New Zenith

The Monthly Newsletter of the Vectis Astronomical Society

Vol 28 Issue 11 — December/January 2020/21 *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

We are still unable to hold meetings during the current Covid-19 virus pandemic.

The Observatory is still closed and all of our monthly meetings are currently cancelled.

Latest News

Sorry, but we still can't open the observatory or restart meetings yet.

Work at the observatory continues and should be completed before we can re-open.

What a Year?

I can't imagine that any of us expected the events of 2020 back at this time in 2019. The year got off to a good start with everyone's plans and activities being arranged and finalised. Then a few rumours started about something going on in China and, all very quickly, things changed.

It's certainly been the strangest year I have ever experienced and I'm sure it's been pretty much the same for many VAS members. I have to thank all of you for your understanding and acceptance of what we've seen so far. Your support is really appreciated.

It's still too early to make definite plans for 2021 but we can begin talking about things we need or would like to achieve next year. If you have any ideas about what we should be doing, please contact any member of the committee or drop me an email (details over on the top right)

Thanks to everyone who has helped out in 2020 and, let's all look forward to a return to normality in the next few months.

Wishing everyone a Happy and Safe Christmas

Brian Curd

VAS Website: wightastronomy.org

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

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

Observatory Diary

The diary is currently empty!

VAS Website: wightastronomy.org

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*Also known as **NGC 2264, the Christmas Tree Cluster** is an open cluster of stars embedded in a diffuse nebula. This image taken in visible light also contains two famous nebulae.*

At the bottom center of the image is the Cone Nebula, and to the upper left is the Fox Fur Nebula.

When viewed upside-down, the entire cluster looks like a Christmas tree.

Image Credits: NASA/JPL-Caltech/P.S. Teixeira & C.J. Lada (CfA)/E.T. Young (U. Arizona)

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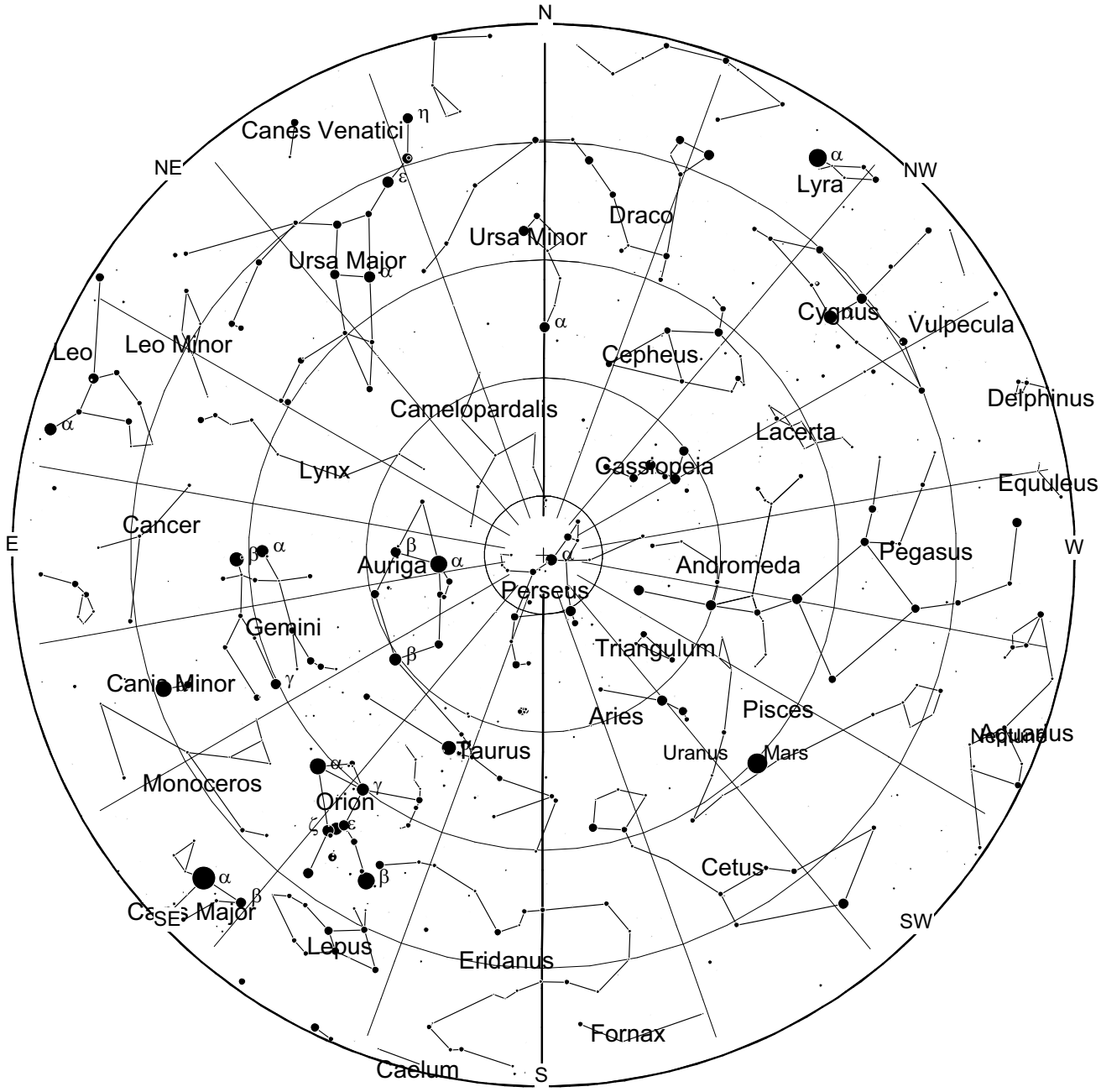
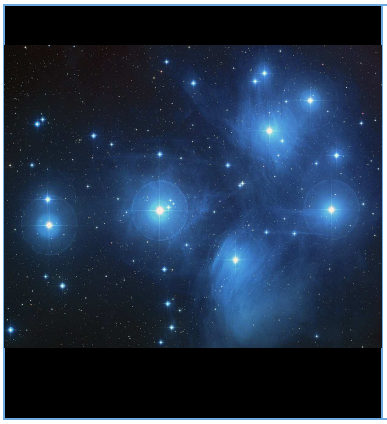
Important

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

DECEMBER 2020 SKY MAP



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

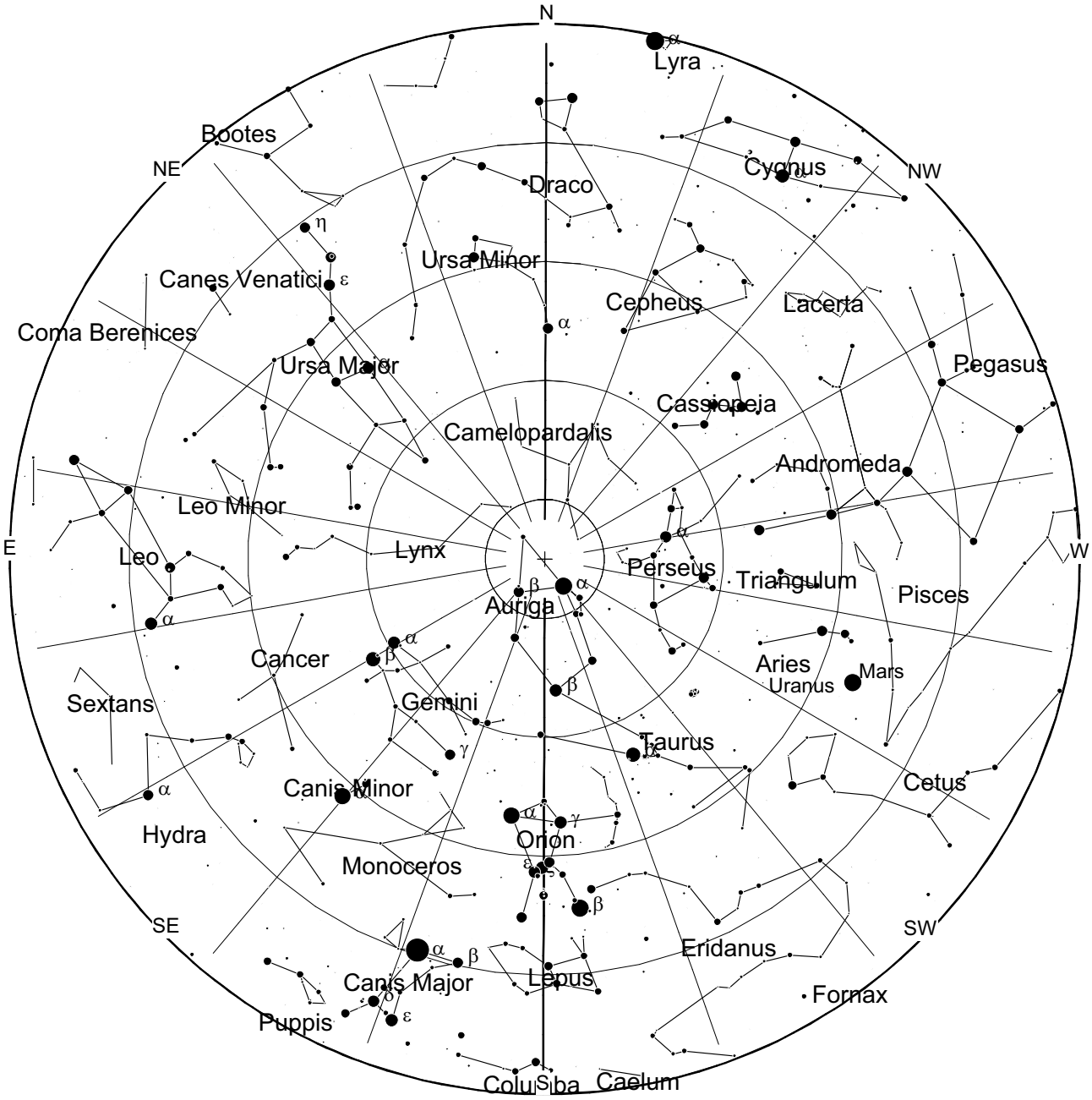


The Pleiades, also known as the Seven Sisters and Messier 45, is an open star cluster containing middle-aged, hot B-type stars in the north-west of the constellation Taurus. It is among the star clusters nearest to Earth, it is the nearest Messier object to Earth, and is the cluster most obvious to the naked eye in the night sky.

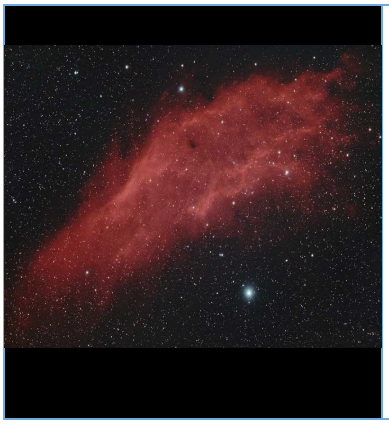
The cluster is dominated by hot blue and luminous stars that have formed within the last 100 million years. Reflection nebulae around the brightest stars were once thought to be left over material from the formation of the cluster, but are now considered likely to be an unrelated dust cloud in the interstellar medium through which the stars are currently passing.

Computer simulations have shown that the Pleiades were probably formed from a compact configuration that resembled the Orion Nebula. Astronomers estimate that the cluster will survive for about another 250 million years, after which it will disperse due to gravitational interactions with its galactic neighborhood.

JANUARY 2021 SKY MAP



View from Newchurch Isle of Wight UK - 2200hrs - 15 January 2021



The California Nebula (NGC 1499) is an emission nebula located in the constellation Perseus. It is so named because it appears to resemble the outline of the US State of California on long exposure photographs. It is almost 2.5° long on the sky and, because of its very low surface brightness, it is extremely difficult to observe visually. It can be observed with a Ha filter (isolates the Ha line at 656 nm) or Hß filter (isolates the Hß line at 486 nm) in a rich-field telescope under dark skies. It lies at a distance of about 1,000 light years from Earth. Its fluorescence is due to excitation of the Hß line in the nebula by the nearby prodigiously energetic O7 star, Xi Persei (also known as Menkib, seen at center below it in the inset at right).

The California Nebula was discovered by E. E. Barnard in 1884.

By coincidence, the California Nebula transits in the zenith in central California as the latitude matches the declination of the object.

DECEMBER/JANUARY 2020/21 NIGHT SKY

Moon Phases

	New	First Qtr	Full	Last Qtr
Dec	14th	21st	30th	8th
Jan	13th	20th	28th	6th
				

Winter Solstice

Winter Solstice, the point at which the Sun reaches its most southerly extent, occurs on December 21st at 09:59. From this moment onwards it starts it journey back to the north and northern hemisphere nights start to shorten, and days lengthen.

Planets

Venus

During December, Venus drops towards the rising Sun and during January disappears into the glare of the sunrise. It re-appears as the Evening Star later in the year.

Mars

At mid evening Mars remains a prominent object rising higher in the southern sky throughout the period. It is fading all the time and significantly fainter than when at its best in October. It still remains however a distinctly red hued object that is brighter than anything else in that part of the sky. The surface markings are now much less visible, but still worth observing.

Jupiter & Saturn

Both Jupiter and Saturn are close together in the southwestern sky after sunset and are both too low in the sky for serious observation. On the 21st they are in close conjunction with a separation of just 6 arc minutes. The available time for observing this phenomenon is quite short, they both set at 18:28, but will not be observable very close to the horizon.

After the first week of January they will be too close to the Sun to be observable until they re-appear in the morning sky.

Uranus

Uranus is close to the border between the constellations of Ares and Cetus in a part of the sky with very few guide stars. It can be found about 5° north of the fourth magnitude star Xi2 Ceti, See the finder chart in the August New Zenith. On January 19 Mars is about 1.5° to the northwest of Uranus.

Neptune

Neptune can be found about 1° east of the fourth magnitude star Phi Aquarii. During December it can be observed in the south form mid evening on until it sets. Once into January it starts to get rather low in the sky, but can be observed for a short while once the sky has darkened adequately, and before it has sunk too close to the horizon.

Mercury

Mercury makes an appearance in the evening sky during January. On the 10th and 11th it passes close underneath Saturn and Jupiter respectively. This may be difficult to observe as all objects are close to the Sun. Look to the west just after sunset using Jupiter it can be seen through the haze as a guide. It should be visible from about 16:30 for 15 or 20 minutes.

Azimuth and altitude for Mercury at 17:00						
Date	**Az**	**Alt**		**Date**	**Az**	**Alt**
13th	231	4		23rd	231	11
15th	231	5		25th	232	11
17th	230	7		27th	233	12
19th	230	8		29th	235	11
21st	230	10		31st	237	11

Deep Sky

M34
RA 2h 43m Dec 42° 48' mag 6.0

This open cluster in Perseus is a little smaller and slightly fainter than NGC752 it contains 70 to 80 stars and, as with most star clusters, it is best viewed using binoculars or a low magnification telescope.

M45 Pleiades
RA 3h 47m Dec 24° 13' mag 1.4

Known since ancient times as a herald of the wet season, the Pleiades is probably the most famous of all star clusters. It is an object that has something for all observers whether they are using naked eye, binoculars or a telescope.

NGC1499 California Nebula
RA 4h 1m Dec 36° 21' mag 5.0

This very large nebula can be found just to the north of Menkib, Xi Persei. Although it may have a magnitude of 5

this light is spread out over an area of some 2° x 1° making the surface brightness very low. It can be seen in large aperture binoculars and rich field telescopes but when using a telescope the magnification must be kept to the minimum available to stand any chance of seeing it. A hydrogen beta nebula filter will help to increase the contrast of the nebula. This is a good target for long exposure photography.

M103 Open Cluster
R.A. 1h 34m Dec 60° 42' mag 7.0

A celestial Christmas tree. This is a young cluster with many bright blue members, the brightest of which forms the star on top of the tree. It is a colourful cluster with a number of orange and yellow stars that make up the effect of Christmas tree lights. M103 is the last entry of Messier's catalogue, the remaining objects were added after his death based on his unpublished work.

Peter Burgess

WATER CAN BECOME TWO DIFFERENT LIQUIDS

Scientists discover that under certain conditions two kinds of water exist.

Water can be in two liquid states under cold temperatures, shows new research.

The scientists used x-ray lasers and computer simulations.

The discovery has applications across a variety of fields due to water's ubiquity.

Water is an essential life force for humanity and our planet. But despite it's omnipresence, there's much we have still to learn about the fateful combination of hydrogen and oxygen atoms that comprises this near-magical substance. Now a new study proves water can have two different liquid states, in one of its most unusual properties.

The research, carried out by an international team of researchers, involved sophisticated experiments with x-ray lasers and computer simulations. The team, led by chemical physics professor Anders Nilsson from Sweden's Stockholm University, also included CUNY professor Nicolas Giovambattista. He explained in a press release that while it's been proposed about 30 years ago that water may have two different liquid states, this "counterintuitive hypothesis" was been hard to prove, due to the complexity of the experiments necessary. Ice tends to form at the conditions when the two liquids should exist.

The liquid state of water that we all know and encounter in our daily lives is how water behaves at regular temperatures – around 25° Celsius (77° F). What the new study showed is that at low temperatures of around -63° C (-81° F), water can be found in two states: a low-density liquid at low pressures, and a high-density liquid at high pressures.

"What was special was that we were able to X-ray unimaginably fast, before the water froze, and could observe how one liquid transformed to the other", said professor Nilsson.

The researchers found that the difference in density between the two liquids was about 20 percent. A thin interface would form, given the right conditions, to separate the two kinds of water without mixing them. A similar phenomenon to what you observe when oil and water are combined.

The scientists think their find can affect a variety of scientific and engineering uses of water. "It remains an open question how the presence of two liquids may affect the behavior of aqueous solutions in general, and in particular, how the two liquids may affect biomolecules in aqueous environments," Giovambattista explained. "This motivates further studies in the search for potential applications."

Besides CUNY and Stockholm University, scientists from POSTECH University in Korea, PAL-XFEL in Korea, SLAC national accelerator laboratory in California, and St. Francis Xavier University in Canada were also involved in the study.

From: https://bigthink.com/

ARECIBO TELESCOPE COLLAPSED

The Arecibo telescope in Puerto Rico has collapsed less than two weeks after officials announced it was too dangerous to attempt repairs.

This aerial view shows the damage at the Arecibo Observatory after the 900-ton platform fell 140m (450 ft), taking the supporting cables with it, and smashing onto the radio dish below.
Credit: Ricardo Arduengo / AFP via Getty Images

Astronomers knew the clock was ticking for the iconic Arecibo radio telescope in Puerto Rico. Engineers had pronounced the second-largest radio dish in the world to be on the brink of collapse and too dangerous to try to repair.

At 7:55 a.m. local time on December 1st, that ticking clock struck midnight. The National Science Foundation is reporting that the 900-ton platform, suspended over the dish via multiple cables to three support towers, has fallen.

The 900-ton platform suspended above Arecibo came crashing down on December 1st, damaging the dish and surrounding facilities. Credit: UCF

It crashed into the dish and damaged surrounding facilities, ending any hopes of a more controlled decommissioning. No injuries were reported as a result of the collapse.

Staff member Jonathan Friedman, who lives near the telescope, reported to the Associated Press that he heard the collapse as a rumble. When he ran to a hill overlooking the natural sinkhole that's home to the massive 305-meter radio dish, he could see the dust cloud coming up from the collapsed structure.

The collapse follows two cable failures within four months. First, a support cable wrenched out of its socket on August 10th, then a main cable snapped on November 6th. Two weeks later, the NSF announced that it would dismantle the telescope, while still supporting other onsite facilities, such as the LIDAR facility for geospace research. While engineers had assessed the structure after the first cable failure and replacement parts were on order, the second failure suggested the system could collapse at any time. Each cable is 8.25 centimeters thick and made of 160 wires, but drone footage of the remaining cables to that tower showed individual wires were breaking daily.

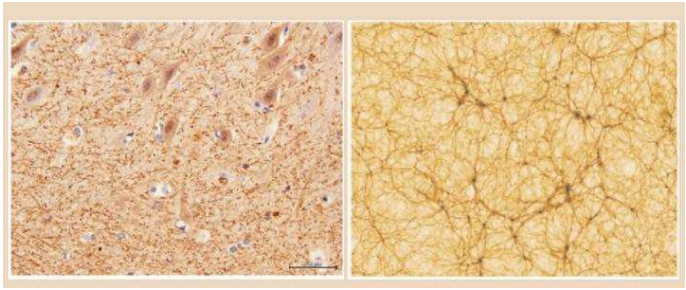
A preliminary assessment of the collapse indicates that the top section of all three of the support towers broke off. Then as the platform fell, the support cables also dropped. The falling cables seem to have significantly damaged the observatory's learning center.

The platform that collapsed was original to the 1960s construction but became significantly heavier in the 1990s, when new instruments were added. That upgrade — including a Gregorian reflector system to help focus radio signals and a powerful radar transmitter — made Arecibo the powerhouse radio observatory and radar facility it was until this past August. The upgrade also warranted additional support cables, and it was one of these support cables that came out of its socket in August. "[It] should not have failed the way it did," says Ashley Zauderer (NSF). "The team is looking very closely at why that happened."

"Our focus is now on assessing the damage, finding ways to restore operations at other parts of the observatory, and working to continue supporting the scientific community, and the people of Puerto Rico," says NSF director Sethuraman Panchanathan. Engineers and environmental workers are already arriving at the site to appraise the situation and begin repairs to the other onsite facilities.

Info and Links: https://skyandtelescope.org/

Does the human brain resemble the universe?



Left: section of cerebellum, with magnification factor 40x, obtained with electron microscopy (Dr. E. Zunarelli, University Hospital of Modena); right: section of a cosmological simulation, with an extension of 300 million light-years on each side (Vazza et al. 2019 A&A). CREDIT: University of Bologna

In their paper published in Frontiers of Physics, Franco Vazza (astrophysicist at the University of Bologna) and Alberto Feletti (neurosurgeon at the University of Verona) investigated the similarities between two of the most challenging and complex systems in nature: the cosmic network of galaxies and the network of neuronal cells in the human brain.

Despite the substantial difference in scale between the two networks (more than 27 orders of magnitude), their quantitative analysis, which sits at the crossroads of cosmology and neurosurgery, suggests that diverse physical processes can build structures characterized by similar levels of complexity and self-organization.

The human brain functions thanks to its wide neuronal network that is deemed to contain approximately 69 billion neurons. On the other hand, the observable universe can count upon a cosmic web of at least 100 billion galaxies. Within both systems, only 30% of their masses are composed of galaxies and neurons. Within both systems, galaxies and neurons arrange themselves in long filaments or nodes between the filaments. Finally, within both systems, 70% of the distribution of mass or energy is composed of components playing an apparently passive role: water in the brain and dark energy in the observable Universe.

Researchers compared a simulation of the network of galaxies to sections of the cerebral cortex and the cerebellum. The goal was to observe how matter fluctuations scatter over such diverse scales.

“We calculated the spectral density of both systems. This is a technique often employed in cosmology for studying the spatial distribution of galaxies”, explains Franco Vazza. “Our analysis showed that the distribution of the fluctuation within the cerebellum neuronal network on a scale from 1 micrometer to 0.1 millimeters follows the same progression of the distribution of matter in the cosmic web but, of course, on a larger scale that goes from 5 million to 500 million light-years”.

The two researchers also calculated some parameters characterizing both the neuronal network and the cosmic web: the average number of connections in each node and the tendency of clustering several connections in relevant central nodes within the network.

“Once again, structural parameters have identified unexpected agreement levels. Probably, the connectivity within the two networks evolves following similar physical principles, despite the striking and obvious difference between the physical powers regulating galaxies and neurons”, adds Alberto Feletti. “These two complex networks show more similarities than those shared between the cosmic web and a galaxy or a neuronal network and the inside of a neuronal body”.

The encouraging results of this pilot study are prompting the researchers to think that new and effective analysis techniques in both fields, cosmology, and neurosurgery, will allow for a better understanding of the routed dynamics underlying the temporal evolution of these two systems.

Geminid meteor shower is born from a humble asteroid

On Sunday night, December 13, countless meteors will shoot across the sky as space particles burn up in our atmosphere and meet a fiery end. Most meteor showers occur when Earth slams into debris left behind by a comet. But not this meteor shower, which is likely to be the most spectacular of the year. Known as the Geminid shower, it strikes every December and arises not from a flamboyant comet but from an ordinary asteroid - the first, but not the last, linked to a meteor shower.

Although both comets and asteroids are small objects orbiting the sun, icy comets sprout beautiful tails when

their ice vaporizes in the heat of the sun. In contrast, asteroids have earned the name "vermin of the skies" for streaking through and ruining photographs of celestial vistas by reflecting the sun's light.

Astronomers still don't know the secret to the asteroid's success in creating a shower that at its peak normally produces more meteors per hour than any other shower of the year. Three years ago, however, the asteroid swung extra close to Earth and gave scientists their best chance to study the humble space rock. They now look forward to the launch of a spacecraft that will image the asteroid's surface.

Cosmic Connections

Astronomers first linked a meteor shower to a comet in 1866. They connected the well-known Perseid meteors, visible to most of the world every August, with a comet named Swift-Tuttle that had passed Earth four years earlier. Astronomers later matched most major meteor showers with one comet or another.

When a comet's ice vaporizes in sunlight, dust grains also fly off the comet. These dust particles, called meteoroids, sprinkle along the comet's orbit. If Earth plows into this long dust stream, we see a fiery shower as the particles hit our atmosphere. The typical meteoroid is no larger than a grain of sand, but it travels so fast that it energizes electrons both in its own atoms as it disintegrates and in atmospheric atoms and molecules. As these electrons lose energy, they emit the streak of light - the meteor - that looks as though a star has fallen from the sky.

Still, as comet after comet was linked to different meteor showers, the Geminids remained apart; no one knew their source.

The Geminid meteors stood out in other ways, too. Unlike the Perseid meteors, which people have been observing for nearly 2,000 years, the Geminids are relatively new. First reports of their existence came from England and the United States in 1862. The shower in those days was weak, producing at most only one or two dozen meteors an hour. During the 20th century, however, the shower strengthened. Nowadays, at the shower's peak, a single observer under a dark sky can see more than 100 meteors an hour.

On top of that, the Geminid meteoroid stream, the ribbon of dust that traces the asteroid's orbit around the sun, is newer than many other streams. Over time, streams spread out, but this one is so narrow it must have formed less than 2,000 years ago and maybe only a few hundred years ago. And astronomers deduced that Geminid meteoroids are fairly dense, about three times as dense as water and twice as dense as the Perseid meteoroids.

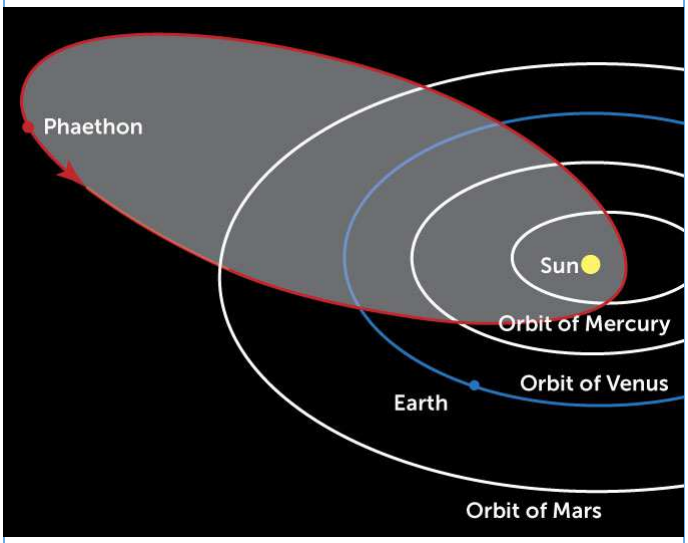
In 1983, astronomers finally found the Geminids' parent. Jewitt, then a graduate student at Caltech, remembers walking home one January evening when he happened to see a rocket lift off from a military base. "I assumed it was an ICBM or something that the Air Force was launching to test," he says. Instead, it was a heat-seeking spacecraft named the Infrared Astronomical Satellite.

In October of that year, the satellite discovered a small asteroid. To Harvard astronomer Fred Whipple, best known for his "dirty snowball" model of comets, that small object stood out. It followed the same path around the sun as the particles in the Geminid meteoroid stream. Half a century earlier, Whipple himself had determined the orbit of the meteoroids by photographing the paths of the meteors against the sky. The newfound asteroid, Whipple declared, must be their long-sought source. The find also explained why the meteoroids were so dense: They come from a space rock rather than an icy comet.

The asteroid orbits the sun every 1.43 years and comes very close to it, cutting well inside the orbit of Mercury,. Astronomers therefore christened the asteroid Phaethon, a son of Helios the sun god in Greek mythology. At its farthest, Phaethon ventures beyond the orbit of Mars and reaches the asteroid belt, home of the largest space rocks, between the paths of Mars and Jupiter.

Meteor-Maker

The asteroid Phaethon, which produces the annual Geminid meteor shower, orbits the sun on a highly elliptical path that takes the small body from well inside the orbit of Mercury to beyond the orbit of Mars.



Credit: T. TIBBITTS. Source: JPL-CALTECH/NASA

Much More at: https://www.sciencenews.org/article/geminid-meteor-shower-december-asteroid-phaethon

AUSTRALIAN TELESCOPE CREATES NEW ATLAS OF THE UNIVERSE

The *Australian Square Kilometre Array Pathfinder (ASKAP)*, developed and operated by Australia's national science agency, CSIRO, mapped approximately three million galaxies in just 300 hours.

The Rapid ASKAP Continuum Survey is like a Google map of the universe where most of the millions of star-like points on the map are distant galaxies - about a million of which we've never seen before.

CSIRO Chief Executive Dr. Larry Marshall said ASKAP brought together world-class infrastructure with scientific and engineering expertise to unlock the deepest secrets of the universe.

"ASKAP is applying the very latest in science and technology to age-old questions about the mysteries of the universe and equipping astronomers around the world with new breakthroughs to solve their challenges," Dr. Marshall said.

"It's all enabled by innovative receivers developed by CSIRO that feature phased array feed technology, which see ASKAP generate more raw data at a faster rate than Australia's entire internet traffic.

"In a time when we have access to more data than ever before, ASKAP and the supercomputers that support it are delivering unparalleled insights and wielding the tools that will underpin our data-driven future to make life better for everybody.

"Minister for Industry, Science and Technology, Karen Andrews said ASKAP is another outstanding example of Australia's world-leading radio astronomy capability.

"ASKAP is a major technological development that puts our scientists, engineers and industry in the driver's seat to lead deep space discovery for the next generation.

This new survey proves that we are ready to make a giant leap forward in the field of radio astronomy," Minister Andrews said.

The telescope's key feature is its wide field of view, generated by new CSIRO-designed receivers, that enable ASKAP to take panoramic pictures of the sky in amazing detail.

Using ASKAP at CSIRO's Murchison Radio-astronomy Observatory (MRO) in outback Western Australia, the survey team observed 83% of the entire sky.

This record-breaking result proves that an all-sky survey can be done in weeks rather than years, opening new opportunities for discovery. The new data will enable astronomers to undertake statistical analyses of large populations of galaxies, in the same way social researchers use information from a national census.

"This census of the universe will be used by astronomers around the world to explore the unknown and study everything from star formation to how galaxies and their super-massive black holes evolve and interact," lead author and CSIRO astronomer Dr. David McConnell said.

With ASKAP's advanced receivers the RACS team only needed to combine 903 images to form the full map of the sky, significantly less than the tens of thousands of images needed for earlier all-sky radio surveys conducted by major world telescopes.

"For the first time ASKAP has flexed its full muscles, building a map of the universe in greater detail than ever before, and at record speed. We expect to find tens of millions of new galaxies in future surveys," Dr. McConnell said.

The 13.5 exabytes of raw data generated by ASKAP were processed using hardware and software custom-built by CSIRO. The Pawsey Supercomputing Centre's Galaxy supercomputer converted the data into 2-D radio images containing a total of 70 billion pixels. The final 903 images and supporting information amount to 26 terabytes of data.

Pawsey Executive Director Mark Stickells said the supercomputing capability was a key part of ASKAP's design.

From: https://phys.org/

Gravitational Lenses Measure Universe Expansion

t's one of the big cosmology debates: The universe is expanding, but how fast exactly? Two available measurements yield different results. Leiden physicist David Harvey adapted an independent third measurement method using the light warping properties of galaxies predicted by Einstein. He published his findings in the Monthly Notices of the Royal Astronomical Society.

We've known for almost a century about the expansion of the universe. Astronomers noted that the light from faraway galaxies have a lower wavelength than galaxies close by. The light waves seem stretched, or redshifted, which means that those far galaxies are moving away.

This expansion rate, called the Hubble constant, can be measured. Certain supernovas, or exploding stars, have a well-understood brightness; this makes it possible to estimate their distance from Earth and relate that distance to their redshift or speed. For every megaparsec of distance (a parsec is 3.3 light-years), the speed that galaxies recede from us, increases with 73 kilometers per second.

Einstein

However, increasingly accurate measurements of the cosmic microwave background, a remnant of light in the very early universe, yielded a different Hubble constant: about 67 kilometers per second.

How can that be? Why the difference? Could this difference tell us anything new about the universe and physics? “This,” says Leiden physicist David Harvey, “is why a third measurement, independent from the other two, has come into view: gravitational lenses.”

Albert Einstein's theory of general relativity predicts that a concentration of mass, such as a galaxy, can bend the path of light, much like a lens does. When a galaxy is in front of a bright light source, the light is bent around it and can reach Earth via different routes, providing two, and sometimes even four, images of the same source.

In 1964, the Norwegian astrophysicist Sjur Refsdal had an “a-ha” moment: When the lensing galaxy is a bit off-center, one route is longer than the other. That means that the light takes longer by that path. So when there is a variation of the brightness of the quasar, this blip will be visible in one image before the other. The difference could be days, or even weeks or months.

This timing difference, Refsdal showed, can also be used to pin down distances to the quasar and the lens. Comparing these with the redshift of the quasars gives you an independent measurement of the Hubble constant.

A research collaboration under the HoliCOW project used six of these lenses to narrow down the Hubble constant to about 73. However, there are complications: apart from the distance difference, the mass of the foreground galaxy also exerts a delaying effect, depending on the exact mass distribution. “You have to model that distribution, but a lot of unknowns remain,” says Harvey. Uncertainties like this limit the accuracy of this technique.

Imaging the Whole Sky

This could change when a new telescope sees first light in Chile in 2021. The Vera Rubin Observatory is dedicated to imaging the whole sky every few nights, and is expected to image thousands of double quasars, offering a chance to narrow down the Hubble constant even further.

Harvey says, “The problem is that modeling all those foreground galaxies individually is impossible computationally.” So instead, Harvey designed a method to calculate the average effect of a full distribution of up to 1,000 lenses.

“In that case, individual quirks of the gravitational lenses are not that important, and you don't have to do simulations for all the lenses. You just have to make sure that you model the entire population,” says Harvey.

“In the paper, I show that with this approach, the error in the Hubble constant thresholds at 2% when you approach thousands of quasars.”

This error margin will allow a meaningful comparison between the several Hubble constant candidates, and could help in understanding the discrepancy. “And if you want to go below 2%, you have to improve your model by doing better simulations. My guess is that this would be possible.”

More & Video: https://phys.org/news/2020-11-gravitational-lenses-universe-expansion.html

THE BACK PAGE

LINKS, COMMENTS AND OBSERVATIONS

A Little Quiz for Christmas

1. Ariel, Umbriel, Miranda, Titania and Oberon are all moons of which planet?
2. Which is the largest planet in the Solar system?
3. What is the brightest object in the night sky?
4. The Sun being the centre of the Solar System was first proposed by which astronomer?
5. Vesta is the third largest what?
6. Which present day country was the launch site for manned Soviet Union space flights?
7. Which planet did space probe Mariner 9 visit in 1971?
8. Name the Russian space station that operated in low Earth orbit from 1986 to 2001?
9. Name the comet that completes an orbit of the Sun once every three years — the shortest period of any known comet?
10. Which planet is nearest the earth: Mars or Venus?
11. Name the nearest known star to the Sun?
12. Which rare astronomical event occurs when a high-mass star reaches the end of its life?
13. The Shoemaker-Levy 9 comet smashed into which planet in July 1994?
14. Name the brightest star in the constellation Ursa Minor?
15. Which astronomer is best known for his laws of planetary motion?
16. In 1610, who discovered the four largest moons of Jupiter using a telescope?
17. The Sun is composed primarily of which chemical element?
18. Which astronomer proposed an equation to work out how many civilizations there could be in our galaxy?
19. Name the galaxy that contains the Solar System?
20. What unit of length is equal to about 3.26 light-years?

Answers on Page 2 - Good Luck!

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.

"The history of astronomy is a history of receding horizons"
Edwin Hubble

"Do not take life too seriously. You will never get out of it alive"
Elbert Hubbard

"By all means let's be open-minded, but not so open-minded that our brains drop out"
Richard Dawkins

"I love fools' experiments. I am always making them"
Charles Darwin

"The chief function of the body is to carry the brain around"
Thomas Edison

"I once bought my kids a set of batteries for Christmas with a note on it saying, toys not included"
Bernard Manning

"Geologists have a saying - rocks remember"
Neil Armstrong