New Zenith

The Monthly Newsletter of the Vectis Astronomical Society

Vol 29 Issue 9 — October 2021 *When Printed, this Newsletter costs VAS at least £1*

Society News

The Observatory

It appears that Summer is definitely over now as the nights are getting darker (and colder).

We have had some visitors to the Observatory in the last few weeks but numbers attending are still a long way from the usual.

No fault of anyone; as the number of positive Covid tests on the Island is still rising uncomfortably quickly and I am quite sure many members prefer to stay away from any sort of crowd or public gathering.

Your Committee is still meeting and events are being arranged and we will carry on, hoping for a real return to normal some time soon.

Feel free to join us on a Thursday evening, it really would be good to see you!

2022 Project Suggestions Welcomed

It's been a difficult time to do any serious astronomy for a while now but it would be nice to get fully started again.

How about that favourite astronomical subject of yours that you haven't ever quite gotten around to?

There are always jobs that ***need*** to be done at or around the Observatory but, we need a list of things that members ***want*** to do as well.

Rather than keep guessing what you want, here's is a chance to tell us.

Of course ongoing stuff like Dark Skies support will continue but there are lots of other things we could do, or at least attempt, with the support of you the members.

Come on, send us a challenge and we will do our best to turn it into a project for the whole Society.

Brian Curd

VAS Website: wightastronomy.org

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

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PO36 8EE
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

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

2021 Monthly Meetings

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

Date	Subject	Speaker
26 Mar	Space Traffic Control	Dr Stuart Eves
23 Apr	HOYS	Dirk Froebrich
28 May	Can we live on Mars?	Greg Smye-Rumsby
25 Jun	The Astronomy of Robert Hooke in Context	Paul Bingham
Jul	No Meeting	
27 Aug	**AGM followed by open meeting**	
24 Sep	Two Eyes are Better than One - Binocular Astronomy	Stephen Tonkin
22 Oct	Gravitational Waves	Dr Laura Nuttall
26 Nov	**Martin Lunn John Goodricke and Edward Pigott the 'Fathers of Variable Star Astronomy**	**This will be a Zoom Meeting**

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.

VAS Contacts 2021

President	Barry Bates president@wightastronomy.org
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Others	Dudley Johnson

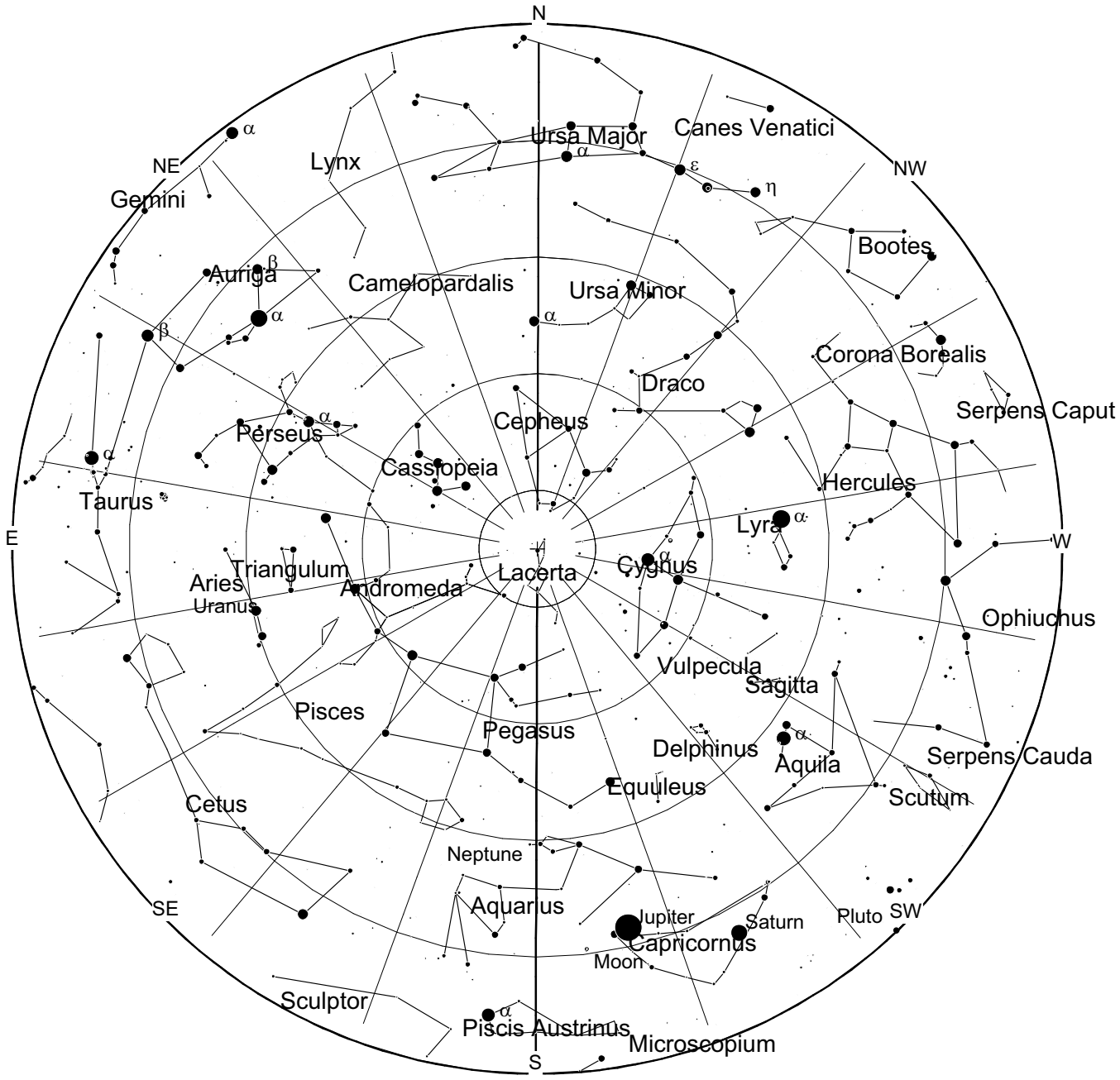
Important

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.

October 2021 - Sky Map



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

NGC 7662 (also known as the Blue Snowball Nebula, Snowball Nebula, and Caldwell 22) is a planetary nebula located in the constellation Andromeda.

NGC 7662 is a popular planetary nebula for casual observers. A small telescope will reveal a star-like object with slight nebulosity. A 6" telescope with a magnification around 100x will reveal a slightly bluish disk, while telescopes with a primary mirror at least 16" in diameter may reveal slight colour and brightness variations in the interior.

October 2021- Night Sky

Moon Phases

New	First Qtr	Full	Last Qtr
7th	13th	20th	29th
			

Planets

Mercury

Mercury makes a morning apparition towards the end of the month. The table shows the altitude and azimuth of Mercury at 0700BST.

Altitude & Azimuth for Mercury at 0700BST						
Date	**Alt**	**Az**		**Date**	**Alt**	**Az**
16	5	103		24	9	107
18	7	105		26	9	109
20	9	106		28	9	108
22	9	106		30	7	108
22	9	107		1 Nov	6	108

Venus

At sunset Venus can be seen just above the horizon in the south-western sky. It is not well placed for observation during this apparition, setting only about an hour after the Sun.

Mars

Mars is in conjunction with the Sun this month and as such is not visible until the end of the year.

Jupiter

As the sky darkens after sunset Jupiter can be found in the south-east. It is brighter than any star in that part of the sky and can be seen soon after sunset before the sky is completely dark. It is best placed for observation when it is due south which is in the mid evening. By midnight it is too close to the horizon for observation.

Saturn

At about an hour after sunset Saturn can be found in the south, about an outstretched hand's width to the right and slightly lower than the much brighter Jupiter. Next to Jupiter Saturn is the brightest star like object in that part of the sky.

Uranus

Uranus is in the constellation of Aries, but the nearest bright star, about 5 degrees away is the 4th magnitude Mu Ceti in the constellation of Cetus. The easiest way to locate this planet is by using a planetarium program to plot its position at the time of observation. The finder chart in the September New Zenith will help.

Neptune

Like Uranus, Neptune is also located in a part of the sky devoid of bright guide stars. It is about 4 degrees east of the 4th magnitude Phi Aquarii. Again a computer generated star map for the time of observation will assist in locating the planet. At magnitude 8 a small telescope or pair of binoculars will be needed for observation.

Deep Sky

NGC7662 Planetary Nebula
RA 23h 26m Dec 42° 32' mag 8.3

A small but relatively bright planetary nebula sometimes referred to as the blue snowball. The planetary is only about a quarter the size of the famous Ring Nebula, but being bright takes magnification well. A large telescope is needed to reveal a central void and the 13th magnitude white dwarf that powers the surrounding nebula.

NGC6946 Galaxy
RA 20h 35m Dec 60° 11' mag 9.7

Located just off the plane of the Milky Way, the intervening material in our own galaxy helps makes this face on spiral galaxy represents a rather challenging object. At a distance of about 10M light years it is relatively close by galactic standards, but this does not make it any easier to see. Use as large an instrument as you can on this galaxy to reveal the structure in the spiral arms. This galaxy has hosted 8 supernovae in the past 90 years, something of a record. After observing this galaxy or if the sky or your eyes fail you with this target, stop by at the nearby open cluster NGC6939. At low power both object will be in the same field of view.

NGC6910 Open Cluster
RA 20h 23m Dec 40° 48' mag 7.4

NGC6910 is a small cluster located about ½ degrees north of Sadr the central star of Cygnus. The brighter members make a cluster of three short spokes.

Peter Burgess

Antennas Searching for Extraterrestrials Threatened by Wildfire

View of the Dixie Fire from the Allen Telescope Array in Hat Creek, CA. Credit: Alex Pollak

The Allen Telescope Array, an ensemble of 42 antennas used in the search for extraterrestrial intelligence (SETI), is once again threatened by wildfires. The scientists and engineers normally on-site have been evacuated as a precautionary measure, and in response to an order from the Shasta County Sheriff's Office.

The Dixie Fire, which is currently approximately 12 miles south of the Array, covers just short of a million acres, or an area larger than the state of Rhode Island. It ranks as the second-largest fire in California history, just shy of last year's August Complex fire. Now 59 percent contained, it is one of eight major conflagrations in northern California.

It is an unfortunate fact that environments that are suitable for radio telescopes - including the Allen Telescope Array - are also frequently places where wildfires are commonplace. Since microwaves, the type of radio signals sought by the Array, are not hampered by Earth's atmosphere, there's no reason to place such instruments on mountain tops, as is done for optical telescopes.

But like their mirror-and-lens cousins, radio telescopes are generally located in rural areas. The signals sought by the Allen Array are presumed to be extremely faint, and radio quiet is a necessity. The Hat Creek Radio Observatory, where the Array is located, was established in 1959 and is now run by the SETI Institute. It was deliberately situated in a region of low population density. The surrounding landscape consists of pasture and forest land. On most days there are more cattle near the site than people.

According to Alex Pollak, the Array's Science and Engineering Operations Manager, the fire's slow northward march has provoked the need for evacuation. Anticipating the possibility that it might reach the antennas; the observatory staff contacted the U.S. Forest Service's Fire Department to prepare the site against eventual damage. Two teams from the Forest Service, about a dozen people in total, removed brush from near the antennas. Trees in the area were pruned of any branches lower than ten feet above the ground.

This is not the first time the Array has been threatened. In the summer of 2014, the so-called Eiler fire reached State Highway 89, approximately two miles from the antennas. The mom-and-pop Circle K restaurant, the only public dining facility in Hat Creek, met its end in that conflagration.

The Allen Telescope Array is a unique facility. It is the only radio telescope constructed with SETI as a principal activity. It's 42 telescopes are currently being refurbished with more sensitive receivers and follow-on electronics that will greatly speed the search for signals that would prove the presence of technological societies in other star systems. This upgrade is funded by Franklin Antonio, a co-founder of the California semiconductor company, Qualcomm.

As of writing, there are more than 4,000 firefighters battling the Dixie Fire, and the hope is that it will not reach the Observatory. But as Pollak notes, climate change has made "the entire west coast more susceptible to fire. The situation is not getting better."

Link: https://phys.org/

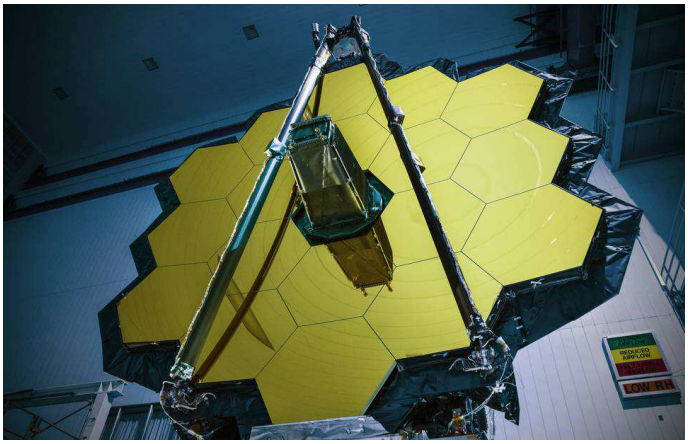
A New Window to the Early Universe (and Aliens?)

The upcoming launch of the James Webb Space Telescope is the event of a lifetime.

The history of science could be written as a history of instrumentation. From particle accelerators and microscopes to fMRIs and telescopes, as instruments become more powerful, they act as reality amplifiers: they magnify our view of the very small and the very large, allowing us a glimpse of what is invisible to the human eye.

It is hard to imagine that, up to 1609, all we knew about the skies depended on what we can see with the naked eye. When Galileo Galilei had the insight to aim his telescope at the night sky, he saw what no human had seen before: a new sky, full of surprises and possibility. This new sky would reveal a new world order: out with the Aristotelian

view of an Earth-centered cosmos, a frozen sky where celestial objects were perfect and unchangeable, and in with a marvellously imperfect heaven — a moon full of craters and mountains, Jupiter with four orbiting moons (now we know there are about 79 and counting), a Saturn with "ears" (that is, the rings that his telescope could not yet resolve), and a Milky Way made of a countless number of stars. New instruments hold the promise of a world view transformation: as we look deep into nature, our vision of reality and us in it changes.



Two Big Missions for James Webb Space Telescope

The JWST is designed to capture mostly infrared light, which is of a longer wavelength than what our eyes can see. The focus on infrared comes from the two main missions for the telescope.

The first is to look into the very young universe by observing very far away objects, nascent galaxies and stars born about 13 billion years ago, which was only a few hundred million years after the Big Bang. (In cosmology, the science of our cosmic history, hundreds of millions of years is not a long time.) Contrary to Hubble, which had a near-Earth orbit, the JWST will be stationed far away, at 1.5 million kilometers from Earth at a spot known as a Lagrange point, where the gravitational attractions of sun and Earth cancel out — a peaceful cosmic parking spot.

After taking off inside an Ariane 5 rocket from the European Space Agency, the JWST will continue for another twenty-nine days until it gets to its final destination. The good thing about the Lagrange point is its remoteness and thus distance from interfering infrared sources near Earth. To make the shielding even more effective, the telescope comes with five layered sheets of Kapton foil, a sort of space umbrella to stop radiation interference. At the size of a tennis court, the shields are programmed to open during the telescope's migration to its final position. The bad thing about being stationed so far away from Earth is that if something goes wrong, we cannot go there to fix it, as we had to with the Hubble Space Telescope. Anxiety rises.

The "eyes" of the telescope are made of 18 hexagonal, gold-coated, beryllium mirrors, making up a giant honeycomb the size of a large house. The mirrors will capture and focus light from distant sources that will then be sent off to the telescope's four different instruments. The mirrors must also unfurl in space, another nerve-wracking step before astrophysicists can start to gather data.

The second big mission is to aim its sights on exoplanets, planets orbiting stars in our galactic neighborhood, for signs of life. A little over 20 years ago, astronomers detected the first alien worlds outside our solar system. Since then, the list has grown steadily to over four thousand confirmed exoplanets today. The essential question, of course, is whether some of these worlds may harbor life. We may not be able to travel across interstellar distances to see for ourselves, but our machines can scrutinize these worlds by detecting the chemical composition of their atmospheres in the hope of finding the telltale signs of life: mainly oxygen, water, carbon dioxide, and methane. Thus, JWST aims to map out other worlds that may resemble our own, addressing the age-old question of whether we are alone in the universe.

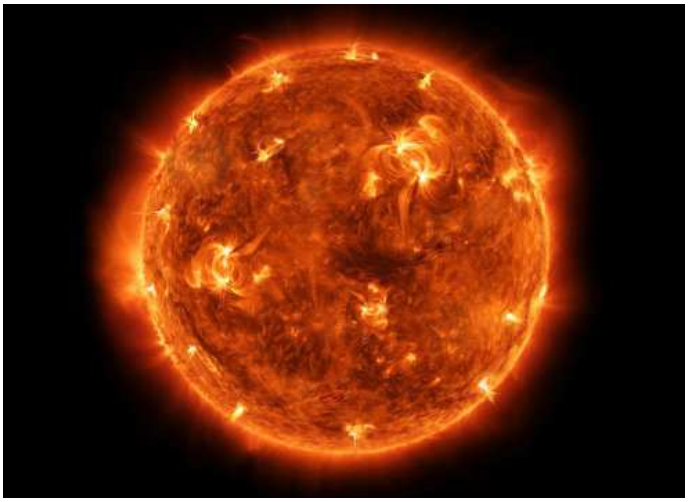
An Early Christmas Present

The current launch date is December 18, a week before Christmas. As with any space launch of a complex instrument, there are many things that could go wrong, although extensive testing has built up confidence that all will go smoothly. Regardless, we only will succeed in stretching the boundaries of knowledge by taking risks. The launch will be a gripping moment for humanity. What will a new window opening to the sky reveal about our story?

Unless you are lost to the power of wonder, a mission like this must capture your imagination. We all want this spectacular mission to succeed, astrophysicists and non-astrophysicists alike. We care about worlds so far away from us because the story this machine will tell is a mirror of our own. As we witness stars and galaxies being born, we learn about our galaxy and how our solar system emerged a little under five billion years ago. We learn about the myriad ways that gravity and chemistry conspired to bake matter into worlds, each different, some potentially thriving with life like our own. And with each discovery, we dive a little deeper into the mystery of who we are and of what makes us both alike and different from what is out there in the universe.

Link: https://bigthink.com/

Have we detected dark energy? Scientists say it's a possibility



A new study, led by researchers at the University of Cambridge and reported in the journal Physical Review D, suggests that some unexplained results from the XENON1T experiment in Italy may have been caused by dark energy, and not the dark matter the experiment was designed to detect.

They constructed a physical model to help explain the results, which may have originated from dark energy particles produced in a region of the Sun with strong magnetic fields, although future experiments will be required to confirm this explanation. The researchers say their study could be an important step toward the direct detection of dark energy.

Everything our eyes can see in the skies and in our everyday world makes up less than five percent of the universe. The rest is dark. About 27% is dark matter -- the invisible force holding galaxies and the cosmic web together -- while 68% is dark energy, which causes the universe to expand at an accelerated rate.

To detect dark energy, scientists generally look for gravitational interactions: the way gravity pulls objects around. And on the largest scales, the gravitational effect of dark energy is repulsive, pulling things away from each other and making the Universe's expansion accelerate.

About a year ago, the XENON1T experiment reported an unexpected signal, or excess, over the expected background. "These sorts of excesses are often flukes, but once in a while they can also lead to fundamental discoveries," said Dr Luca Visinelli, a researcher at Frascati National Laboratories in Italy, a co-author of the study. "We explored a model in which this signal could be attributable to dark energy, rather than the dark matter the experiment was originally devised to detect."

At the time, the most popular explanation for the excess were axions -- hypothetical, extremely light particles -- produced in the Sun. However, this explanation does not stand up to observations, since the amount of axions that would be required to explain the XENON1T signal would drastically alter the evolution of stars much heavier than the Sun, in conflict with what we observe.

We are far from fully understanding what dark energy is, but most physical models for dark energy would lead to the existence of a so-called fifth force. There are four fundamental forces in the universe, and anything that can't be explained by one of these forces is sometimes referred to as the result of an unknown fifth force.

However, we know that Einstein's theory of gravity works extremely well in the local universe. Therefore, any fifth force associated to dark energy is unwanted and must be 'hidden' or 'screened' when it comes to small scales, and can only operate on the largest scales where Einstein's theory of gravity fails to explain the acceleration of the Universe. To hide the fifth force, many models for dark energy are equipped with so-called screening mechanisms, which dynamically hide the fifth force.

Vagnozzi and his co-authors constructed a physical model, which used a type of screening mechanism known as chameleon screening, to show that dark energy particles produced in the Sun's strong magnetic fields could explain the XENON1T excess.

"Our chameleon screening shuts down the production of dark energy particles in very dense objects, avoiding the problems faced by solar axions," said Vagnozzi. "It also allows us to decouple what happens in the local very dense Universe from what happens on the largest scales, where the density is extremely low."

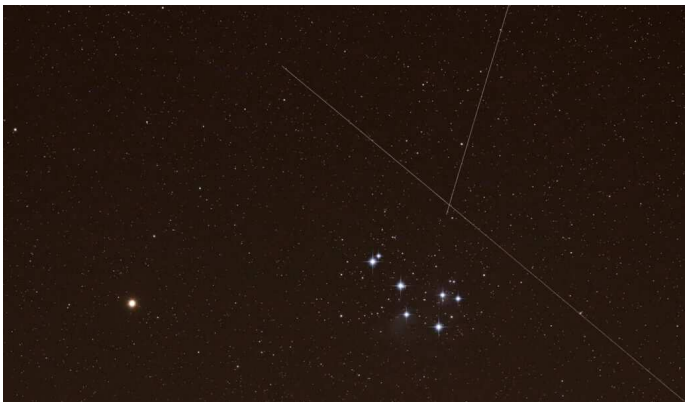
The researchers used their model to show what would happen in the detector if the dark energy was produced in a particular region of the Sun, called the tachocline, where the magnetic fields are particularly strong.

Their calculations suggest that experiments like XENON1T, which are designed to detect dark matter, could also be used to detect dark energy. However, the original excess still needs to be convincingly confirmed. "We first need to know that this wasn't simply a fluke," said Visinelli. "If XENON1T actually saw something, you'd expect to see a similar excess again in future experiments, but this time with a much stronger signal."

If the excess was the result of dark energy, upcoming upgrades to the XENON1T experiment, as well as experiments pursuing similar goals such as LUX-Zeplin and PandaX-xT, mean that it could be possible to directly detect dark energy within the next decade.

Link: https://www.sciencedaily.com/

Satellite Swarms May Outshine the Night Sky's Natural Constellations



Artificial satellites like SpaceX's Starlink constellations will leave streaks in photos of the sky taken by researchers and amateur astronomers alike. This photo shows Mars (left) and the Pleiades star cluster with light trails from two Starlinks crisscrossing the scene.

Christophe Lehenaff/moment/getty Images Plus

Companies like SpaceX and Amazon have launched hundreds of satellites into low orbits since 2019, with plans to launch thousands more in the works - a trend that's alarming astronomers. The goal of these satellite "mega-constellations" is to bring high-speed internet around the globe, but these bright objects threaten to disrupt astronomers' ability to observe the cosmos.

A new simulation of the potential positions and brightness of these satellites shows that, contrary to earlier predictions, casual sky watchers will have their view disrupted, too. And parts of the world will be affected more than others, astronomer Samantha Lawler of the University of Regina in Canada and her colleagues report in a paper posted September 9 at arXiv.org.

"How will this affect the way the sky looks to your eyeballs?" Lawler asks. "We humans have been looking up at the night sky and analyzing patterns there for as long as we've been human. It's part of what makes us human." These mega-constellations could mean "we'll see a human-made pattern more than we can see the stars, for the first time in human history."

Flat, smooth surfaces on satellites can reflect sunlight depending on their position in the sky. Earlier research had suggested that most of the new satellites would not be visible with the naked eye.

Lawler, along with Aaron Boley of the University of British Columbia and Hanno Rein of the University of Toronto at Scarborough in Canada, started building their simulation with public data about the launch plans of four companies - SpaceX's Starlink, Amazon's Kuiper, OneWeb and StarNet/GW - that had been filed with the U.S. Federal Communications Commission and the International Telecommunications Union. The filings detailed the expected orbital heights and angles of 65,000 satellites that could be launched over the next few years.

There are currently about 7,890 objects in Earth orbit, about half of which are operational satellites, according to the U.N. Office for Outer Space Affairs. But that number is increasing fast as companies launch more and more satellites. In August 2020, there were only about 2,890 operational satellites.

Next, the researchers computed how many satellites will be in the sky at different times of year, at different hours of the night and from different positions on Earth's surface. They also estimated how bright the satellites were likely to be.

That calculations required a lot of assumptions because companies aren't required to publish details about their satellites like the materials they're made of or their precise shapes, both of which can affect reflectivity. But there are enough satellites in orbit that Lawler and colleagues could compare their simulated satellites to the light reflected down to Earth by the real ones.

The simulations showed that "the way the night sky is going to change will not affect all places equally," Lawler says. Naked-eye stargazing will be most affected at latitudes 50° N and 50° S, regions that cross lower Canada, much of Europe, Kazakhstan and Mongolia, and the southern tips of Chile and Argentina.

"The geometry of sunlight in the summer means there will be hundreds of visible satellites all night long," Lawler says. "It's bad everywhere, but it's worse there." For her, this is personal: She lives at 50° N.

Closer to the equator, where many research observatories are located, there is a period of about three hours in the winter and near the time of the spring and fall equinoxes with few or no sunlit satellites visible. But there are still hundreds of sunlit satellites all night at these locations in the summer.

A few visible satellites can be a fun spectacle, Lawler concedes. "I think we really are at a transition point here where right now, seeing a satellite, or even a Starlink train, is cool and different and wow, that's amazing," she says. "I used to look up when the ISS was overhead.".

"Every sixteenth 'star' will actually be moving," she says. "I hope I'm wrong. I've never wanted to be wrong about a simulation more than this. But without mitigation, this is what the sky will look like in a few years."

Astronomers have been meeting with representatives from private companies, as well as space lawyers and

government officials, to work out compromises and mitigation strategies. Companies have been testing ways to reduce reflectivity, like shading the satellites with a "visor." Other proposed strategies include limiting the satellites to lower orbits, where they move faster across the sky and leave a fainter streak in telescope images."

But that lower altitude strategy will mean more visible satellites for other parts of the world, and more that are visible to the naked eye. "There's not some magical orbital altitude that solves all our problems," Rawls says. "There are some latitudes on Earth where no matter what altitude you put your satellites at, they're going to be all over the darn place. **The only way out of this is fewer satellites.**"

There are currently no regulations concerning how bright a satellite can be or how many satellites a private company can launch. Scientists are grateful that companies are willing to work with them, but nervous that their cooperation is voluntary.

Efforts are under way to bring the issue to the attention of the United Nations and to try to use existing environmental regulations to place limits on satellite launches, says study coauthor Boley (who also lives near 50° N).

Analogies to other global pollution problems, like space junk, can provide inspiration and precedents, he says. "There are a number of ways forward. We shouldn't just lose hope. We can do things about this."

https://www.sciencenews.org/article/satellite-mega-constellations-night-sky-stars-simulations

Aurora Webcams

Solar activity is increasing with some large spots from cycle 25 becoming visible. This is increasing the likelihood of large solar storms, but it is a rare event for us to see an auroral display this far south; so rare that advanced warning may be given in news broadcasts. If there is a display you can almost guarantee that the weather will not co-operate and all we get to see is a cloudy sky with some rain for good measure.

By using suitably located webcams you can get to see a display almost every day, weather permitting of course. Using a webcam is no substitute for the real thing where you have a full sky view, but does have some advantages; it is bitterly cold in winter above the arctic-circle, and it is a lot cheaper than travelling there.

There are a few webcams that give a view of the northern lights, some are freely accessible and some are behind a pay wall. I have found two to be good, one in Swedish Lapland and the other in Canada. The Canadian camera in Churchill, Manitoba, famed for its polar bears waiting for the sea ice to form in Hudson Bay is located at a research institute and has more resources available than the Swedish camera that is used to advertise holidays in Abisko national park.

The best times to view the Swedish camera is during the mid evening our time. The camera is not active during the summer because it is above the Arctic Circle and of course it does not get dark. The camera is live, but can be paused.

The Canadian camera has a 12 hour history that can be reviewed. This camera runs all year and is best checked in the morning, auroras are often at their best at around midnight local time. I have found that the Canadian camera shows more spectacular auroras than the Swedish one; it seems to be a better camera and is pointed towards the best parts of the display. It does sometimes switch to 'Highlights' when nothing much is happening. This camera is part of the Explore network where you will have the ability to watch a number of wildlife cameras in the Americas and Africa. While writing this have been watching a brown bear in Katmai Alaska fattening itself for hibernation by having a salmon lunch and listening to the sounds of the African bush from Rosie's Pan in South Africa.

Links

https://lightsoverlapland.com/aurora-webcam/

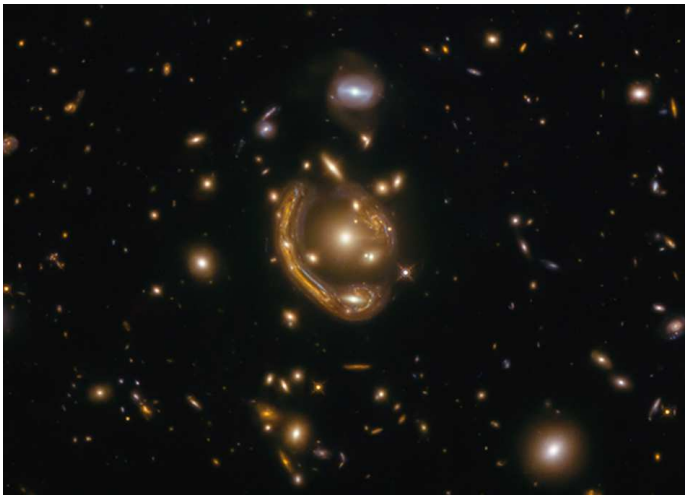
https://explore.org/livecams/aurora-borealis-northern-lights/northern-lights-cam

Aurora forecast

https://services.swpc.noaa.gov/images/aurora-forecast-northern-hemisphere.jpg

Peter Burgess

"Molten Ring" Galaxy Prompts New Research



GAL-CLUS-022058s. In this particular snapshot, a science discovery followed the release of a Hubble observation of a striking example of a deep-space optical phenomenon dubbed an "Einstein ring." The photo was released in December 2020 as an example of one of the largest, nearly complete Einstein rings ever seen. CREDIT Saurabh Jha (Rutgers, The State University of New Jersey)

Hubble Space Telescope's glamour shots of the universe are so revealing they nearly always have a discovery behind them.

In this image, a remote galaxy is greatly magnified and distorted by the effects of gravitationally warped space. After its public release, astronomers used the picture to measure the galaxy's distance of 9.4 billion light-years. This places the galaxy at the peak epoch of star formation in cosmic evolution.

In this particular snapshot, a science discovery followed the release of a Hubble observation of a striking example of a deep-space optical phenomenon dubbed an "Einstein ring." The photo was released in December 2020 as an example of one of the largest, nearly complete Einstein rings ever seen.

The extremely high rate of star formation in the brightest and very dusty early galaxies saw stars being born at a rate a thousand times faster than occurs within our own galaxy. This could help explain the rapid build-up of present day giant elliptical galaxies.

This object's unusual partial ring-like appearance can be explained by a phenomenon called gravitational lensing, which causes light shining from a faraway galaxy to be warped by the gravity of an object between its source and the observer. This effect was first theorized by Albert Einstein in 1912, and later worked into his theory of general relativity.

In this case, the galaxy's light has also been magnified by a factor of 20. This magnification, boosted by mother nature, effectively made Hubble's observing capability equivalent to that of a 48-meter-aperture (157 feet) telescope. The lensing effects also create multiple apparitions around the curved arc of the single background magnified galaxy.

In order to derive the physical properties of the galaxy, astronomers had to precisely model the effects of the lensing on the galaxy's image. "Such a model could only be obtained with the Hubble imaging," explained the lead investigator Anastasio Díaz-Sánchez of the Universidad Politécnica de Cartagena in Spain. "In particular, Hubble helped us to identify the four duplicated images and the stellar clumps of the lensed galaxy."

The initial Hubble observation was first conducted by Saurabh Jha of Rutgers, The State University of New Jersey. His team's science goal was to use Hubble's sharp image to reveal detailed complex structure in the ring arcs.

The object, GAL-CLUS-022058s, is located in the southern hemisphere constellation of Fornax (the Furnace). The image was nicknamed the "Molten Ring" by Jha, which alludes to its appearance and host constellation.

The Hubble Space Telescope is a project of international cooperation between NASA and ESA (European Space Agency). NASA's Goddard Space Flight Center in Greenbelt, Maryland, manages the telescope. The Space Telescope Science Institute (STScI) in Baltimore, Maryland, conducts Hubble science operations. STScI is operated for NASA by the Association of Universities for Research in Astronomy in Washington, D.C.

Link: http://spaceref.com/

Gravitational Lensing

A gravitational lens is a distribution of matter (such as a cluster of galaxies) between a distant light source and an observer, that is capable of bending the light from the source as the light travels towards the observer. This effect is known as gravitational lensing, and the amount of bending is one of the predictions of Albert Einstein's general theory of relativity. (Classical physics also predicts the bending of light, but only half of that predicted by general relativity.)

Although Einstein made unpublished calculations on the subject in 1912, Orest Khvolson (1924) and Frantisek Link (1936) are generally credited with being the first to discuss the effect in print. However, this effect is more commonly associated with Einstein, who published an article on the subject in 1936.

Link: Gravitational Lensing

This is What it Looks Like When a Black Hole Snacks on a Star

This illustration shows a glowing stream of material from a star, torn to shreds as it was being devoured by a supermassive black hole. The feeding black hole is surrounded by a ring of dust, not unlike the plate of a toddler is surrounded by crumbs after a meal.
Credit: NASA/JPL-Caltech

In a paper published in The Astrophysical Journal, a team of astronomers led by Sixiang Wen, a postdoctoral research associate at the University of Arizona Steward Observatory, use the X-rays emitted by a tidal disruption event known as J2150 to make the first measurements of both the black hole's mass and spin. This black hole is of a particular type - an intermediate-mass black hole - which has long eluded observation.

"The fact that we were able to catch this black hole while it was devouring a star offers a remarkable opportunity to observe what otherwise would be invisible," said Ann Zabludoff, UArizona professor of astronomy and co-author on the paper. "Not only that, by analyzing the flare we were able to better understand this elusive category of black holes, which may well account for the majority of black holes in the centers of galaxies."

By re-analyzing the X-ray data used to observe the J2150 flare, and comparing it with sophisticated theoretical models, the authors showed that this flare did indeed originate from an encounter between an unlucky star and an intermediate-mass black hole. The intermediate black hole in question is of particularly low mass - roughly 10,000 times the mass of the sun.

"The X-ray emissions from the inner disk formed by the debris of the dead star made it possible for us to infer the mass and spin of this black hole and classify it as an intermediate black hole," Wen said.

"Thanks to modern astronomical observations, we know that the centers of almost all galaxies that are similar to or larger in size than our Milky Way host central supermassive black holes," said study co-author Nicholas Stone, a senior lecturer at Hebrew University in Jerusalem. "These behemoths range in size from 1 million to 10 billion times the mass of our sun, and they become powerful sources of electromagnetic radiation when too much interstellar gas falls into their vicinity."

"We still know very little about the existence of black holes in the centers of galaxies smaller than the Milky Way," said co-author Peter Jonker of Radboud University and SRON Netherlands Institute for Space Research, both in the Netherlands. "Due to observational limitations, it is challenging to discover central black holes much smaller than 1 million solar masses."

Despite their presumed abundance, the origins of supermassive black holes remain unknown, and many different theories currently vie to explain them, according to Jonker. Intermediate-mass black holes could be the seeds from which supermassive black holes grow.

"Therefore, if we get a better handle of how many bona fide intermediate black holes are out there, it can help determine which theories of supermassive black hole formation are correct," he said.

Even more exciting, according to Zabludoff, is the measurement of J2150's spin that the group was able to obtain. The spin measurement holds clues as to how black holes grow, and possibly to particle physics.

This black hole has a fast spin, but not the fastest possible spin, Zabludoff explained, begging the question of how the black hole ends up with a spin in this range.

In addition, the spin measurement allows astrophysicists to test hypotheses about the nature of dark matter, which is thought to make up most of the matter in the universe. Dark matter may consist of unknown elementary particles not yet seen in laboratory experiments. Among the candidates are hypothetical particles known as ultralight bosons, Stone explained.

"If those particles exist and have masses in a certain range, they will prevent an intermediate-mass black hole from having a fast spin," he said. "Yet J2150's black hole is spinning fast. So, our spin measurement rules out a broad class of ultralight boson theories, showcasing the value of black holes as extraterrestrial laboratories for particle physics."

In the future, new observations of tidal disruption flares might let astronomers fill in the gaps in the black hole mass distribution, the authors hope.

Link: https://phys.org/

THE BACK PAGE

LINKS, COMMENTS AND OBSERVATIONS

Important News - Virtual Monthly Meetings

As the Observatory is now **OPEN** and we can now use the Newchurch Pavilion, most monthly meetings will now be back to normal.
That is they will be held in the Pavilion.

We may still use Zoom from time-to-time and these meetings will be clearly marked in the Monthly Meetings list on Page 2.

If there are Zoom meetings please use this link:

https://us02web.zoom.us/j/81142510951?pwd=a2RCQXZKMmRMeXBMSXEvU0dxS2gzUT09
Meeting ID: 811 4251 0951 and Passcode: 346096

Mars' seasonal changes make it harder for Ingenuity to fly

On Tuesday (Sept. 28), NASA's Jet Propulsion Laboratory announced that its Ingenuity Mars helicopter will get adjustments to help it fly in the future. This is because the Red Planet's atmosphere has been thinning as a result of seasonal changes. When Ingenuity attempted its 14th flight on Sept. 18, it couldn't get off the ground.

Full story: Mars helicopter Ingenuity aborted latest flight attempt

Artemis Rover to Land Near Nobile Region of Moon's South Pole

In 2023, NASA's Volatiles Investigating Polar Exploration Rover (VIPER) will land near the western edge of the Nobile Crater at the Moon's South Pole to map and explore the region's surface and subsurface for water and other resources. Part of Artemis, VIPER will launch on a SpaceX Falcon-Heavy rocket for delivery to the Moon by Astrobotic's Griffin lander under NASA's Commercial Lunar Payload Services initiative.

The Moon's South Pole is one of the coldest areas in our solar system. No prior missions to the Moon's surface have explored it – scientists have thus far only studied the region using remote sensing instruments, including those on NASA's Lunar Reconnaissance Orbiter and the Lunar Crater Observation and Sensing Satellite.

More at: https://www.nasa.gov/

At The Observatory

1. **Please bring a torch.**
2. **Make sure you close and lock the car park gate if you are the last to leave.**

Articles Needed

NZ needs astronomy related content. Contact details on page 1.

"Modern science has been a voyage into the unknown, with a lesson in humility waiting at every stop. Many passengers would rather have stayed home"
Carl Sagan

"Science flies you to the moon. Religion flies you into buildings"
Victor Stenger

"To invent, you need a good imagination and a pile of junk"
Thomas A. Edison

"Never memorize something that you can look up"
Albert Einstein

"I learned very early the difference between knowing the name of something and knowing something"
Richard Feynman

"Everything is theoretically impossible, until it is done"
Robert A. Heinlein

"Failure is success if we learn from it"
Malcolm Forbes