New Zenith

The Monthly Newsletter of the Vectis Astronomical Society

Vol 28 Issue 3 — April 2020 *When Printed, this Newsletter costs VAS at least £1*

Society News

Well. What a Month!

It all started so well, the rain began to stop, it started getting a little warmer but then what happened?

Well it seems we've been invaded, it's time to stay indoors for our and everyone's safety and wellbeing.

Oh, and please note my change of address over on the right

Obvious News

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

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

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

The government will let us know when the situation changes and, of course, we will contact members both here, via the website and social media when that situation changes.

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

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

A Little Good News

The spring seems to be here and the planes aren't flying so, I think we can expect some beautifully clear skies.

There's nothing in the rules which forbids you getting out into **your own gardens** and doing some observing! Please get out there and take some photo's, send them in to NZ and we can make the best of the situation.

Stay safe and well.

Brian Curd

Observatory Director and NZ Editor

VAS Website: wightastronomy.org

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

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1 Malvern Cottages
Kings Road
Bembridge
Isle of Wight PO35 5NT

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

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

Observatory Diary

The VAS Observatory is closed to all members and visitors until further notice

VAS Website: wightastronomy.org

Contents this Month

2020 Monthly Meetings

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

All Monthly Meetings are Cancelled Until Further Notice

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

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

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

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

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

Observatory Visits Booked

All Observatory Visits are Cancelled Until Further Notice

Please see the important information above this.

IMPORTANT

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

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

VAS Contacts 2020

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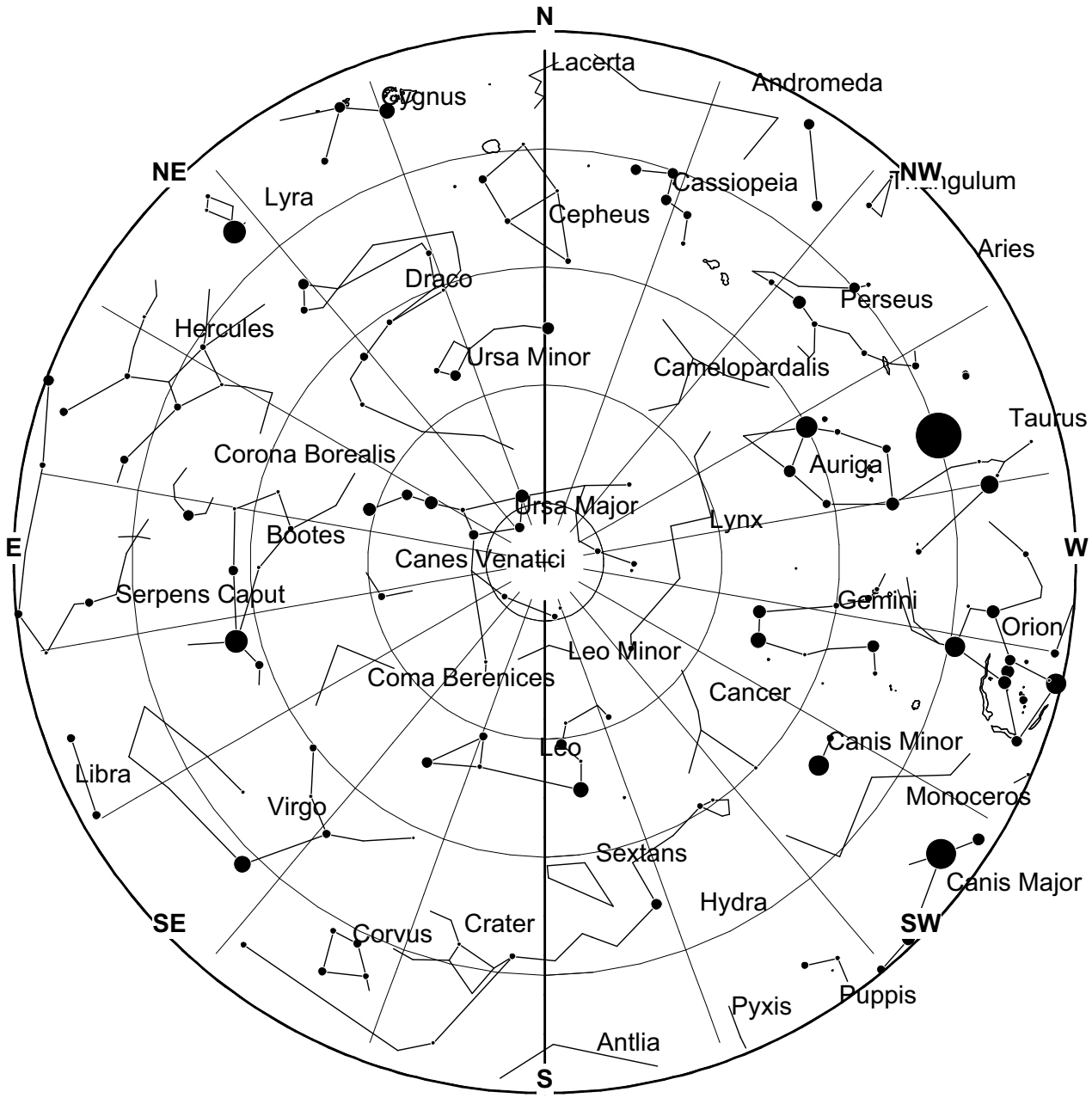
Important

The VAS Observatory is closed to all members and visitors until further notice

April 2020 Sky Map



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

Venus is the second planet from the Sun. It is named after the Roman goddess of love and beauty. As the second-brightest natural object in the night sky after the Moon, Venus can cast shadows and, rarely, is visible to the naked eye in broad daylight. Venus orbits the Sun every 224.7 Earth days. With a rotation period of 243 Earth days, it takes longer to rotate about its axis than any planet in the Solar System and does so in the opposite direction to all but Uranus (meaning the Sun rises in the west and sets in the east). Venus does not have any moons, a distinction it shares only with Mercury among planets in the Solar System.

April 2020 Night Sky

Moon Phases

New	First Qtr	Full	Last Qtr
			
23rd	30th	8th	14th

Planets

Mercury

Mercury is in opposition with the Sun this month and is not visible

Venus

Continuing its apparition as the "Evening Star" Venus is easily seen in the western sky from sunset until it sets in mid evening. On the 3rd there is a potential photo opportunity as it passes through the Pleiades star cluster. The brightness difference will make this a little challenging to photograph. The crescent moon passes close by on the 26th.

Mars

Mars straggles behind Jupiter and Saturn as they pull away from it heading towards the south in the predawn sky while Mars stays close to the eastern horizon. Look for it low in the south east from about 4am onwards. On the 16th it is just above the crescent moon.

Jupiter

From about 3am onwards Jupiter can be seen in the south eastern sky. It is by far the brightest star like object in that part of the sky and can be seen while it is quite close to the horizon. On the 15th it makes a nice grouping with the crescent moon and the much dimmer Saturn.

Saturn

Saturn can be found about 5° to the east of the much brighter and similarly coloured Jupiter. Neither planet is well placed in the sky for observation this year, so if you are an early riser you may as well start observing from this month onward, the views are not going to get significantly better.

Uranus & Neptune

Both outer planets are lost in the glare of the Sun until later in the year.

Deep Sky

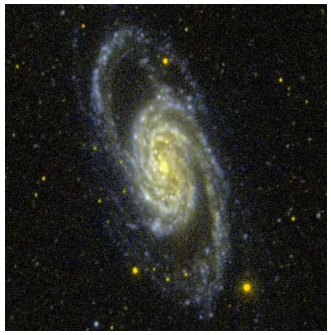
M101 The Pin Wheel Galaxy
RA 14h 3m Dec 54° 18' mag 8.5

In contrast to M102 this is a large, almost perfectly face on galaxy. Covering an area of sky about a quarter of that of the full moon this galaxy is visually not as bright as its magnitude might suggest, but as galaxies go it is still quite easy to find and is visible as a dim smudge on the sky in a pair of binoculars.

M104 The Sombrero Galaxy
RA 12h 40m Dec -11° 40' mag 9.5

This is a classic galaxy, it is pictured in almost all books on astronomy showing it's distinctive dark dust lane forming the 'shadow' that gives this almost edge on galaxy it's name. Unfortunately it is a little low in our skies and so is dimmed by atmospheric absorption. This does not however prevent some detail being seen visually in telescopes with greater than 6" diameter, or CCD cameras capturing the vast halo that surrounds this galaxy.

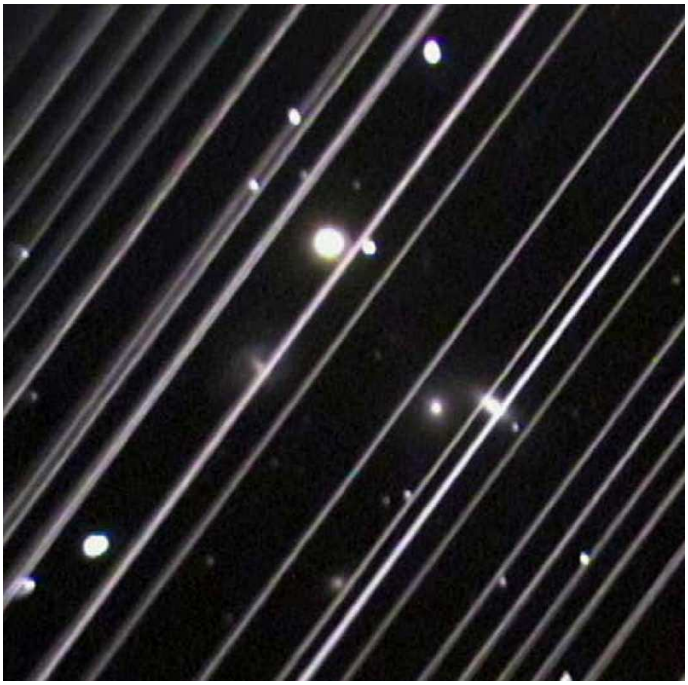
NGC2903 Galaxy
RA 9h 32m Dec 21° 28' mag 9.6



When comet hunting Charles Messier did not find all the fuzzy objects that could be mistaken for these elusive visitors to our skies. There are many relatively bright galaxies that he could have put into his catalogue if his telescope had happened upon them. NGC2903 is one of these; commonly regarded as one of the best NGC objects for small telescopes it is a large almost face on barred spiral galaxy. This is a young galaxy with a much higher rate of star formation than our own Milky Way. In larger telescopes this activity can be glimpsed in the spiral arms which have a mottled appearance when viewed with averted vision.

Peter Burgess

Satellite Streak Watcher



As more satellites are placed into orbit, they will become an increasing problem to astronomers on the ground. This long term project will photographically track the population growth of these satellites over time.

Goal

Photographically record satellite streaks across the night sky to monitor this form of sky pollution.

What participants do

Use your smartphone camera to record satellite streaks through the night sky to monitor this problem over time.

In the coming years, thousands of satellites will be deployed into low Earth orbit as part of the new internet mega-constellations. In the three hours after sunset and before sunrise, these bright streaks from reflected sunlight will crisscross the night sky and wreak havoc with astronomers trying to photograph astronomical objects from the ground. It will also be a problem for amateur astronomers for the same reasons.

This project will record for posterity the growth of this problem over many years as participants use their smartphones to photograph the increase in these streaks over time from locations around the world. These satellites will be bright enough due to sun glint to appear with magnitudes between +2 and +6m, and so can be readily photographed using most smartphone cameras.

At the speed of the satellites, they will streak across the sky from horizon to horizon in about 1 degree per second, so in 10 seconds they will travel 20 times the diameter of the full moon across the sky.

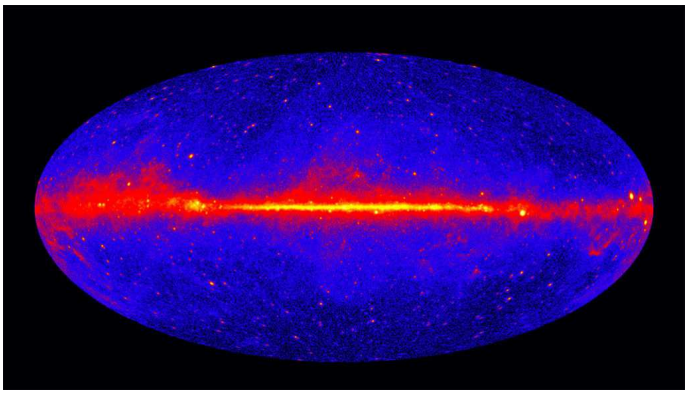
To photograph this event here's what you need to do.

1. Attach your smartphone to a tripod using an inexpensive bracket.
2. On an evening before your shoot, set your native camera app at >10 seconds, and ISO > 800, or use a second-party app
3. Adjust the settings to get the best star pictures and lowest sky brightness.
4. Go to Heavens-Above.com and click on 'Satellite database' which predicts satellite transit events and provides a sky map.
5. Follow the Heavens-Above directions to find the next time a satellite will pass across your local sky.
6. In the minutes just before the event is predicted to start, take a few test photos.
7. At the predicted start of the event, begin taking your sequence of photos until the event ends.
8. Upload the best of the photos you took and don't forget to indicate the name of the constellation being 'streaked' in your photo!
9. Make as many of these observations during the year as you can!

How to join the project and more info at:
https://www.anecdata.org/projects/view/687

Astronomers Have Found the Edge of the Milky Way at Last

Our galaxy spans 1.9 million light-years, a new study finds



In this image from the Fermi space telescope, the Milky Way's stellar disk, which runs horizontally along the middle, glows in gamma rays. A vast halo of dark matter engulfs the disk and emits no light at all, which makes measuring the galaxy's total size a challenge.
FERMI LAT COLLABORATION/DOE/NASA

Our galaxy is a whole lot bigger than it looks. New work finds that the Milky Way stretches nearly 2 million light-years across, more than 15 times wider than its luminous spiral disk. The number could lead to a better estimate of how massive the galaxy is and how many other galaxies orbit it.

Astronomers have long known that the brightest part of the Milky Way, the pancake-shaped disk of stars that houses the sun, is some 120,000 light-years across (SN: 8/1/19). Beyond this stellar disk is a disk of gas. A vast halo of dark matter, presumably full of invisible particles, engulfs both disks and stretches far beyond them (SN: 10/25/16). But because the dark halo emits no light, its diameter is hard to measure.

Now, Alis Deason, an astrophysicist at Durham University in England, and her colleagues have used nearby galaxies to locate the Milky Way's edge. The precise diameter is 1.9 million light-years, give or take 0.4 million light-years, the team reports February 21 in a paper posted at arXiv.org.

To put that size into perspective, imagine a map in which the distance between the sun and the Earth is just one inch. If the Milky Way's heart were at the center of the Earth, the galaxy's edge would be four times farther away than the moon actually is.

To find the Milky Way's edge, Deason's team conducted computer simulations of how giant galaxies like the Milky Way form. In particular, the scientists sought cases where two giant galaxies arose side by side, like the Milky Way and Andromeda, our nearest giant neighbor, because each galaxy's gravity tugs on the other (SN: 5/12/15). The simulations showed that just beyond the edge of a giant galaxy's dark halo, the velocities of small nearby galaxies drop sharply (SN: 3/11/15).

Using existing telescope observations, Deason and her colleagues found a similar plunge in the speeds of small galaxies near the Milky Way. This occurred at a distance of about 950,000 light-years from the Milky Way's center, marking the galaxy's edge, the scientists say. The edge is 35 times farther from the galactic center than the sun is.

Although dark matter makes up most of the Milky Way's mass, the simulations reveal that stars should also exist at these far-out distances. "Both have a well-defined edge," Deason says. "The edge of the stars is very sharp, almost like the stars just stop at a particular radius."

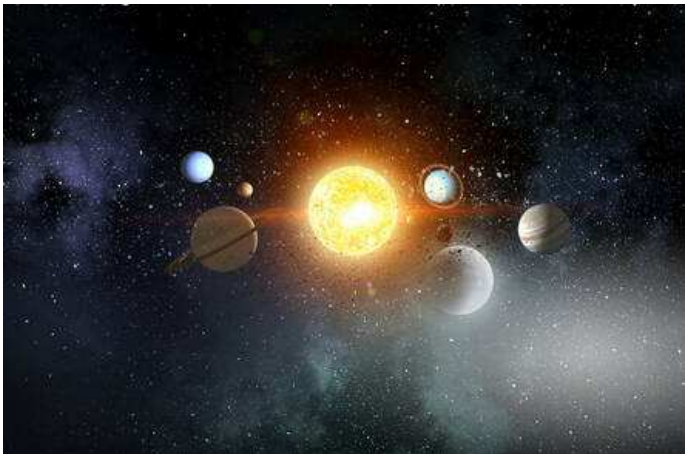
In the future, astronomers can refine the location of the Milky Way's edge by discovering additional small galaxies nearby. Astronomers could also search for individual stars out at the boundary, says Mike Boylan-Kolchin, an astrophysicist at the University of Texas at Austin who was not involved with the study. The farthest such stars will be very dim, but future observations should be able to find them.

The measurement should also help astronomers tease out other galactic properties. For instance, the larger the Milky Way, the more massive it is — and the more galaxies there should be revolving around it, says Rosemary Wyse, an astronomer at Johns Hopkins University who was not part of the new work. So far, there are about 60 known Milky Way satellites, but astronomers suspect that many more await discovery.

Many links at: https://www.sciencenews.org/article/astronomers-have-found-edge-milky-way-size

In case you want to flee this wretched Earth, 139 minor planets were spotted at the outer reaches of our Solar System. *Just a FYI...*

Too bad they are likely uninhabitable



Astronomers have discovered 139 minor planets lurking at the edge of the Solar System after examining a dataset collected to study dark energy in the universe.

Small worlds that circle our Sun in orbits further out than Neptune are labelled trans-Neptunian objects (TNO), with one being the relegated-planet Pluto. Eggheads, led by those at the University of Pennsylvania (UPenn) in the US, identified 316 TNOs in the dark-energy dataset, of which 139 bodies were previously unknown. That's according to a study published in The Astrophysical Journal this week.

Specifically, the dataset features images snapped by the Dark Energy Survey (DES), a project that used the Victor M. Blanco Telescope at the Cerro Tololo Inter-American Observatory in Chile to study the role of dark energy in the universe's rate of expansion. The pictures were taken of the southern hemisphere for six years, from 2013 to 2019.

"The number of TNOs you can find depends on how much of the sky you look at and what's the faintest thing you can find," said Gary Bernstein, co-author of the study and a Professor of Astronomy and Astrophysics at UPenn.

Unlike stars or supernovas, TNOs don't emit a lot of light. The trick to spotting TNOs among all the other stuff in the images is to look for things that move across the night sky. TNOs orbit the Sun whereas stars and distant galaxies appear more fixed. "Dedicated TNO surveys have a way of seeing the object move, and it's easy to track them down," said Pedro Bernardinelli, first author of the paper and a graduate student at UPenn. "One of the key things we did in this paper was figure out a way to recover those movements."

The academics began with seven billion objects in the DES dataset. After they removed static objects – things that appeared in the same spot on multiple nights – they were left with a list of 22 million transient objects.

Each one looks like a dot, and the goal was to track each dot as it travelled across the sky to see if it really was an individual object. That narrowed the list down to 400 candidates that warranted further study and verification.

"We have this list of candidates, and then we have to make sure that our candidates are actually real things," Bernardinelli said. They then realized 316 of the 400 candidates were TNOs – and 139 of that 316 were previously undetected minor worlds.

The boffins only rifled through four years' worth of data, and they believe that, by using their method, many more TNOs can be uncovered in the future.

"There are lots of ideas about giant planets that used to be in the solar system and aren't there anymore, or planets that are far away and massive but too faint for us to have noticed yet," said Bernstein. "Making the catalog is the fun discovery part. Then when you create this resource; you can compare what you did find to what somebody's theory said you should find."

More at: https://www.theregister.co.uk/2020/03/13/139_new_transneptunian_objects/

Comet Atlas May Soon be so Bright that it's Visible From Earth with the Naked Eye

A newly discovered comet known as C/2019 Y4 (ATLAS) is making its way toward our sun and is rapidly increasing in brightness.

Astronomers spotted the comet on December 28, 2019, using the ATLAS (Asteroid Terrestrial-impact Last Alert System) robotic astronomical survey system in Hawaii, hence the name.

At that point, when the object was around 273 million miles away from the sun, ATLAS was about 398,000 times dimmer than stars that are just about visible with the naked eye, Space magazine reported.

But after it was discovered, scientists observed it growing in brightness at an incredibly fast rate. It went from a magnitude of +17 in February to +8 in March, a 4,000-fold increase in brightness, Science X reported.

It is now possible to see the comet, which recently crossed the orbit of Mars, using amateur astronomy equipment, given that it has about the same brightness as an eighth-magnitude star. By March 17, it was more than 600 times brighter than experts had predicted, Space magazine reported.

If the comet continues to grow in brightness at its current rate, it may even be visible to the naked, assuming you are in an area with low light pollution, by the beginning of May.

Like other comets, ATLAS is becoming brighter as it approaches the sun because it is being blasted with increasing amounts of radiation from the star, causing it to shed large quantities of material.

"Right now the comet is releasing huge amounts of its frozen volatile gases," Karl Battams from the Naval Research Lab in Washington, D.C., told SpaceWeatherArchive. "That's why it's brightening so fast."

According to EarthSky, the comet will make its closest approach to the sun on May 31, 2020 when the object will come within 23,517,819 miles of our star, closer than the average orbit of Mercury (around 36 million miles.)

During this close approach, the brightness of the comet will be expected to peak, and experts estimate that it could reach anywhere between +2 to -6 in magnitude, which could potentially make it as bright as the planet Venus in the night sky.

However, it is important to note that the behavior of comets is notoriously unpredictable. The rate at which ATLAS has been brightening has decreased slightly in recent days. Furthermore, we don't currently know whether or not the comet will remain intact given that many of these objects simply burn up completely as they fly past the sun.

"We should expect the rate of increase to slow again," Carl Hergenrother, an Arizona-based comet observer, told Space magazine. "This is where it gets tricky for predicting just how bright it will get."

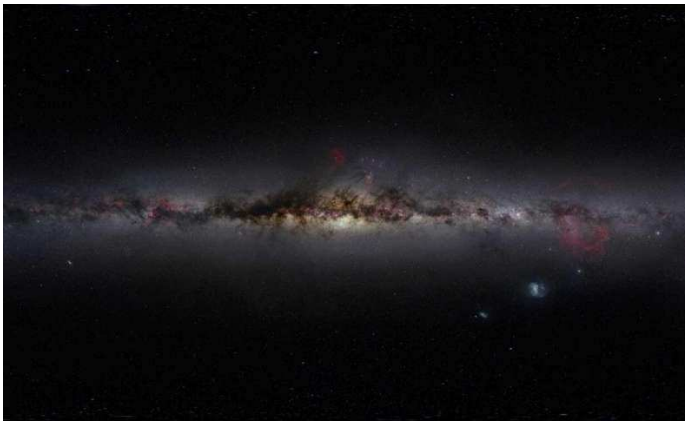
"It's going to be fun the next few weeks watching Comet ATLAS develop, and provide a nice distraction from the current state of the world," Hergenrother said. "Here's to good health and clear skies!"

NASA data indicates that the comet takes just over 6,000 years to make one full circle around our star. It appears that ATLAS has a very similar orbit to that of the Great Comet of 1844, indicating that it could be a fragment of this object.

If ATLAS does turn out to appear as bright as some estimates are predicting, it could rival the last spectacularly bright comet to pass by Earth, the Comet Hale-Bopp, which flew past our planet in 1997.

Video and links at: https://www.newsweek.com/comet-atlas-bright-visible-earth-naked-eye-1493912?piano_t=1

New Telescopes aim to Detect Extraterrestrial Intelligence



The Milky Way galaxy observed from both the Northern and Southern hemisphere on Earth. Credit: Nick Risinger (Photopic Sky Survey)

A team of astronomers led by UC San Diego physicist Shelley Wright is deploying a pair of telescopes that will constantly search the nighttime sky for signals from intelligent life in our galaxy.

Project researchers from UC San Diego, UC Berkeley, University of California Observatories and Harvard University recently installed the two prototype telescopes at Lick Observatory near San Jose. They are the first of hundreds of telescopes planned to be installed as part of a project called Panoramic SETI or PANOSETI, for Pulsed All-sky Near-infrared Optical SETI. Wright, an associate professor of physics at UC San Diego, serves as lead investigator.

When finally assembled, PANOSETI will be the first dedicated observatory capable of constantly searching for flashes of optical or infrared light. Such pulsed signals occurring on nanosecond-to-second time scales, may be from either artificial origin (e.g., extraterrestrial communication) or astrophysical phenomena (e.g., counterparts to fast-radio bursts).

Wright explained that the deployment of the two PANOSETI telescopes offers astronomers a new window into how the universe behaves at nanosecond timescales.

PANOSETI explores the universe at billionth-of-a-second time scales, a time scale that has not been examined well to date, agreed Dan Werthimer, chief technologist at UC Berkeley's SETI Research Center and co-investigator.

“When astronomers examine an unexplored parameter space, they usually find something surprising that no one predicted,” he said. “PANOSETI could discover new astronomical phenomena or signals from E.T.”

But how likely is it that scientists will detect extraterrestrial signals with PANOSETI?

“The short and correct answer is we have no idea on the likelihood of detection,” said Wright. “With PANOSETI we will be observing an unexplored phase space for SETI and astronomical observations. Our goal is to make the first dedicated SETI observatory that is capable of observing the entire visible sky all of the time.”

Wright said that the entire project team is excited to embark on the ambitious program that has others talking. For example, according to a recent article in The Guardian, Jill Tarter, an emeritus researcher at the SETI Institute, discussed PANOSETI at the recent American Association for the Advancement of Science (AAAS) conference in Seattle. Tarter noted that with its anticipated vast view of the sky, the instrument is positioned to uniquely spot signals like flashes from faraway lasers.

“The goal is to basically look for very brief but powerful signals from an advanced civilization. Because they are so brief, and likely to be rare, we plan to check large areas of the sky for a long period of time,” said Werthimer, who has been involved with SETI for the past 45 years.

The initial pair of PANOSETI telescopes marks a critical milestone for testing the system and making unique observations enabling new discoveries of astrophysical transient and variable phenomena. With support from Lick Observatory staff, UC San Diego and UC Berkeley researchers can operate these dedicated telescopes and the Astrograph Dome they sit in from their campus locations. Lick Observatory is owned and operated by the University of California Observatories (UCO) for the benefit of astronomers across the UC system.

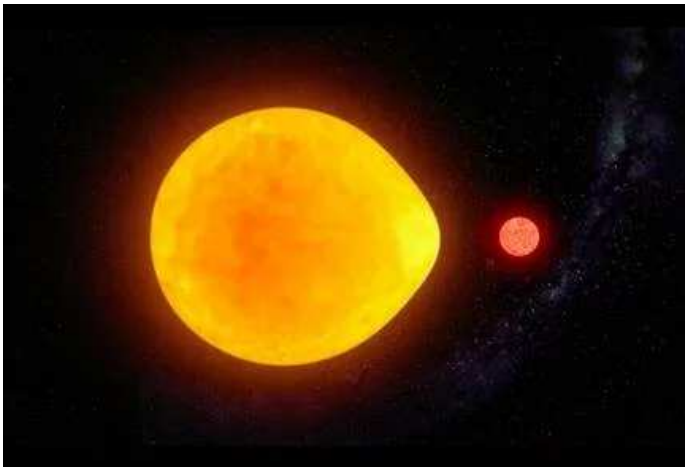
PANOSETI began development in 2018, aiming to create a dedicated optical SETI observatory to image the entire observable sky, approximately 10,000 square degrees, instantaneously. The final project plans to generate hundreds of telescopes to achieve this enormous sky coverage. What distinguishes the program is that a single PANOSETI telescope images 10 degrees by 10 degrees. For reference, the Earth's moon measures one-half degree in size. Currently, the team is characterizing the night sky and continuing to develop its large observatory mission.

PANOSETI's final design will feature a dedicated observatory at each of two locations. Each observatory will contain 80 of these unique telescopes. Site selection is underway, and the research team hopes to begin observatory construction in the next year.

From: https://phys.org/news/2020-03-telescopes-aim-extraterrestrial-intelligence.html

Astroboffin Kurtz Ends 40-year Quest to find a Predicted One-sided Vibrating Star that was Never Seen – Until Now

I love the smell of plasma in the morning. It smells like... victory



Artist's impression of the strange binary star system containing HD74423 (left) and its red dwarf star companion (right).
Image credit: Gabriel Pérez Díaz (IAC)

Astronomers have discovered for the first time a bizarre star floating in space some 1,500 light years from Earth that seems to only pulsate on one side.

Stars, being giant balls of plasma, are constantly in vibrating motion, with the layers of ionised matter expanding and contracting rhythmically under gravity. At first glance, the object known as HD74423 doesn't appear too different from the Sun, but something odd is going on.

Hiding on the other side of the star is a red dwarf. The two stars circle each other in a tidally locked orbit: in other words, one hemisphere of HD74423 constantly faces one side of the red dwarf star.

The red dwarf star exerts a stronger gravitational pull on one side of HD74423 and distorts the star's oscillations. Although the researchers know the binary system is tidally locked with one another, they're not quite sure what is dampening HD74423's pulsations.

"The pulsations get trapped in that tidal bulge, and we're working on the details of why that happens," Simon Murphy, co-author of the study published in Nature Astronomy and an astronomer at the Australian National University, told The Register.

"We're just observing this phenomenon for the first time — Jim Fuller, a young professor at Caltech, is working on the theory and developing a mathematical description of what we're seeing."

Stars that pulsate asymmetrically like HD74423 have been theorised since the 1980's, but they were never discovered until now. "I've been looking for a star like this for nearly 40 years and now we have finally found one," said Donald Kurtz, an astronomy professor at the University of Central Lancashire in the UK.

Kurtz and his colleagues can't take all the credit, however. The odd binary system was originally flagged by amateur scientists digging through public data recorded by NASA's Transiting Exoplanet Survey Satellite (TESS).

In this case, instead of an exoplanet as a neighbouring object to the star HD74423, it's a red dwarf star. The older companion star lies so close to HD74423 that it completes an orbit once every 1.6 days.

The strength of the HD74423's vibrations depends on what angle the astronomers are looking at the star. "As the binary stars orbit each other we see different parts of the pulsating star," said David Jones, co-author of the study, an astronomer at the Instituto de Astrofisica de Canarias, the Canary Islands of Spain. "Sometimes we see the side that points towards the companion star, and sometimes we see the outer face."

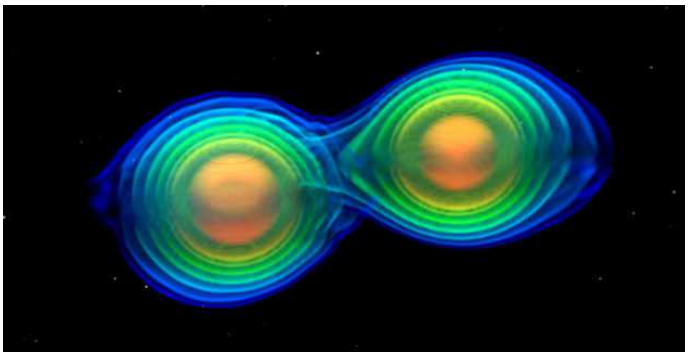
The researchers credited TESS for being able to finally spot a star that only pulsates on one side. "You need sensitive telescopes to detect these systems, and you need to observe a lot of systems to find one. We suspect that the conditions need to be 'just right' for this phenomenon to occur — the stars need to be the right distance apart, and the hotter star needs to be within a narrow range of masses — but we're still working on the theory," Murphy told El Reg.

"The breakthrough is occurring now because of TESS. TESS is collecting data for more than 200,000 stars, and is in the process of observing most of the night sky during its two-year mission. So we have better data for more stars than we've ever had before. We therefore expect to find more of these systems in future TESS data, even if they are rare."

From: https://www.theregister.co.uk/2020/03/10/astroboffins_star_vibration/

Gravitational Waves put Ruler to Neutron Stars

Scientists have combined observations of gravitational waves from a neutron star collision with nuclear theory to shed light on the size and nature of neutron stars.



When it comes to neutron star physics, size matters.

Neutron stars, the collapsed cores of massive stars, compress matter so tightly that atoms break apart and nearly everything converts into neutrons. As a result, about 1½ Suns' worth of mass squeezes into these Manhattan-size objects. Most of this matter, perhaps all of it, is in the form of neutrons, but some theories suggest that deep within neutron stars, neutrons themselves dissociate, leaving a soup of quarks and gluons.

There's no way to peer inside a neutron star, of course. But their size betrays their interior — the smaller a neutron star, the more it compresses its innards. So by taking a ruler to neutron stars, scientists can probe their nature.

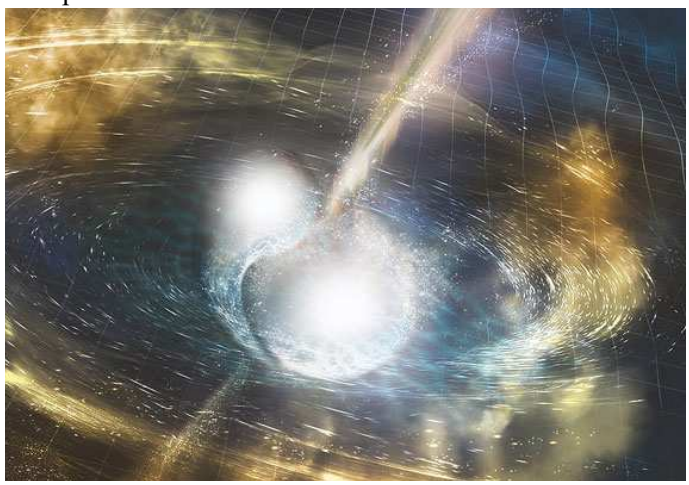
In a study appearing March 9th in Nature Astronomy, Collin Capano (Max Planck Institute for Gravitational Physics and Leibniz University Hannover, Germany) and colleagues examine the ripples in spacetime released in a neutron star merger. Combining these gravitational-wave observations with nuclear theory, the scientists estimate that a typical neutron star would span about 22 kilometers (13.7 miles)

This is the most precise measurement obtained from gravitational waves, and it has important implications for future observations.

When Neutron Stars Collide

The Laser Interferometer Gravitational-wave Observatory (LIGO) detectors witnessed spacetime ripples coming from two colliding neutron stars on August 17, 2017. The event, known as GW170817, marked the first time that astronomers could see both light and gravitational waves coming from the same source.

While the gravitational-wave signal showed the neutron stars spiralling inward and merging into a single object, light released across the electromagnetic spectrum showed the aftereffect — an explosion known as a kilonova that was visible from 130 million light-years away. At the center of the explosion, observations suggest a short-lived "hypermassive" neutron star formed that then collapsed into a black hole.



To understand the nature of the neutron stars that collided, Capano and colleagues wielded mathematics describing the nature of neutron star material, known as an equation of state. After folding in the gravitational-wave and electromagnetic observations, the equation yields the size of a typical neutron star: between 20.8 and 23.8 kilometers across. This estimate is twice as precise as previous results.

"Like we've seen in other results from analyzing GW170817, gravitational-wave astronomy has begun to meaningfully constrain the range of possibilities for neutron star matter," says Jocelyn Read (California State University, Fullerton). "It suggests neutron stars are on the compact side."

More compact neutron stars might mean more exotic interiors. But Read cautions that it's not quite that simple. Even larger sizes could accommodate quark-soup cores, while smaller sizes could still be "boring" mostly-neutron objects.

Capano agrees. "We just don't have enough data at the moment to say conclusively what happens in the core," he says.

More gravitational-wave events will help, Capano adds, as will ongoing observations from the Neutron Star Interior Composition Explorer (NICER) instrument aboard the International Space Station. Upcoming physics experiments will also play a role in better nailing down the nuclear theory.

More at: https://skyandtelescope.org/

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LINKS, COMMENTS AND OBSERVATIONS

Mercury's 400° C Heat May Help It Make Ice

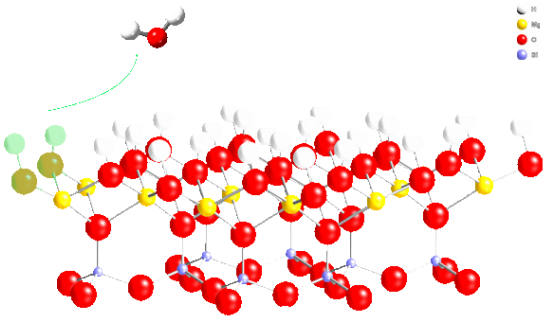
As with Earth, asteroids delivered most of Mercury's water, the scientific consensus holds. But the extreme daytime heat could be combining with the minus 200-degree Celsius cold in nooks of polar craters that never see sunlight to act as a gigantic ice-making chemistry lab, say researchers at the Georgia Institute of Technology.

The chemistry is not too complicated. But the new study models it onto complex conditions on Mercury, including solar winds that pelt the planet with charged particles, many of which are protons key to that chemistry. The model presents a feasible path for water to arise and collect as ice on a planet rife with all the necessary components.

"This is not some strange, out-of-left-field idea. The basic chemical mechanism has been observed dozens of times in studies since the late 1960s," said Brant Jones, a researcher in Georgia Tech's School of Chemistry and Biochemistry and the paper's first author. "But that was on well-defined surfaces. Applying that chemistry to complicated surfaces like those on a planet is groundbreaking research."

Hot, simple chemistry

Minerals in Mercury's surface soil contain what are called hydroxyl groups (OH), which are generated mainly by the protons. In the model, the extreme heat helps to free up the hydroxyl groups, then energizes them to smash into each other to produce water molecules and hydrogen that lift off from the surface and drift around the planet.



A molecular model of chemical reactions on Mercury that lead to the creation of ice. Image by Georgia Tech / Orlando / Jones

Some water molecules are broken down by sunlight or rise far above the planet's surface, but other molecules land near Mercury's poles in permanent shadows of craters that shield the ice from the sun. Mercury does not have an atmosphere and thus no air that would conduct heat, so the molecules become a part of the permanent glacial ice housed in the shadows.

"It's a little like the song *Hotel California*. The water molecules can check in to the shadows but they can never leave," said Thomas Orlando, a professor in Georgia Tech's School of Chemistry and Biochemistry and the study's principal investigator. Orlando co-founded the Georgia Tech Center for Space Technology and Research.

"The total amount that we postulate that would become ice is 1013 kilograms (10,000,000,000,000 kg or 11,023,110,000 tons) over a period of about 3 million years," Jones said. "The process could easily account for up to 10 percent of Mercury's total ice."

More at: https://rh.gatech.edu/

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.

"Right now the first and foremost priority of the entire humankind must be to plank the curve through self-isolation"
Abhijit Naskar

"A toilet paper manufacturer's worst fear is that the masses will learn how to abstain from toilet paper use during the COVID-19 pandemic"
Steven Magee

"Telling the truth may cause a few seconds of pain, but there's no medicine that can manage the pain of keeping lies"
RM Ford

"Anyone who is capable of getting themselves made President should on no account be allowed to do the job"
Douglas Adams

"Telling you to stay safe isn't going to keep you any safer. But it does mean I care"
The Editor - Stay Safe!