New Zenith

The Monthly Newsletter of the Vectis Astronomical Society

Vol 28 Issue 10 — November 2020

When Printed, this Newsletter costs VAS at least £1

Society News

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

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. In fact the very recent rule changes have made things even more difficult!

I think we can assume there will be no activity at the Observatory or the nearby Pavilion until 2021. All very depressing but hardly unexpected.

There is still some work which needs to be done at the observatory and this will take place whenever it is possible/convenient to do so.

Stay safe and well

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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.

Registered Charity No 1046091

Observatory Diary

The diary is currently empty!

VAS Website: wightastronomy.org

Contents this Month

2020 Monthly Meetings

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

All Monthly Meetings are Cancelled Until Further Notice

Sorry but we are still 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 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.

Please read the latest news on the front page.

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.

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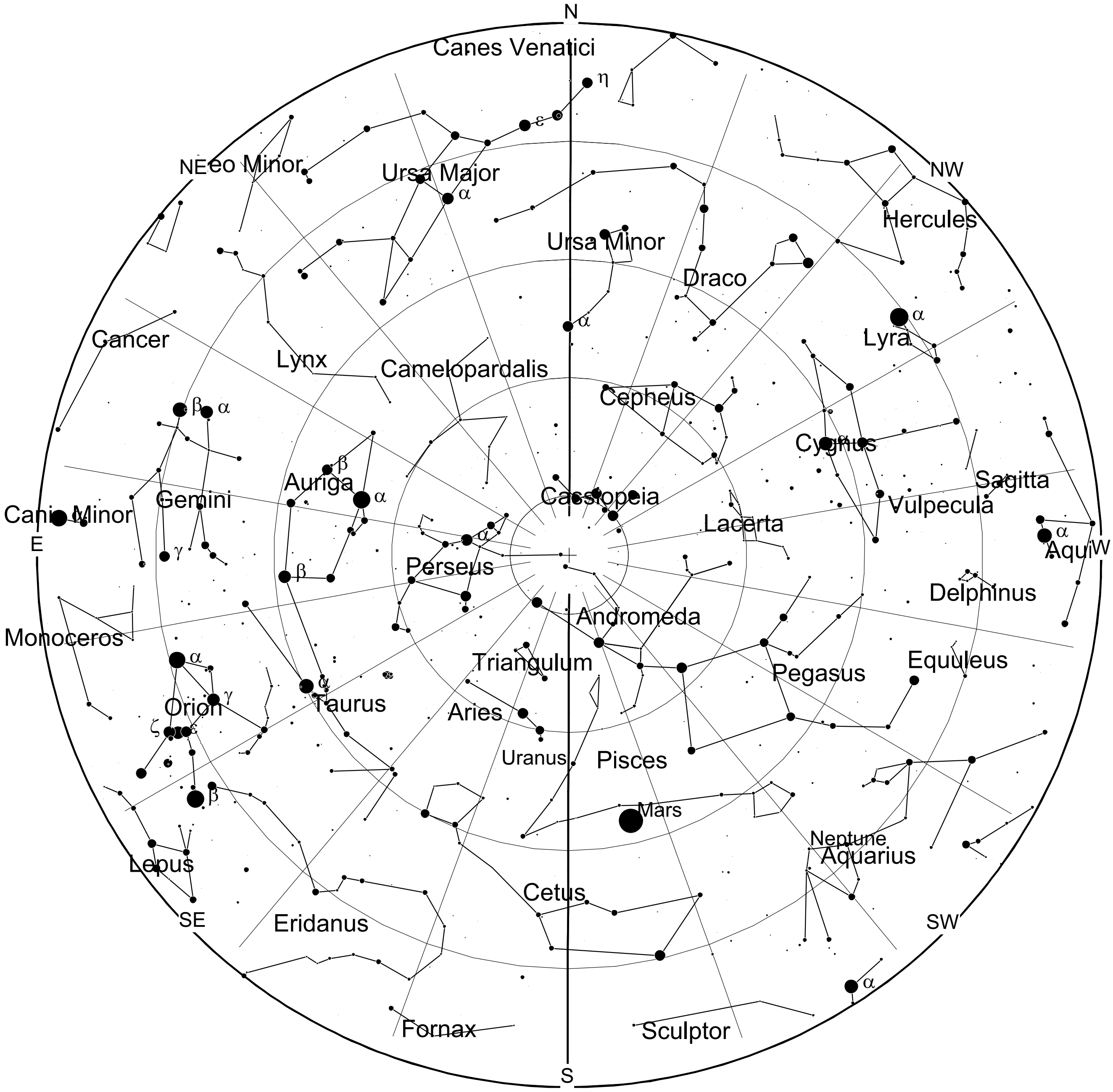
Important

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

November 2020 Sky Map



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

Messier 74 (*also known as NGC 628 and Phantom Galaxy*) is a spiral galaxy in the constellation Pisces. It is at a distance of about 32 million light-years away from Earth. The galaxy contains two clearly defined spiral arms and is therefore used as an archetypal example of a grand design spiral galaxy.

The galaxy's low surface brightness makes it the most difficult Messier object for amateur astronomers to observe. However, the relatively large angular size of the galaxy and the galaxy's face-on orientation make it an ideal object for professional astronomers who want to study spiral arm structure and spiral density waves.

It is estimated that M74 is home to about 100 billion stars.

November 2020 Night Sky

Moon Phases

New 15th	First Qtr 22nd	Full 30th	Last Qtr 8th
●	◐	○	◑

Planets

Mercury

After the first week of the month Mercury makes a good appearance in the predawn sky. On the 13th there is a photo opportunity with both Mercury and Venus flanking the crescent moon.

Azimuth and altitude for Mercury at 07:00					
Date	**Az**	**Alt**	**Date**	**Az**	**Alt**
5th	122	14	15th	124	12
7th	123	14	17th	125	10
9th	124	14	19th	125	9
11th	124	13	21st	124	8
13th	124	13	23rd	124	6

Venus

Venus remains the prominent object in the eastern sky before dawn. As it draws away from us to pass behind the Sun it gets closer to the Sun and so is rising later each morning; it does however still remain an easily seen object even as it drops towards the horizon.

Mars

Mars spends most of the time either low in the east before sunrise, as it has earlier this year, or low in the west after sunset as it will be later this year and next. It now begins its dash towards the western evening sky. Take the opportunity to view it now, it is already past its best and by the end of the month it will be noticeably fainter and smaller making viewing the surface features more difficult. Mars can be found low in the east after sunset and is visible for most of the night.

Jupiter

At sunset Jupiter is conspicuous low in the south-southwest is and is observable until it gets too low in the sky.

Saturn

Saturn is getting slightly closer to Jupiter in the southern sky. Like Jupiter it is observable from just after sunset for a few hours until the planet gets too low in the 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 degrees north of the fourth magnitude star Mu Ceti, and about 2.5 degrees west of the sixth magnitude star 29 Arietis. *See the finder chart in the August New Zenith.*

Neptune

Neptune is on the eastern side of the constellation of Aquarius. It can be found about 2 degrees east of the fourth magnitude star Phi Aquarii, and 0.5 degrees south of the fifth magnitude 96 Aqarii. *See the finder chart in the July issue of New Zenith.*

Deep Sky

Deep Sky

NGC869 & 884 The Double Cluster
RA 2h 19m Dec 57° 19′ Mag 5.3

Either one of these clusters would be high in the list of sights in the winter sky yet here we have two in the same field of view. They can be seen as a pair of diffuse glows with the naked eye, and were recorded by the ancient Greeks. A small pair of binoculars shows them to be a pair of rich star clusters and will resolve a few of the stars. A telescope at low magnification gives the best view, careful use of magnification is needed as too much will spoil the view.

M103 Open Cluster
RA 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.

M74 The Phantom Galaxy
RA 1h 37m Dec 15° 50′ mag 9.1

This low surface brightness face on spiral galaxy is probably the most challenging of all the Messier objects. With a large aperture telescope and dark skies detail can be glimpsed in the spiral arms.

Peter Burgess

'Echo Mapping' in faraway galaxies could measure vast distances

When you look up at the night sky, how do you know whether the specks of light that you see are bright and far away, or relatively faint and close by? One way to find out is to compare how much light the object actually emits with how bright it appears. The difference between its true luminosity and its apparent brightness reveals an object's distance from the observer.

Measuring the luminosity of a celestial object is challenging, especially with black holes, which don't emit light. But the supermassive black holes that lie at the center of most galaxies provide a loophole: They often pull lots of matter around them, forming hot disks that can radiate brightly. Measuring the luminosity of a bright disk would allow astronomers to gauge the distance to the black hole and the galaxy it lives in. Distance measurements not only help scientists create a better, three-dimensional map of the universe, they can also provide information about how and when objects formed.

In a new study, astronomers used a technique that some have nicknamed "echo mapping" to measure the luminosity of black hole disks in over 500 galaxies. Published last month in the Astrophysical Journal, the study adds support to the idea that this approach could be used to measure the distances between Earth and these faraway galaxies.

The process of echo mapping, also known as reverberation mapping, starts when the disk of hot plasma (atoms that have lost their electrons) close to the black hole gets brighter, sometimes even releasing short flares of visible light (meaning wavelengths that can be seen by the human eye). That light travels away from the disk and eventually runs into a common feature of most supermassive black hole systems: an enormous cloud of dust in the shape of a doughnut (also known as a torus). Together, the disk and the torus form a sort of bullseye, with the accretion disk wrapped tightly around the black hole, followed by consecutive rings of slightly cooler plasma and gas, and finally the dust torus, which makes up the widest, outermost ring in the bullseye. When the flash of light from the accretion disk reaches the inner wall of the dusty torus, the light gets absorbed, causing the dust to heat up and release infrared light. This brightening of the torus is a direct response to or, one might say an "echo" of the changes happening in the disk.

The distance from the accretion disk to the inside of the dust torus can be vast - billions or trillions of miles. Even light, traveling at 186,000 miles (300,000 kilometers) per second, can take months or years to cross it. If astronomers can observe both the initial flare of visible light in the accretion disk and the subsequent infrared brightening in the torus, they can also measure the time it took the light to travel between those two structures. Because light travels at a standard speed, this information also gives astronomers the distance between the disk and the torus.

Scientists can then use the distance measurement to calculate the disk's luminosity, and, in theory, its distance from Earth. Here's how: The temperature in the part of the disk closest to the black hole can reach tens of thousands of degrees - so high that even atoms are torn apart and dust particles can't form. The heat from the disk also warms the area around it, like a bonfire on a cold night. Traveling away from the black hole, the temperature decreases gradually.

Astronomers know that dust forms when the temperature dips to about 1,200°C) the bigger the bonfire (or the more energy the disk radiates), the farther away from it the dust forms. So measuring the distance between the accretion disk and the torus reveals the energy output of the disk, which is directly proportional to its luminosity.

Because the light can take months or years to traverse the space between the disk and the torus, astronomers need data that spans decades. The new study relies on nearly two decades of visible-light observations of black hole accretion disks, captured by several ground-based telescopes. The infrared light emitted by the dust was detected by NASA's Near Earth Object Wide Field Infrared Survey Explorer (NEOWISE), previously named WISE. The spacecraft surveys the entire sky about once every six months, providing astronomers with repeated opportunities to observe galaxies and look for signs of those light "echoes." The study used 14 surveys of the sky by WISE/NEOWISE, collected between 2010 and 2019. In some galaxies, the light took more than 10 years to traverse the distance between the accretion disk and the dust, making them the longest echoes ever measured outside the Milky Way galaxy.

Galaxies Far, Far Away

The idea to use echo mapping to measure the distance from Earth to far away galaxies is not new, but the study makes substantial strides in demonstrating its feasibility. The largest single survey of its kind, the study confirms that echo mapping plays out in the same way in all galaxies, regardless of such variables as a black hole's size, which can vary significantly across the universe. But the technique isn't ready for prime time.

Due to multiple factors, the authors' distance measurements lack precision. Most notably, the authors said, they need to understand more about the structure of the inner regions of the dust doughnut encircling the black hole. That structure could affect such things as which specific wavelengths of infrared light the dust emits when the light first reaches it.

The WISE data doesn't span the entire infrared wavelength range, and a broader dataset could improve the distance measurements. NASA's Nancy Grace Roman Space Telescope, set to launch in the mid-2020s, will provide targeted observations in different infrared wavelength ranges. The agency's upcoming SPHEREx mission (which stands for Spectro-Photometer for the History of the Universe, Epoch of Reionization and Ices Explorer) will survey the entire sky in multiple infrared wavelengths and could also help improve the technique.

"The beauty of the echo mapping technique is that these supermassive black holes aren't going away anytime soon," said Qian Yang, a researcher at the University of Illinois at Urbana-Champaign and lead author of the study, referring to the fact that black hole disks may experience active flaring for thousands or even millions of years. "So we can measure the dust echoes over and over again for the same system to improve the distance measurement."

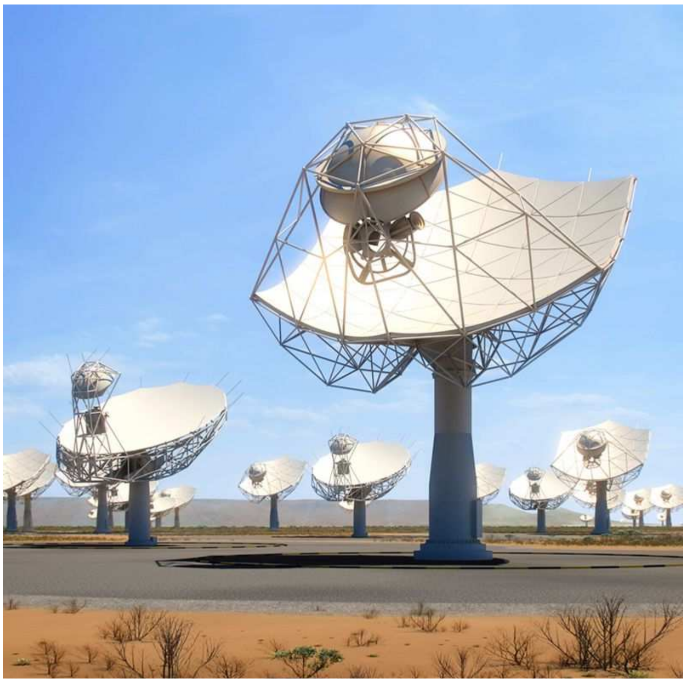
Luminosity-based distance measurements can already be done with objects known as "standard candles," which have a known luminosity. One example is a type of exploding star called a Type 1a supernova, which played a critical role in the discovery of dark energy (the name given to the mysterious driving force behind the universe's accelerating expansion). Type 1a supernova all have about the same luminosity, so astronomers only need to measure their apparent brightness to calculate their distance from Earth.

With other standard candles, astronomers can measure a property of the object to deduce its specific luminosity. Such is the case with echo mapping, where each accretion disk is unique but the technique for measuring the luminosity is the same. There are benefits for astronomers to being able to use multiple standard candles, such as being able to compare distance measurements to confirm their accuracy, and each standard candle has strengths and weaknesses.

"Measuring cosmic distances is a fundamental challenge in astronomy, so the possibility of having an extra trick up one's sleeve is very exciting," said Yue Shen, also a researcher at the University of Illinois at Urbana-Champaign and co-author of the paper.

More information at: https://phys.org/news/2020-10-echo-faraway-galaxies-vast-cosmic.html

Square Kilometre Array Project Frets About Satellite Interference



The SKA will consist of thousands of radio receivers. Construction starts next year

The project to build the largest telescope facility on Earth has also now voiced its concern about the coming era of satellite mega-constellations.

The Square Kilometre Array (SKA) will link radio antennas across South Africa and Australia to study the far-reaches of the cosmos.

But its governing organisation says the telescope's science would be severely compromised if thousands of telecommunications spacecraft begin flying overhead with no regard for the radio interference they might cause.

A number of companies - including US entrepreneur Elon Musk's SpaceX outfit, and the UK/Indian-owned OneWeb firm - plan vast networks in the sky to relay broadband internet.

The Square Kilometre Array Organisation (SKAO) says it's imperative these ventures engage with the radio astronomy community to minimise their impacts on the South African and Australian antennas.

Already, scientists who observe the Universe in visible/optical light have complained about the brightness of some of the spacecraft and how this can leave streaks in sky images.

The radio astronomers' issue is slightly different - it concerns the potential for the satellites' downlink communications to swamp the signals the SKA will try to detect from deep space.

The particular worry is the spectrum in Band 5b - a set of frequencies that runs from 8.3 to 15.4 GHz.

A portion of this is allocated for satellite use, but astronomers also like to use it because it's where some interesting features are seen to radiate. These include atoms and molecules that on Earth are involved in life processes.

Satellites and astronomers have to date lived relatively happily side by side in Band 5b, largely because those existing spacecraft dedicated to telecommunications have either not operated over radio facilities or when passing by have made sure they aren't transmitting.

This scenario could radically change, however, with the introduction of thousands of fast-moving, low-orbiting broadband satellites, warns the SKAO.

The organisation has just completed a modelling study that describes the impacts a population sample of 6,400 broadband spacecraft would have on the “SKA-Mid telescope” segment of the project, which will soon be erected in South Africa and consist of an array of 197 dishes.

The investigation finds that - without any mitigation measures - the loss of sensitivity in Band 5b as a result of frequency interference will result in observations taking 70% longer.

If observing sessions take longer to complete, fewer astronomers will get the opportunity to use the SKA - and that will cut down on its scientific return.

“There is tremendous scientific and public interest in identifying the origins of life beyond that found on Earth and one of the most promising methods of tracking it down elsewhere in our galaxy is the detection of complex pre-biotic molecules, whose spectral signatures are concentrated between about 10 and 15 GHz,” explained SKA science director Dr Robert Braun.

“This is only one of many exciting science goals that depend on sensitive access to this frequency range. The prospect of losing sensitivity in this key frequency band is extremely worrying.”

Mitigation would see satellite operators either pointing their transmissions away from the SKA antennas, or switching them off completely when moving overhead.

The SKA is to be built in sparsely populated areas, to try to avoid interference from telephone, TV, WiFi and other ground-based radio links. This means there ought not to be many customers near the “SKA-Mid telescope” for the broadband services the new players in satellite communications will be delivering.

“We've pointed out some problems, but we've also pointed out the solutions,” said Tim Stevenson, the head of assurance at the SKAO.

“We know the constraints that relate to these satellite systems; after all some of us are actually spacecraft engineers.

“What we need is a pragmatic approach because we also recognise the value of what they're doing. This is the modern world, and access to the internet is critical to development. Indeed, some of our member states are in the developing world, and so we are very sensitive to such issues,” he told BBC News.

Elon Musk's SpaceX company says it is committed to eliminating any impacts on astronomy from its new Starlink broadband constellation. OneWeb is in the process of extracting itself from bankruptcy proceedings but made similar commitments earlier this year.

The SKA is one of the grand scientific projects of the 21st Century.

It aims to produce a radio telescope with a collecting area of one million square metres (one square km) - equivalent to about 200 football pitches.

The SKA will investigate radio sources in the sky that radiate at centimetre to metre wavelengths - but it will achieve sensitivities that are far beyond the reach of current radio telescopes.

This should allow it to see the hydrogen in the first stars and galaxies to form after the Big Bang.

The SKA will also pinpoint precisely the positions of the nearest 100 million galaxies. Scientists hope this map will reveal new details about “dark energy”, the mysterious negative pressure that appears to be pushing the cosmos apart at an ever increasing speed.

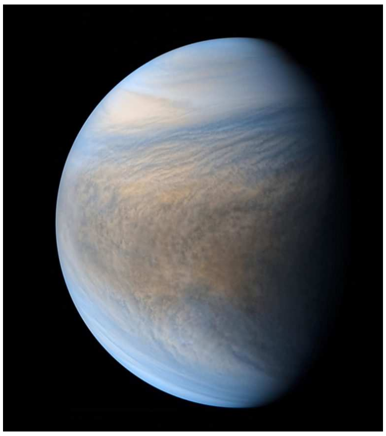
Construction of the SKA is scheduled to begin next year, with routine science observations expected to be under way by the late 2020s.

The project will cost the SKAO's 14 member states just under €2bn (£1.8bn) to implement.

More at: https://www.bbc.com/news/science-environment-54457344

Original Pioneer Identified Phosphine

On September 14th, an international team of scientists led by Jane Greaves (Cardiff University) published an unexpected result in Nature Astronomy: the detection of phosphine gas in the relatively cool cloud decks of Venus.



Damia Bouic, an amateur image processor, combined Akatsuki images taken through its UV1 filter — at different distances — to create this composite image. The brown region bristles with small convective clouds.

JAXA / ISAS / DARTS / Damia Bouic

Since then, the scientific community has been scrambling to verify the result. The Mars community has even gotten in on the fun, back-checking ExoMars spectral data for phosphine, though they didn't see any.

But scientists have now seen the signal in another unexpected place: Legacy data collected by the Pioneer mission in 1979.

Fact-checking the Phosphine Signal

A flurry of activity accompanied the announcement of phosphine at Venus. To confirm the phosphine signal, astronomers must make more spectroscopic observations, but most astronomers aren't yet willing to do that until the data reduction by Greaves' team has been inspected for errors.

In the meantime, some researchers are sufficiently convinced by the preliminary detection to begin exploring other aspects of the discovery, such as posing additional abiotic production methods, creating more complete models of the Venusian atmosphere, and digging through archival data to look for previous signs of phosphine that had been missed.

This last approach has already yielded some interesting results. NASA's Pioneer Venus 2, launched in 1978, had an entry probe with a mass spectrometer which was used to determine the composition of the atmosphere as it descended to the surface. More than 40 years later, another look at this legacy data has revealed evidence of phosphine in Venus's cool cloud decks, exactly where Greaves detected it.

The team, led by Rakesh Mogul (Cal Poly Pomona), has already posted their preliminary analysis on the arXiv preprint server. Although their results do not address phosphine's abundance and do not enable conclusions regarding its source, the results are important because not only did they see features consistent with phosphine, but other related species as well.

"We knew that people were going to question the veracity of the signal," Mogul said. "So I was inspired to look for other sources. A colleague sent me the data from Pioneer. Then I started thinking about how phosphine would act inside the spectrometer, if it would fragment, and what those fragments would look like."

Remote spectroscopy works from afar by examining light as it shines through various gases. But mass spectrometry is necessarily in situ: the instrument vaporizes a sample inside a chamber, and then sorts the ionized remains by mass-to-charge ratio. This thus gives a description of the elements present in a sample. When Mogul looked at the Pioneer mass spectrometer data, he found four out of the five spectral lines that one would expect in the presence of phosphine.

"The very first cool result was seeing atomic phosphorus," he said. "And then the other related molecules, including a deuterated species. This is to be expected on a planet that is hydrogen poor and makes it that much more likely that phosphine is actually present."

More than Phosphine

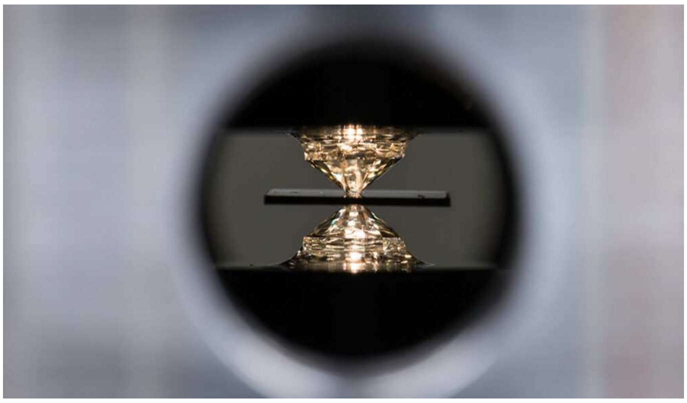
They also found signs of several other, previously unnoticed chemicals, including methane and ammonia. Like phosphine, these molecules might be potential biosignatures, because they are considered to be incompatible with the oxidizing atmosphere of Venus and because no obvious abiotic production route is currently known.

But how is it possible that these interesting detections have been overlooked for 40 years?

"It could be because I'm totally wrong," Mogul said. "But looking back at the literature, I wonder if there wasn't a reluctance to find anything out of equilibrium. Their efforts were focused on bulk gases, and how abundances changed across altitudes. Perhaps they were just waiting for other data to support the evidence of disequilibria in the minor species. And maybe this is the time for it."

More with links at: https://skyandtelescope.org/astronomy-news/did-pioneer-venus-find-phosphine-first/

The First Room-Temperature Superconductor Finally Found



When squeezed to high pressure between two diamonds (shown), a material made of carbon, sulfur and hydrogen can transmit electricity without resistance at room temperature. Credit: ADAM FENSTER

Scientists have reported the discovery of the first room-temperature superconductor, after more than a century of waiting.

The discovery evokes daydreams of futuristic technologies that could reshape electronics and transportation. Superconductors transmit electricity without resistance, allowing current to flow without any energy loss. But all superconductors previously discovered must be cooled, many of them to very low temperatures, making them impractical for most uses.

Now, scientists have found the first superconductor that operates at room temperature — at least given a fairly chilly room. The material is superconducting below temperatures of about 15° C, physicist Ranga Dias of the University of Rochester in New York and colleagues report in Nature.

The team's results "are nothing short of beautiful," says materials chemist Russell Hemley of the University of Illinois at Chicago, who was not involved with the research. However, the new material's superconducting superpowers appear only at extremely high pressures, limiting its practical usefulness.

Dias and colleagues formed the superconductor by squeezing carbon, hydrogen and sulfur between the tips of two diamonds and hitting the material with laser light to induce chemical reactions. At a pressure about 2.6 million times that of Earth's atmosphere, and temperatures below about 15° C, the electrical resistance vanished.

That alone wasn't enough to convince Dias. "I didn't believe it the first time," he says. So the team studied additional samples of the material and investigated its magnetic properties.

Superconductors and magnetic fields are known to clash — strong magnetic fields inhibit superconductivity. Sure enough, when the material was placed in a magnetic field, lower temperatures were needed to make it superconducting. The team also applied an oscillating magnetic field to the material, and showed that, when the material became a superconductor, it expelled that magnetic field from its interior, another sign of superconductivity.

The scientists were not able to determine the exact composition of the material or how its atoms are arranged, making it difficult to explain how it can be superconducting at such relatively high temperatures. Future work will focus on describing the material more completely, Dias says.

When superconductivity was discovered, it was found only at temperatures near absolute zero. But since then, researchers have steadily uncovered materials that superconduct at higher temperatures. In recent years, scientists have accelerated that progress by focusing on hydrogen-rich materials at high pressure.

In 2015, physicist Mikhail Eremets of the Max Planck Institute for Chemistry in Mainz, Germany, and colleagues squeezed hydrogen and sulfur to create a superconductor at temperatures up to -70° C. A few years later, two groups, one led by Eremets and another involving Hemley and physicist Maddury Somayazulu, studied a high-pressure compound of lanthanum and hydrogen. The two teams found evidence of superconductivity at even higher temperatures of -23° C and -13° C, respectively, and in some samples possibly as high as 7° C.

If a room-temperature superconductor could be used at atmospheric pressure, it could save vast amounts of energy lost to resistance in the electrical grid. And it could improve current technologies, from MRI machines to quantum computers to magnetically levitated trains. Dias envisions that humanity could become a "superconducting society."

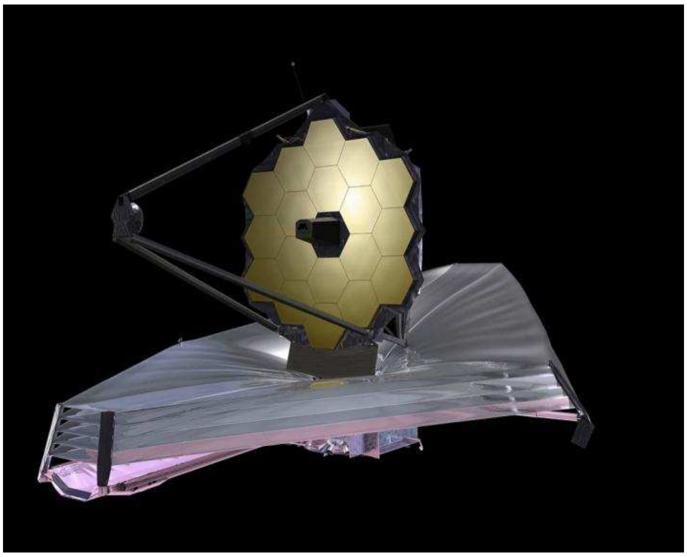
But so far scientists have created only tiny specks of the material at high pressure, so practical applications are still a long way off.

Still, "the temperature is not a limit anymore," says Somayazulu, of Argonne National Laboratory in Lemont, Ill., who was not involved with the new research. Instead, physicists now have a new aim: to create a room-temperature superconductor that works without putting on the squeeze, Somayazulu says. "That's the next big step we have to do."

More at: https://www.sciencenews.org/article/physics-first-room-temperature-superconductor-discovery

Australian Research Shows Nasa's James Webb Telescopes will Reveal Hidden Galaxies

Blinding glare of quasars can be overcome



An artist impression of the James Webb Space Telescope, fully deployed. Credit: NASA

Two new studies from the University of Melbourne will help the largest, most powerful and complex space telescope ever built to uncover galaxies never before seen by humanity.

The papers are published in The Astrophysical Journal and the Monthly Notices of the Royal Astronomical Society and show that NASA's James Webb Space Telescope, scheduled for launch late next year, will reveal hidden galaxies.

Powerful lights called 'quasars' are the brightest objects in the universe. Powered by supermassive black holes up to a trillion times the mass of our Sun, they outshine entire galaxies of billions of stars.

Simulations led by Science PhD candidate, Madeline Marshall, show that while even NASA's Hubble Space Telescope can't see galaxies currently hidden by these quasars, the James Webb Telescope will be able to get past the glare.

“Webb will open up the opportunity to observe these very distant host galaxies for the first time,” said Ms Marshall, who conducted her research at the ARC Centre of Excellence in All Sky Astrophysics in 3 Dimensions (ASTRO 3D).

“That can help us answer questions like: How can black holes grow so big so fast? Is there a relationship between the mass of the galaxy and the mass of the black hole, like we see in the nearby universe?”

Although quasars are known to reside at the centers of galaxies, it has been difficult to tell what those galaxies are like and how they compare to galaxies without quasars.

“Ultimately, Webb's observations should provide new insights into these extreme systems,” said ASTRO 3D co-author Stuart Wyithe of the University of Melbourne.

“The data it gathers will help us understand how a black hole could grow to weigh a billion times as much as our Sun in just a billion years. These big black holes shouldn't exist so early because there hasn't been enough time for them to grow so massive.”

The University of Melbourne team collaborated with researchers from the US, China, Germany, and The Netherlands to use the Hubble Space Telescope to try to observe these galaxies.

They then used a state-of-the-art computer simulation called BlueTides, which was developed by a team led by ASTRO 3D distinguished visitor, Tiziana Di Matteo, from Carnegie Mellon University in Pittsburgh, Pennsylvania, US.

“BlueTides is designed to study the formation and evolution of galaxies and quasars in the first billion years of the universe's history,” said Yueying Ni of Carnegie Mellon University, who ran the BlueTides simulation.

“Its large cosmic volume and high spatial resolution enables us to study those rare quasar hosts on a statistical basis.”

The team used these simulations to determine what Webb's cameras would see if the observatory studied these distant systems. They found that distinguishing the host galaxy from the quasar would be possible, although still challenging due to the galaxy's small size on the sky.

They also found that the galaxies hosting quasars tended to be smaller than average, spanning only about 1/30 the diameter of the Milky Way despite containing almost as much mass as our galaxy.

“The host galaxies are surprisingly tiny compared to the average galaxy at that point in time,” said Ms Marshall.

From: https://www.eurekalert.org/pub_releases/2020-10/uom-ars101420.php

Arcturus: Guardian of the Bear

Physical Characteristics

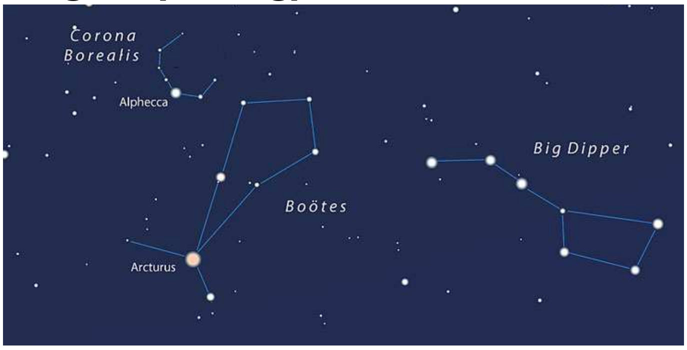
Arcturus is a fine example of a red giant star — impressively large, accordingly rarefied, brilliantly bright, and surprisingly cool. Arcturus possesses only slightly more mass than the Sun, but expands that material into a radius about 25 times larger.

As far as stars go, Arcturus is pretty close to us at only about 37 light-years away — appreciably more than the 4 or 8 light-years of Alpha Centauri or Sirius, respectively. But it's much closer than the hundreds of light-years that separate us from other red giants such as Betelgeuse or Antares. This proximity to Earth is certainly a contributing factor to Arcturus's apparent brightness. In fact, Arcturus is the fourth-brightest star in the night sky, outshone only by Sirius, Canopus, and Alpha Centauri, and the second brightest for much of the Northern Hemisphere.

Arcturus is a star on the move — it speeds along at about 273,000 mph. Because it's so close to us, its proper motion, or movement on the sky, is fairly easy to detect: It amounts to about 2.3" a year. With careful observation through a telescope, and a lot of patience, you can detect the star's movement over the course of a few decades. Arcturus is also moving toward us, but that motion isn't observable without a spectroscope.

You can thank the 18th-century astronomer Edmond Halley (of Halley's Comet fame) for discovering the proper motion of Arcturus (and by implication, other stars). He did this by comparing the star's position during his lifetime against records in the Almagest.

Origin/Mythology



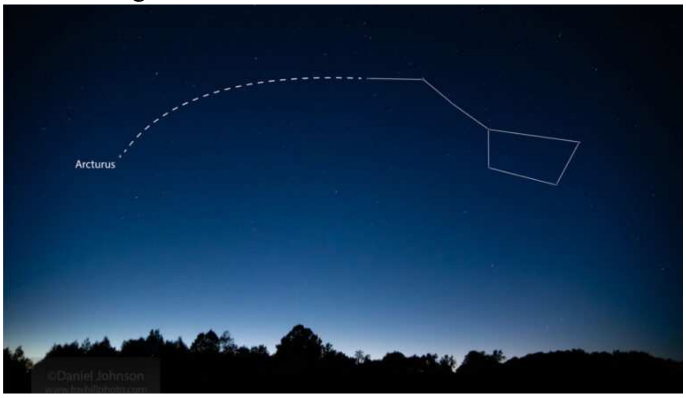
Arcturus is a Greek name, and you'll find a few different subtle translations of the meaning: "guardian of the bear," "bear follower," "keeper of the bear," and others. All of these imply the same basic fact: Arcturus "chases" Ursa Major around the sky.

Of course, an alternate set of views depicts the Big Dipper section of Ursa Major as a plough — a common concept in the UK, for example. Mythology has a nice connection between Arcturus for that view as well. The star's constellation, Boötes is the Herdsman — a farmer, in other words. In this case, Boötes the Herdsman becomes the man driving the plow.

Ancient cultures also put Arcturus to use as a navigational aid. Homer's Odysseus sailed the Mediterranean with his eyes "fixed on . . . late-setting Boötes." Polynesian sailors took advantage of the fact that Arcturus is a zenith star from Hawaii's latitude, meaning that the star passes directly above the islands when at its highest point. Thus, they could use it to estimate their own latitude in relation to the archipelago.

How to See Arcturus

Arcturus is a fine spring and summer star, riding high in the southwest around Summer Equinox. But it's also a nice autumn star, hanging lower in the west just after sunset in the fall. The star's brightness and obvious red color make it easy enough to find, but if you are in need of a handy guidepost, you can't do better than by finding the Plough and "Arcing to Arcturus."



To do this, find the Plough and take a look at the arc that is formed by its three handle stars (these would be Alioth, Mizar, and Alkaid). Then follow the direction of that curve until you run into Arcturus (it's close but not perfect!). If Spica is above the horizon as well, you can then "Speed on to Spica," if you'd like.

Because the Plough is so prominent, the phrase is a handy method of locating Arcturus — and a great learning tool to teach others. The obvious orange color of Arcturus is also a good teaching moment; someone unfamiliar with astronomy may have never noticed that the stars come in a rainbow of colors.

From: https://skyandtelescope.org/astronomy-news/meet-arcturus-guardian/

THE BACK PAGE

LINKS, COMMENTS AND OBSERVATIONS

Some Interesting Links

New Crew at the International Space Station:
https://www.nasa.gov/press-release/

What if Betelgeuse Goes Supernova Soon?
https://phys.org/news/

A Billion Tiny Pendulums Could Detect Missing Mass
https://www.sciencedaily.com/releases/

A More Accurate Model of the Universe
https://www.sciencedaily.com/releases/

Dark Skies Talk: 5 Simple Ways to Solve Light Pollution
https://www.ted.com/talks/

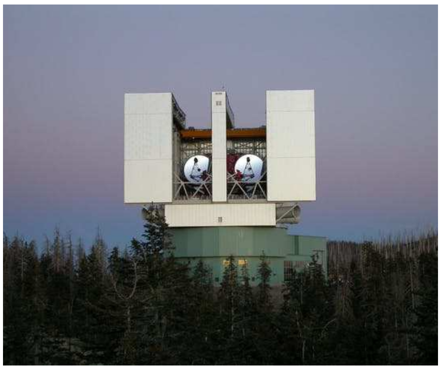
The Milky Way Galaxy has a Clumpy Halo
https://phys.org/news/

Water on the Moon is More Common than Thought
https://www.space.com/

So Why Don't Astronomers Use Binoculars?

Telescopes are not inherently better at looking into space than binoculars. Yes, astronomers' telescopes, with their gigantic lenses and sturdy support systems, are more powerful than binoculars you can carry. But it just comes down to size. Both tools rely on the same optical principles to do the job.

For a long time, actually, we astronomers have been trying – and mostly failing – to use binoculars to look into space! Merging the images from two separate telescopes is a real challenge. You need perfect images from each, with computers correcting for turbulence about 1,000 times a second. Your brain is so good at automatically combining the information from two eyes that technology hasn't really caught up yet.



The new Large Binocular Telescope is like a supersize version of binoculars you might use to go bird-watching.

NASA/JPL-Caltech

But a brand new observatory has just opened in Arizona, the Large Binocular Telescope. It uses a pair of identical 8.2-meter diameter telescopes – about the biggest mirrors that can be made – on a single mount. The Large Binocular Telescope will be able to act much like your eyes and brain to create incredibly sharp images of objects that are extremely faint.

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.

"When everything feels like an uphill struggle, just think of the view from the top"
Anon

"In the middle of difficulty lies opportunity."
Albert Einstein

"Research is what I'm doing when I don't know what I'm doing"
Wernher von Braun

"The scientific theory I like best is that the rings of Saturn are composed entirely of lost airline luggage"
Mark Russell

"If you can't make it good, at least make it look good"
Bill Gates

"I find TV very educational. Every time somebody turns it on, I go into the other room and read a book"
Groucho Marx

"There are no passengers on spaceship earth. We're all crew"
Marshall McLuhan