Editor, New Zenith
Carpenter's Cottage
Dennett Road
Bembridge
Isle of Wight PO35 5XF

Tel: **01983 872875** or email: **editor@wightastronomy.org**

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

Observatory Diary

Monday, 19.30hrs	Members Only and by arrangement Telescope and night sky training. Please contact Martyn Weaver 07855 116490
Thursday	Members (19.30hrs) and Public (20.00hrs). Informal meeting and observing

VAS Website: wightastronomy.org

Contents this Month

2019 Monthly Meetings

Date	Subject	Speaker
Check *http://www.wightastronomy.org/meetings/* for the latest information		
23 Aug	AGM and Barbecue	
27 Sept	What have black holes ever done for us?	Dr David Williamson
25 Oct	Dark Skies Event	
22 Nov	TBA	TBA

Observatory Visits Booked

No bookings so far

Please phone me for the current situation (number on the front page)

It would be appreciated if members could avoid using the observatory at these times.

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.

This applies to all information held but is especially important for email and physical addresses.

VAS Contacts 2018/19

President	Barry Bates president@wightastronomy.org
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NZ Distribution	Graham Osborne distribution@wightastronomy.org
Others	**Vacant Positions**

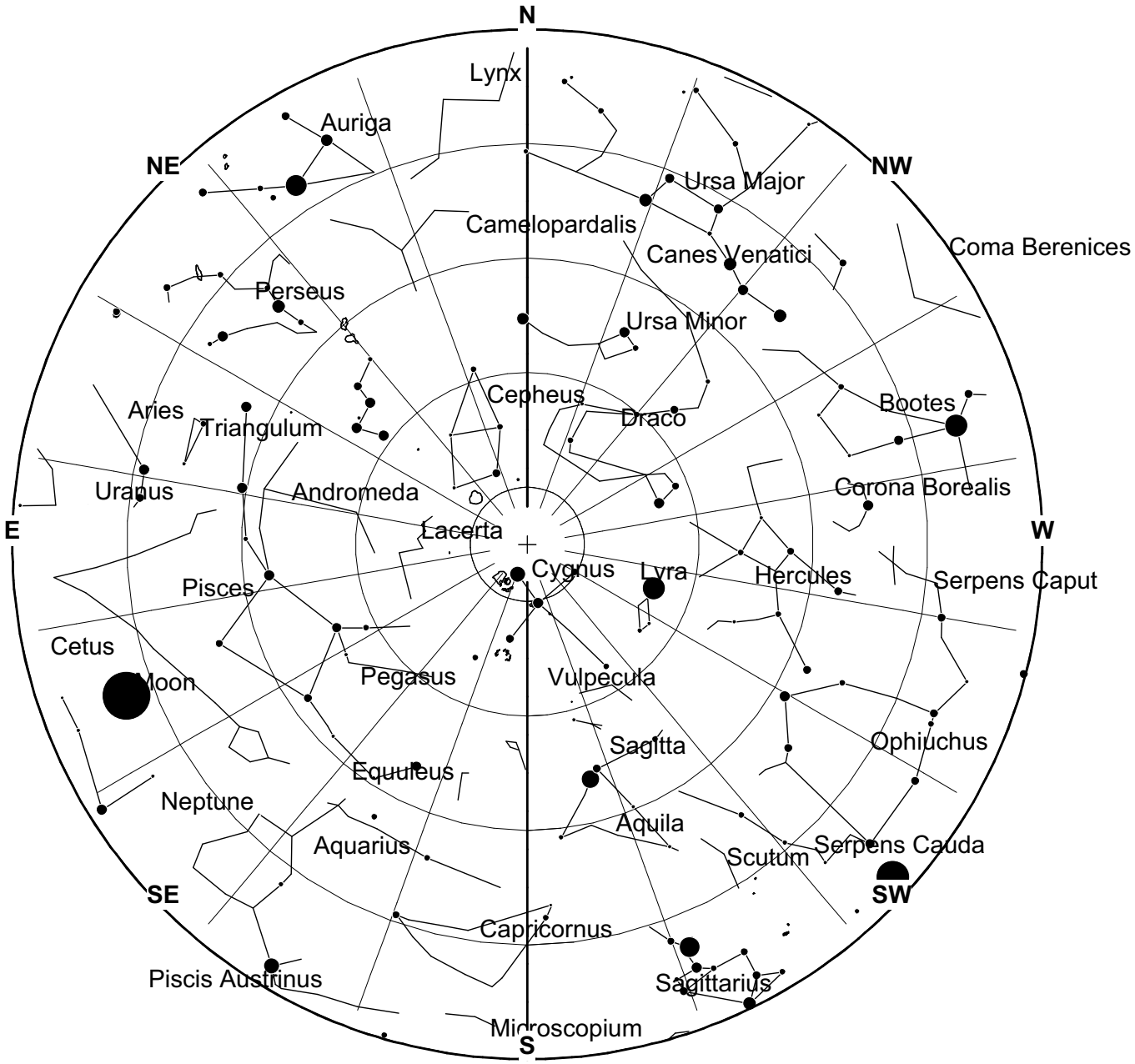
Important

Members using the observatory MUST enter a line or two in the Observatory Log Book.

On several occasions, lights, heaters and the Meade LX200 have been left on!

When leaving, please ensure all is secure and all lights, heaters and telescopes are TURNED OFF.

September 2019 Sky Map



View from Newchurch Isle of Wight UK - 2200hrs - 15 September 2019

Messier 15 (also designated NGC 7078) is a globular cluster in the constellation Pegasus. It was discovered by Jean-Dominique Maraldi in 1746 and included in Charles Messier's catalogue of comet-like objects in 1764. At an estimated 12.0 billion years old, it is one of the oldest known globular clusters.

M 15 is about 33,600 light-years from Earth, and 175 light-years in diameter. It has an absolute magnitude of -9.2, which translates to a total luminosity of 360,000 times that of the Sun. Messier 15 is one of the most densely packed globulars known in the Milky Way galaxy. Its core has undergone a contraction known as “core collapse” and it has a central density cusp with an enormous number of stars surrounding what may be a central black hole.

September 2019 Night Sky

Autumnal Equinox

The autumnal equinox, the point at which the Sun crosses the equator on it journey south occurs on September 23 at 08:50, at this time day and night are equal.

Moon Phases

New	First Qtr	Full	Last Qtr
			
28th	6th	14th	22nd

Planets

Mercury

Mercury makes a very poor evening apparition this month it is at best only 5° above the horizon at sunset. Between the 12th and 14th Mercury is in close conjunction with Venus, but is quite close to the Sun so will be a very difficult event to observe.

Venus

Venus may be glimpsed low in the west-south-west just after sunset. As the month progresses it moves away from the Sun, but does not move away much from the horizon and as it still sets just after the Sun it remains a challenging object.

Mars

Mars is still too close to the Sun to be visible this month.

Jupiter

At sunset Jupiter can be found in the South-south-west. It is very bright and is the first object to become visible as the sky darkens.

Saturn

As the sky darkens the next object to become visible is Saturn low in the South-south-east. It is much fainter than Jupiter, but is still the brightest object in the south-south-east.

Uranus

Uranus lies on a line between the fourth magnitude star Mesarthim in Aries and the slightly fainter Xi2 Ceti. It is about 8° south of Mesarthim and 5° north of Xi2.

Neptune

At the start of the month Neptune draws is just to the east of the fourth magnitude star Phi Aquarii. There is also a star of similar brightness to Neptune close by; Neptune is the more northerly of the two. On the 5th and 6th Neptune passes within about 1 arc minute of the star and by the end of the month is just over a moon diameter to the west.

Deep Sky

M73 Star Cluster
RA 20h 59m Dec -12° 36' mag 9.0

This is a grouping of just four stars that form a Y pattern or perhaps a lambda depending on which way up it appears. The stars can be resolved in the smallest of telescopes used today and shows no sign of nebulosity. This is perhaps another pointer to the quality of some optical instruments being used in Messier's time that he mistook this object for something that looked like a comet. It is not known if this is just a chance alignment of stars or whether they form a true cluster.

M15 Globular Cluster
RA 21h 30m Dec 12° 10' mag 7.5

This impressive globular is quite bright and very easily found in binoculars. Follow the line from Baham to Enif, about 4 degrees beyond the horses nose to find this rather large fuzzy looking star. Through a telescope it reveals its self as a bright core surrounded by a halo of much fainter stars. As with all globulars the view becomes more impressive with increasing aperture. This is one of only a few globular clusters to contain a planetary nebula, it is however about 14th magnitude and for visual beyond all but those with the largest telescopes and best eyes.

M39 Open Cluster
RA 21h 32m Dec 48° 32' mag 4.5

The Milky Way is full of star clusters, many are dimmed by intervening dusts or are so surrounded by other stars that it can be difficult to identify them. M39 can be spotted with the naked eye under good conditions, it is large, about the size of the full moon, so binoculars or a rich field telescope are the best instruments to use to observe this triangular shaped cluster.

Peter Burgess

Scientists Complete LSST Digital Sensor Array

Members of the LSST project team at Brookhaven Lab
Credit: Brookhaven National Laboratory

After 16 years of dedicated planning and engineering, scientists at the U.S. Department of Energy's (DOE) Brookhaven National Laboratory have completed a 3.2 gigapixel sensor array for the camera that will be used in the Large Synoptic Survey Telescope (LSST), a massive telescope that will observe the universe like never before.

"This is the biggest charge-coupled device (CCD) array that has ever been built," said Paul O'Connor, senior scientist at Brookhaven Lab's instrumentation division. "It's three billion pixels. No telescope has ever put this many sensors into one camera."

The digital sensor array is composed of about 200 16-megapixel sensors, divided into 21 modules called "rafts." Each raft can function on its own, but when combined, they will view an area of sky that can fit more than 40 full moons in a single image. Researchers will stitch these images together to create a time-lapse movie of the complete visible universe accessible from Chile.

Currently under construction on a mountaintop in Chile, LSST is designed to capture the most complete images of our universe that have ever been achieved. The project to build the telescope facility and camera is a collaborative effort among more than 30 institutions from around the world, and it is primarily funded by DOE's Office of Science and the National Science Foundation. DOE's SLAC National Accelerator Laboratory is leading the overall effort to construct the camera - the world's largest camera for astronomy - while Brookhaven led the design, construction, and qualification of the digital sensor array - the "digital film" for the camera.

"It's the heart of the camera," said Bill Wahl, science raft subsystem manager of the LSST project at Brookhaven Lab. "What we've done here at Brookhaven represents years of great work by many talented scientists, engineers, and technicians. Their work will lead to a collection of images that has never been seen before by anyone. It's an exciting time for the project and for the Lab."

Brookhaven began its LSST research and development program in 2003, with construction of the digital sensor array starting in 2014. In the time leading up to construction, Brookhaven designed and fabricated the assembly and test equipment for the science rafts used both at Brookhaven and SLAC. The Laboratory also created an entire automated production facility and cleanroom, along with production and tracking software.

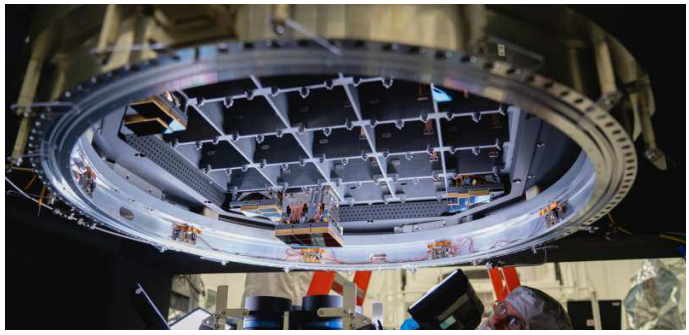
We made sure to automate as much of the production facility as possible," O'Connor said. "Testing a single raft could take up to three days. We were working on a tight schedule, so we had our automated facility running 24/7. Of course, out of a concern for safety, we always had someone monitoring the facility throughout the day and night."

Constructing the complex sensor array, which operates in a vacuum and must be cooled to -100° Celsius, is a challenge on its own. But the Brookhaven team was also tasked with testing each fully assembled raft, as well as individual sensors and electronics. Once each raft was complete, it needed to be carefully packaged in a protective environment to be safely shipped across the country to SLAC.

The LSST team at Brookhaven completed the first raft in 2017. But soon after, they were presented with a new challenge.

"We later discovered that design features inadvertently led to the possibility that electrical wires in the rafts could get shorted out," O'Connor said. "The rate at which this effect was impacting the rafts was only on the order of 0.2%, but to avoid any possibility of degradation, we went through the trouble of refitting almost every raft."

Now, just two years after the start of raft production, the team has successfully built and shipped the final raft to SLAC for integration into the camera. This marks the end of a 16-year project at Brookhaven, which will be followed by many years of astronomical observation.

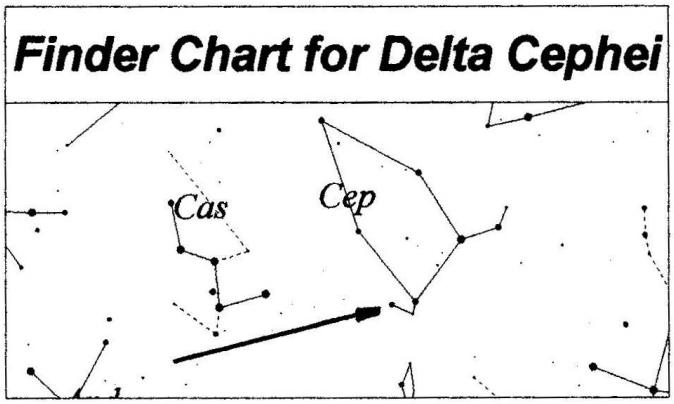


More at: https://phys.org/

My 100 Best Night Sky Sights

Double Star

Coordinates: RA 22h 29m 12s, Dec +58° 25'



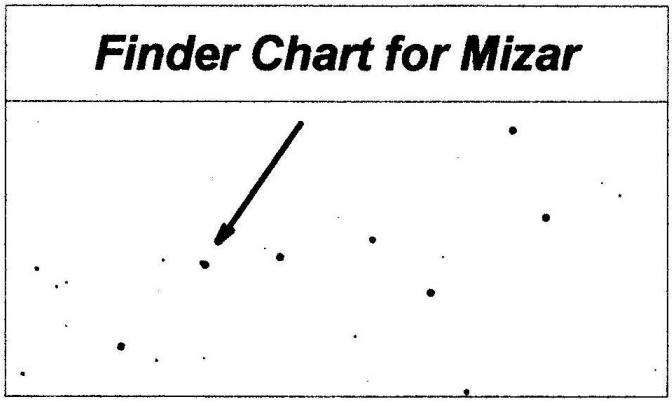
Delta Cephei is the prototype of the important Cepheid Variables that first enabled distances of other galaxies to be estimated with reasonable precision. Variable stars are outside the context of these articles but as a double star δ Cep rightfully claims its position high on the list of desirable objects to view. Its undisputed companion is a 13th magnitude star too close to the bright mag 3.8 primary to be identified easily but there is another mag 6.3 companion 41 arc seconds away that's generally believed to be physically related and this really transforms the scene. The first is blue, the second orange and they rival the most celebrated coloured double in the sky for the sheer beauty of the sight - but there's more.

Just 100" due east is a 'tiny' blue star accompanied by an unrelated faint, but nevertheless easily seen, red companion both of which are neatly framed by two white stars. So here, in one small field of view, we have six stars of four colours ranging from red to blue via orange and white, creating a scene that lifts the heart. The vista is best viewed in autumn with high powers which enhance the hues and exclude other stars on the periphery. Don't miss it.

Multiple Star

Coordinates: RA 13h 23m 54s, Dec +54° 56'

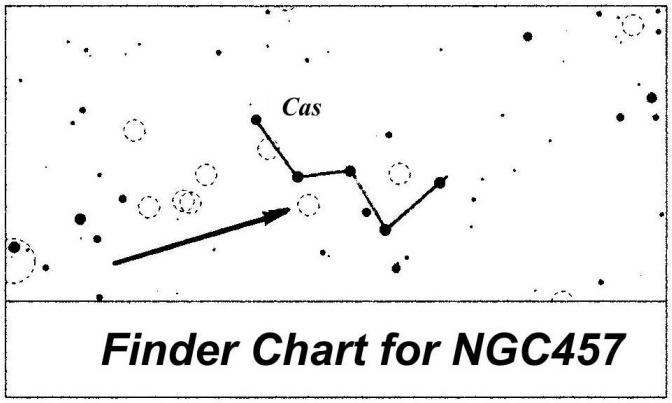
Zeta Ursae Majoris or ***Mizar*** has several claims to fame. As the middle star of the Plough's 'handle' it's one of the most familiar stars to all who take even cursory peeps at the night sky. With ordinarily good eyesight it can readily be seen that it has a faint companion, Alcor, just above and to its left and that alone would rank it highly on the scale of neat unrelated doubles (line-of-sight optical doubles, not physically connected – Alcor is much further away than Mizar). North American Indians certainly held this pair in high esteem, believing the 'little' one to be the cooking pot on the shoulder of one of the three braves hunting the Great Bear through the sky.



In 1650 an Italian astronomer pointed his telescope at this pair and found another companion, this time related, making it the very first true binary to be discovered telescopically. Subsequently Mizar was also discovered to be a spectroscopic binary (an unseen companion whose presence is only betrayed by a doubling of the spectral lines) – again a first. As Alcor is also a spectroscopic binary this is a complex system indeed! We must content ourselves with observing the trio, but this is a grand sight at almost any time of the year although rather better from late winter to early summer. Use any instrument that comes to hand for Alcor and Mizar (binoculars are great here) and any small telescope to capture the complete set.

Galactic Cluster

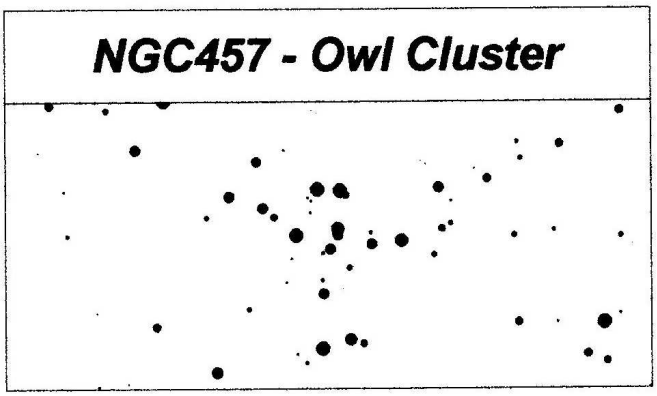
Coordinates: RA 01h 33m 12s, Dec +60° 42'



This is one of my all-time favourites and vies for top place in my Open Cluster category. My very first acquaintance with it came about accidentally. Having spent some time enjoying the delights of the double cluster in Perseus I decided to explore the vicinity by sweeping a 10º arc east to west across the sky, lowering the 'scope 1º and then reversing the direction. I didn't get far! Before I had reached the end of the very first sweep my search came to an abrupt halt when a large, grotesquely robot-like figure, feet planted firmly apart and arms outstretched

glared at me from above with two brilliant, unblinking eyes.

When seen for the first time ***NGC457*** in Cassiopeia is awesome, and was especially so for me as it pounced in the small hours of the morning with no-one else in the neighbourhood awake - just it and me. NGC457 has been dubbed the 'Owl Cluster' for its resemblance to that nocturnal creature and indeed it can be visualised as such but, for me, it will always be a robot.



The cluster contains some 80 stars, a quarter of which are bright, the 'eyes' being formed by the lovely yellow and blue wide double star Phi Cas, and a distinctly red star is situated at one of its 'feet' (painted toenail?)

I've tried to give some impression on the accompanying second chart but as always, such depictions, like most photographs, are light years from doing justice to the object – you just ***have*** to see it for yourself. If viewing through an SCT or a refractor with a star diagonal it's worth removing the diagonal otherwise the robot/owl will be upside down, and this will significantly diminish the spectacle. (Beware! - physical contortions will be required for such direct viewing through these instruments as Cassiopeia rides high in the sky). Like Ursa Major, the Queen is on view all year round but she's best positioned from September to January with the cluster just below the 'W' asterism or, if you see it that way, just above the 'M'.

Originally published in February 2000
Bert Paice

Microgravity Changes Brain Connectivity

What happens to the human brain in weightlessness?

An international team of Russian and Belgian researchers, including scientists from HSE University, has found out that space travel has a significant impact on the brain: they discovered that cosmonauts demonstrate changes in brain connectivity related to perception and movement.

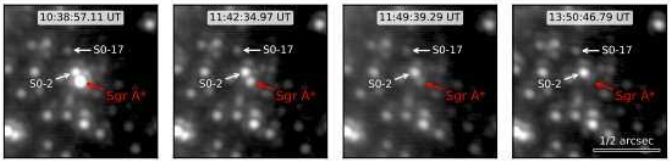
Some areas, such as regions in the insular and parietal cortices, work more synchronously with other brain areas after the space flight. On the other hand, connectivity of some other regions, such as the cerebellum and vestibular nuclei, decreases. The results of the study were published in Frontiers in Physiology.

While Roscosmos is discussing future manned flights to Mars, NASA plans to open the International Space Station for commercial tourism, and SpaceX is testing its Starship Mars prototype, scientists are seriously concerned about the impact of a prolonged stay in space on the human body. During flights, astronauts are continuously exposed to weightlessness, which requires adaptation and causes changes within the body. Life on colonised planets and satellites - humanity's likely future - will demand special conditions to become safe for our body. While the effects of weightlessness on bones, muscles and the vestibular system are well known, how the human brain copes with microgravity has yet to be fully examined. Recent studies using neuroimaging show that space travel does not leave the brain unaffected.

An international team which included scientists from the HSE University, RAS Institute of Biomedical Problems, Federal Center of Treatment and Rehabilitation, Lomonosov Moscow State University, Gagarin Cosmonaut Training Centre and several Belgian research organisations used functional magnetic resonance imaging (fMRI) to measure functional brain connectivity in a group of eleven cosmonauts in a groundbreaking research project. It turned out that adaptation to microgravity and related changes in motor activity can cause the modifications of functional connectivity between the brain areas.

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

Milky Way's Black Hole Just Flared, Growing 75 Times as Bright for a Few Hours



Even though the black hole at the center of the Milky Way is a monster, it's still rather quiet. Called Sagittarius A*, it's about 4.6 million times more massive than the sun. Usually, it's a brooding behemoth. But scientists observing Sgr. A* with the Keck Telescope just observed its brightness blooming to over 75 times normal for a few hours.

The flaring is not visible in optical light. It's all happening in the near-infrared, the portion of the infrared spectrum closest to optical light. Astronomers have been watching Sgr. A* for 20 years, and though the black hole does have some variability in its output, this flaring event is like nothing astronomers have observed before. This peak was over twice as bright as the previous peak flux level.

These results are being reported in the Astrophysical Journal Letters in a paper titled "Unprecedented variability of Sgr A* in NIR," and is available at the prepress site arXiv.org. The lead author is Tuan Do, an astronomer at UCLA.

The team saw Sgr. A* flaring at 75 times normal for a two-hour period on May 13th. At first, astronomer Tuan Do thought that they were seeing a star called SO-2 rather than Sgr. A*. SO-2 is one of a group of stars called S-stars that orbits the black hole closely. Astronomers have been keeping an eye on it as it orbits the black hole.

In an interview with ScienceAlert, Do said, "The black hole was so bright I at first mistook it for the star S0-2, because I had never seen Sgr A* that bright. Over the next few frames, though, it was clear the source was variable and had to be the black hole. I knew almost right away there was probably something interesting going on with the black hole."

The question is, what made Sgr. A* flare like this? At this point, astronomers aren't certain what caused the flaring. Sgr. A* has exhibited flaring before, just not as brightly. So flaring itself isn't unprecedented.

It's likely that something disrupted the black hole's usually quiet neighborhood, and there are at least a couple of possibilities. The first is not actually a disruption, but an inaccuracy in the statistical models used to understand the black hole. If that's the case, then the model needs to be updated to include these variations as "normal" for Sgr. A*.

The second possibility is where things get interesting: Something has changed in the black hole's neighborhood.

The previously mentioned star SO-2 is a prime candidate. It's one of two stars that approach very closely to Sgr. A* in an elliptical orbit. Every 16 years, it's at its closest. In the middle of 2018 was its last closest approach, when it was only 17 light-hours away from the black hole.

It's possible that SO-2's close approach disrupted the way that material flows into Sgr. A*. That would generate the kind of variability and bright flaring that astronomers saw in May, about one year after the star's close approach.

But astronomers aren't certain. SO-2 is not a very large star, and it seems unlikely that it could cause this type of disruption. Not only that, but it's the largest of the S stars that get close to Sgr. A*, so it's unlikely that one of the other stars could be the cause, either.

Another possibility is a gas cloud. Back in 2002, astronomers saw what they thought might be a hydrogen gas cloud approaching the center of Sgr. A*. By 2012, astronomers were more certain that it was a cloud, and it was named G2. They measured the temperature of the cloud at 10,000 degrees Kelvin, and were able to measure its trajectory: In 2013, it would travel closely enough to the black hole that the tidal forces would tear it apart

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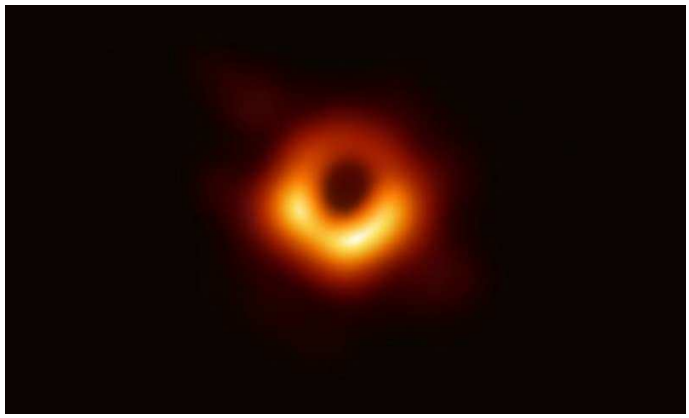


This is our best-yet image of an actual black hole. It's the super-massive black hole at the center of galaxy M87, and it was captured by the Event Horizon Telescope (EHT). The black hole itself can't actually be seen so this image is actually of its event horizon. The EHT's next target is Sgr. A. Credit: Event Horizon Telescope Collaboration*

Read More at: https://phys.org/

Critical Deployment of NASA Webb's Secondary Mirror a Success

In order to do groundbreaking science, NASA's James Webb Space Telescope must first perform an extremely choreographed series of deployments, extensions, and movements that bring the observatory to life shortly after launch. Too big to fit in any rocket available in its fully deployed form, Webb was engineered to intricately fold in on itself to achieve a much smaller size during transport.

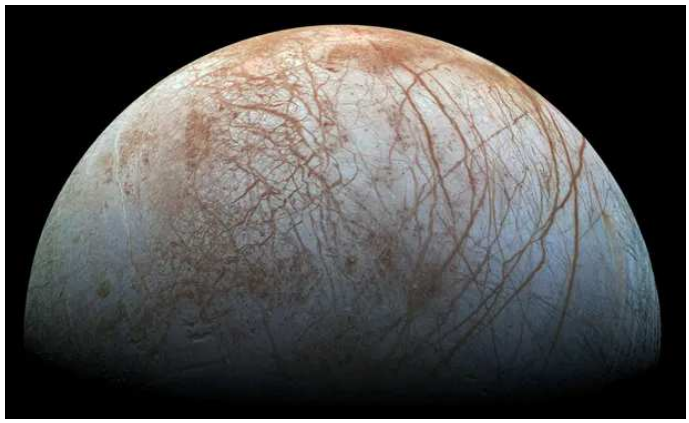
Technicians and engineers recently tested a key part of this choreography by successfully commanding Webb to deploy the support structure that holds its secondary mirror in place. This is a critical milestone in preparing the observatory for its journey to orbit. The next time this will occur will be when Webb is in space, and on its way to gaze into the cosmos from a million miles away.

The secondary mirror is one of the most important pieces of equipment on the telescope, and is essential to the success of the mission. When deployed, this mirror will sit out in front of Webb's hexagonal primary mirrors, which form an iconic honeycomb-like shape. This smaller circular mirror serves an important role in collecting light from Webb's 18 primary mirrors into a focused beam. That beam is then sent down into the tertiary and fine steering mirrors, and finally to Webb's four powerful scientific instruments.

"The proper deployment and positioning of its secondary mirror is what makes this a telescope - without it, Webb would not be able to perform the revolutionary science we expect it to achieve. This successful deployment test is another significant step towards completing the final observatory," said Lee Feinberg, optical telescope element manager for Webb at NASA's Goddard Space Flight Center in Greenbelt, Maryland.

Read More at: https://phys.org/

NASA Mission to Jupiter Moon Europa Moves Step Closer to Launch



Mission that could shed light on possibility of life on icy rock is expected to lift off in 2025

A Nasa mission to explore the most tantalising of Jupiter's 79 moons has been given the green light to proceed to the final stages of development.

Europa – which is slightly smaller than our own moon – has long been considered a possible candidate in the hunt for alien life. Evidence suggests there is an ocean below the moon's thick, icy crust that might be tens of miles deep. Scientists believe this body of water could contain the right chemical cocktail for life and could even be home to some form of living organisms.

Europa appears to have the hat-trick of conditions needed to kick off life: water, possibly chemistry, and energy in the form of tidal heating, a phenomenon arising from gravitational tugs acting on the moon. This could not only drive chemical reactions but also aid movement of chemical substances between rock, surface and ocean, possibly through hydrothermal vents.

It is proposed that the Nasa mission, named Europa Clipper, will make a number of close flybys – it cannot orbit the moon as Jupiter's radiation belt would fry its electronics – carrying cameras and instruments to measure the moon's magnetic field.

The mission will look for subsurface lakes and provide data on the thickness of the moon's icy crust. The team also hope to confirm the presence of plumes of water, previously detected by Nasa's Galileo spacecraft and the Hubble space telescope. If confirmed, it would mean scientists would not need to find a way of hacking through the moon's icy crust to explore the makeup of the ocean.

Read More at: https://www.theguardian.com/

Fantastic Micrometeorites and Where to Find Them

Space is very much the final frontier for humanity, at least as far as our current understanding of the universe takes us. Only a handful of countries and corporations on Earth have the hardware to readily get there, and even fewer are capable of reaching orbit. For these reasons, working in this field can seem out of reach for many. Nevertheless, there's plenty about the great expanse beyond our atmosphere that can be studied by the dedicated citizen scientist. With the right equipment and know-how, it's even possible to capture and study micrometeorites yourself!

For those new to the field, the terms used can be confusing. Meteoroids are small metallic or rocky objects found in outer space, up to around 1 meter in size. When these burn up upon entering the atmosphere, they are referred to as a meteor, or colloquially known as a shooting star. If part of the object survives long enough to hit the ground, this is referred to as a meteorite, and as you'd expect the smaller ones are called micrometeorites, being on the scale of 2mm or less.

Stardust Proves Hard to Find

Being tiny and having fallen from space, micrometeorites present certain challenges to those who wish to find and identify them. In spite of this, they can be found by using the right techniques and a heck of a lot of hard work.

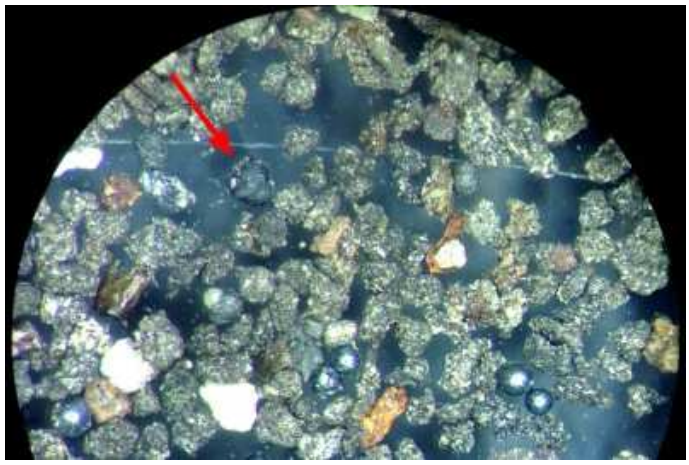
For a long time, micrometeorites were largely ignored by science due to the perceived difficulty in trying to find them. As Verge Science reports, Jon Larsen took this as a challenge. With an estimated 60-100 metric tons falling to Earth every day, Jon simply refused to believe that nothing could be done. Instead, he took a reverse approach at the problem, becoming an expert on all manner of tiny terrestrial particles. Beginning by collecting particles with a magnet, he would painstakingly sort and identify them. By first identifying all the particles of terrestrial origin, it then became easier to focus on whatever was left over to determine whether or not he had found a micrometeorite.

Jon's work led to much greater interest in micrometeorites worldwide. Now, A project is underway in Berlin to enlist the services of the citizenry to help find these tiny visitors from outer space (Google Translate link). The methodology used is similar to Jon's experiments but on a grander scale.

The team placed large tarps on the roofs of university buildings and an Ikea outlet. Dust was allowed to settle on the tarps and over time, 100 kilograms of material was collected. This was sifted to extract only particles under 0.8mm, as in the team's experience most micrometeorites come in under this size range. This also helps to exclude larger particles from other sources, such as dirt and local air pollution. A magnet is then used to select ferromagnetic particles, and these are then washed and prepared for inspection under the microscope. At the end of sorting, only 15 grams was left over from the initial 100 kilograms collected.

At this point, the citizen scientists come in. There currently is no quick solution to the identification of micrometeorites versus terrestrial dust particles; it simply involves gruelling and laborious work by humans to inspect and sort the finds. The participants are trained on what to look for, based on previous finds — primarily not-quite-round, darker objects. Once likely candidates are identified, they are sent off for final geochemical analysis to verify their origin.

Having begun in July, the project aims to eventually display some of the finds in the Museum für Naturkunde Berlin. This promises to be its own challenge, due to the size of the objects in question, but it should make for compelling viewing for anyone wishing to see freshly collected stardust in person.



The process of identifying potential micrometeorites is a painstaking one, undertaken with a steady hand and a careful eye on the microscope.

Read More at: https://hackaday.com/

No Absolute Time

Two centuries before Einstein, Hume recognised that universal time, independent of an observer's viewpoint, doesn't exist

In 1915, Albert Einstein wrote a letter to the philosopher and physicist Moritz Schlick, who had recently composed an article on the theory of relativity. Einstein praised it: 'From the philosophical perspective, nothing nearly as clear seems to have been written on the topic.' Then he went on to express his intellectual debt to 'Hume, whose Treatise of Human Nature I had studied avidly and with admiration shortly before discovering the theory of relativity. It is very possible that without these philosophical studies I would not have arrived at the solution.'

More than 30 years later, his opinion hadn't changed, as he recounted in a letter to his friend, the engineer Michele Besso: 'In so far as I can be aware, the immediate influence of D Hume on me was greater. I read him with Konrad Habicht and Solovine in Bern.' We know that Einstein studied Hume's Treatise (1738-40) in a reading circle with the mathematician Conrad Habicht and the philosophy student Maurice Solovine around 1902-03. This was in the process of devising the special theory of relativity, which Einstein eventually published in 1905. It is not clear, however, what it was in Hume's philosophy that Einstein found useful to his physics. We should therefore take a closer look.

'Hume's philosophy of time shows the fundamental relevance of the relation between an observer and a reference object.'

In Einstein's autobiographical writing from 1949, he expands on how Hume helped him formulate the theory of special relativity. It was necessary to reject the erroneous 'axiom of the absolute character of time, viz, simultaneity', since the assumption of absolute simultaneity unrecognisedly was anchored in the unconscious. Clearly to recognise this axiom and its arbitrary character really implies already the solution of the problem. The type of critical reasoning required for the discovery of this central point [the denial of absolute time, that is, the denial of absolute simultaneity] was decisively furthered, in my case, especially by the reading of David Hume's and Ernst Mach's philosophical writings.

In the view of John D Norton, professor of the history and philosophy of science at the University of Pittsburgh, Einstein learned an empiricist theory of concepts from Hume (and plausibly from Mach and the positivist tradition). He then implemented concept empiricism in his argument for the relativity of simultaneity. The result is that different observers will not agree whether two events are simultaneous or not. Take the openings of two windows, a living room window and a kitchen window. There is no absolute fact to the matter of whether the living room window opens before the kitchen window, or whether they open simultaneously or in reverse order. The temporal order of such events is observer-dependent; it is relative to the designated frame of reference.

Once the relativity of simultaneity was established, Einstein was able to reconcile the seemingly irreconcilable aspects of his theory, the principle of relativity and the light postulate. This conclusion required abandoning the view that there is such a thing as an unobservable time that grounds temporal order. This is the view that Einstein got from Hume.

You can listen to or read the entire essay at:
https://aeon.co/

David Hume

David Hume was a Scottish philosopher, historian, economist, and essayist, who is best known today for his highly influential system of philosophical empiricism, skepticism, and naturalism. Hume's empiricist approach to philosophy places him with John Locke, Francis Bacon and Thomas Hobbes as a British Empiricist.

Born: David Home, 7 May 1711, Edinburgh, Scotland

Died: Aug 25, 1776, Edinburgh, Scotland

Nationality: Scottish

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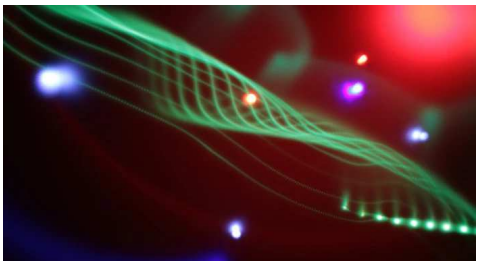
LINKS, COMMENTS AND OBSERVATIONS

Scientists Are 99% Sure They Just Detected a Black Hole Eating a Neutron Star



Black holes, neutron stars, and gravitational waves are deeply weird phenomena. Now, scientists are hyped about a new discovery that may involve all three.

Gravitational waves are ripples in the curvature of spacetime created by disturbances such as black hole collisions or the explosions of dying stars. Since scientists first detected a gravitational wave in 2016 - an achievement that earned the Nobel Prize in Physics - several other waves have been recorded, all of which were caused by mergers between black holes or collisions between neutron stars.

What has not yet been observed, however, is a collision between a black hole and a neutron star - until now… probably.

Recently, a gravitational wave called S190814bv was detected by the US-based Laser Interferometer Gravitational-Wave Observatory (LIGO) and its Italian counterpart Virgo. Based on its known properties, scientists think there is a 99% probability that the source of the wave is a black hole that ate a neutron star.

"We've never detected a neutron star and a black hole together," said Ryan Foley, an astronomer at UC Santa Cruz, in a phone call.

"If it turns out to be right, then we've confirmed a new type of star system. It's that fundamental."

Both black holes and neutron stars are made of stars that exploded and collapsed into stellar corpses. A black hole swallows anything that passes its outer edge, called the event horizon, including light. As a result, black hole mergers are largely invisible to light-based observatories, though several have been detected since the advent of gravitational wave astronomy.

A neutron star can be thought of as "an atom that's a couple times the mass of the Sun," Foley explained. All of that mass is crammed into a sphere with a diameter of about 12 miles, which makes neutron stars super-dense and extremely hot.

In contrast to black hole mergers, neutron star collisions do produce a lot of light. When a gravitational wave from a neutron star crash was detected in 2017, scientists were able to pinpoint bright emissions from the event - called an optical counterpart - in the days that followed the wave detection. This marked the dawn of a technique called "multi-messenger astronomy," in which scientists use multiple types of signals from space to examine astronomical objects.

Foley was part of the team that tracked down that first optical counterpart, a feat that has not yet been repeated. He and his colleagues are currently scanning the skies with telescopes, searching for any light that might have been radiated by the new suspected merger of a black hole and neutron star.

More at: https://www.vice.com/

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 (if you need the combination to the lock, please contact a member of the committee)

Articles Needed

NZ needs letters, articles, reviews or pictures related to astronomy.

"Let's think the unthinkable, let's do the undoable. Let us prepare to grapple with the ineffable itself, and see if we may not eff it after all"
Douglas Adams

"Without deviation from the norm, progress is not possible"
Frank Zappa

"Life is really simple, but we insist on making it complicated"
Confucius

"The important thing is not to stop questioning. Curiosity has its own reason for existing"
Albert Einstein

"Expect everything, I always say, and the unexpected never happens"
Norton Juster

"A person who never made a mistake never tried anything new"
Albert Einstein