New Zenith

The Monthly Newsletter of the Vectis Astronomical Society

Vol 30 Issue 1 — February 2022 *When Printed, this Newsletter costs VAS at least £1*

Society News

Observatory News

I am pleased to announce that our Observatory is now open again

Some restrictions must still apply however; for example, everyone must carry a face covering and use it when in crowded spaces. Of course non-member visitors will have the same instructions. The observatory is a small facility and everyone must take social distancing into account.

Monthly Meeting Program

Please note the new meeting program listed on Page 2. Simon Gardner has done a great job in getting bookings through until May next year. Thanks Simon.

Please also note that, so far, the January, February and March meetings are via ZOOM only and login details are included on the *Back Page* of this NZ.

Outreach

The local schools on the Island have started to request our help with various Space Camp events. We have some booked in and could do with a few extra people to help out - it's always better to have a more on site than we really need at these events, so, if you can help please let Elaine Spear know by email to *outreach@wightastronomy.org*

Dark Skies

The Dark Skies project is still coming together. The biggest hurdle has been the street light colour temperature in the Brighstone area. This is now pretty much resolved as the Council and Island Roads will replace the affected lights with a much lower temperature (warmer) versions to ensure compliance with the requirements of the International Dark-Sky Association's specification.

This really is good news as it will allow use to apply for recognition for the South West quarter of the Island.

Welcome to 2022 - It could be a good one!

Brian Curd

VAS Website: wightastronomy.org

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

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

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

Observatory Diary

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

VAS Website: wightastronomy.org

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2022 Monthly Meetings

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

Date	Subject	Speaker
28 Jan	Galaxy Bars ***(ZOOM Meeting)***	Dr Justus Neuman
25 Feb	Unmanned Satellites - The Basics ***(ZOOM Meeting)***	Ralph Melligio
25 Mar	Rebel Star: The Sun's Greatest Mysteries ***(ZOOM Meeting)***	Colin Stuart
22 Apr	Arrokoth and the Sentinels	Greg Smye-Rumsby
27 May	James Webb Space Telescope	Dr Stephen Wilkins
24 Jun	TBA	
22 Jul	Outreach Event TBA	
26 Aug	AGM	
23 Sep	TBA	
20 Oct	TBA	
25 Nov	TBA	

Observatory Visits Booked

No bookings so far

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

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

IMPORTANT

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

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

VAS Contacts 2022

President	Barry Bates president@wightastronomy.org
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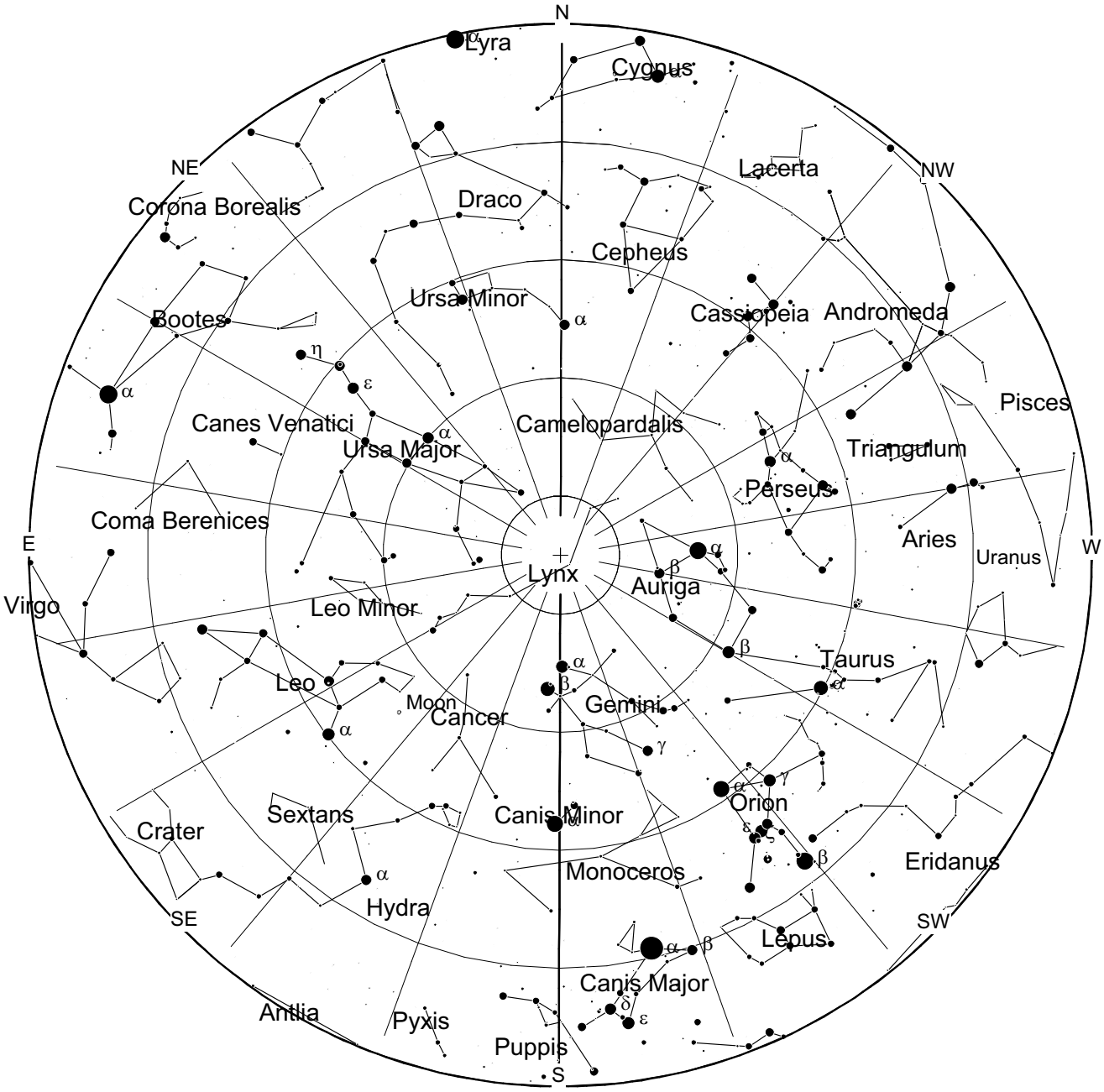
Important

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.

February 2022 - Sky Map



View from Newchurch Isle of Wight UK - 2200hrs - 15 February 2022

The Orion Nebula (Messier 42, M42, or NGC 1976) is a diffuse nebula situated in the Milky Way, being south of Orion's Belt in the constellation of Orion. It is one of the brightest nebulae and is visible to the naked eye in the night sky. It is 1,344 ± 20 light-years away and is the closest region of massive star formation to Earth. The nebula is estimated to be 24 light-years across. It has a mass of about 2,000 times that of the Sun.

The Orion Nebula is one of the most scrutinized and photographed objects in the night sky. The nebula has revealed much about the process of how stars and planetary systems are formed from collapsing clouds of gas and dust. Astronomers have directly observed protoplanetary disks and brown dwarfs within the nebula, intense and turbulent motions of the gas, and the photo-ionizing effects of massive nearby stars in the nebula.

February 2022 - Night Sky

Moon Phases Dec 2021

New	First Qtr	Full	Last Qtr
1st	8th	16th	23rd
			

Planets

Mercury

Mercury makes a poor morning apparition this month and may just be visible against the brightening dawn sky during the first fortnight of the month. Look about 12° below/ left of the much brighter Venus just before sunrise.

Venus

The "Morning Star" can be seen very low down in the south-eastern sky just before sunrise. On the ninth it will be at its brightest and it will be easily visible against the brightening pre-dawn sky. Through a telescope it will show a crescent phase.

Mars

Mars is still too close to the horizon at sunrise this month to be easily visible from our latitude. As the year progresses, it will become more visible in the morning sky before opposition later in the year.

Jupiter

For the first few days of the month Jupiter can be seen slipping down in the south-western sky as it approaches conjunction with the Sun in early March.

Saturn

Saturn is in conjunction with the Sun on the fourth of the month, so is not visible.

Uranus

Uranus can be found between the fourth magnitude star Mu Ceti and the second magnitude Hamal in the constellation of Triangulum. As there are no bright guide stars close by, the best way of locating this ice giant is to use a planetarium program. It is just below naked eye visibility so is an easy target for even a small pair of binoculars.

Neptune

Neptune poorly placed for observation this month, being too close to the horizon when the sky has darkened. It will become visible again in the morning sky later in the year.

Deep Sky

NGC2244
RA 6h 32m Dec 4° 57' mag 4

This is the star cluster surrounded by the Rosette nebula that on the clearest nights is visible to the naked eye as a bright spot in the winter Milky Way. Binoculars show the brightest members of the cluster forming a rectangular shape. The rosette nebula is a large object, about twice the diameter of the full moon, so is best observed visually using a rich field telescope; a nebula filter will help to increase the contrast with the background sky.

NGC2169
RA 6h 9m Dec 13° 58' mag 5.9

This cluster is easily visible in binoculars as a small parallelogram. In creasing the magnification to about 100 with a small telescope will reveal that the stars spell out this cluster's popular name, the '37' cluster. The 7 is quite clear if you can see down to magnitude 11, the 3 is less obvious but is there with a little imagination.

M78
RA 5h 47m Dec 0° 3'

A small bright reflection nebula that is a part of the great Orion nebula M42 located in the sword. This nebula can be seen in binoculars but is rather small so is best viewed through a telescope.

Peter Burgess

Was There Life on Mars?

NASA's Curiosity rover has collected samples of rock from the surface of Mars that are rich in a type of carbon associated with biological processes on Earth.

Is it a sign of ancient life? Well… maybe. It could be the result of methane having been released into the atmosphere of Mars by bacteria. That methane was then maybe converted into "larger, more complex molecules" by ultraviolet light, which rained down to the surface and were preserved (replete with distinctive carbon signature) in the rocks.

At least that's how it works on Earth. The explanation could also be non-biological. It could be down to the interaction of carbon dioxide gas in the atmosphere with ultraviolet light, or perhaps millions of years ago the solar system passed through a giant molecular cloud rich in the type of carbon detected.

As ever, more data is needed and scientists can't make conclusions based on Earth examples.

Curiosity has rolled around Mars since 2012 covering over 16 miles. On board is the Sample Analysis at Mars instrument suite which can analyse organics and gases from atmospheric and solid samples. In this instance, the team used SAM to heat up 24 samples taken from geologically diverse locations in Curiosity's Gale Crater home and heated them to 850°C to release the gases within.

The isotopes were measured using the Tunable Laser Spectrometer and, according to the team, "researchers found that nearly half of their samples had surprisingly large amounts of carbon-12 compared to what scientists have measured in the Martian atmosphere and meteorites."

This is significant since, on Earth, processes that would produce this carbon signal tend to be biological. However, the same explanation might not apply to Mars. The planet might have started off with a different set of carbon isotopes than Earth and the carbon might be cycling without any life involved. Again, more data is needed as scientists seek to let go of Earthly biases when looking at Martian processes and chemistry.

Scientists would also really like to check out the carbon content of a methane plume released from the surface. Curiosity happened across one in 2019, but there's no way to know if it will do so again. In the meantime, the study will provide some pointers to the Perseverance rover team on the types of samples to collect for a possible return to Earth.

From: https://www.theregister.com/

Telescopes for Special Educational Needs (SEN) - Scopes4SEN

Children with special educational needs and more vulnerable people should also be given the chance to look through a telescope and explore the Moon, the planets and the stars.

Since the end of 2015 Joanne & Patrick Poitevin took up the challenge to roll out the initiative for the United Kingdom.

Schools for special educational needs and institutions for children with disabilities are donated a telescope, and if available, loads of other education material. ***All free!***

So far, in 6 years Scopes4SEN donated about 1300 telescopes, sometimes along with other educational material (if available): *Astronomy KIT, SolarCan, Solar Filters, Digital Books, binoculars, meteorites, SUNoculars, books, posters, magazines, stereoscopes, digital microscopes, planispheres, magnifiers, planetariums, CCD cameras, etc.*

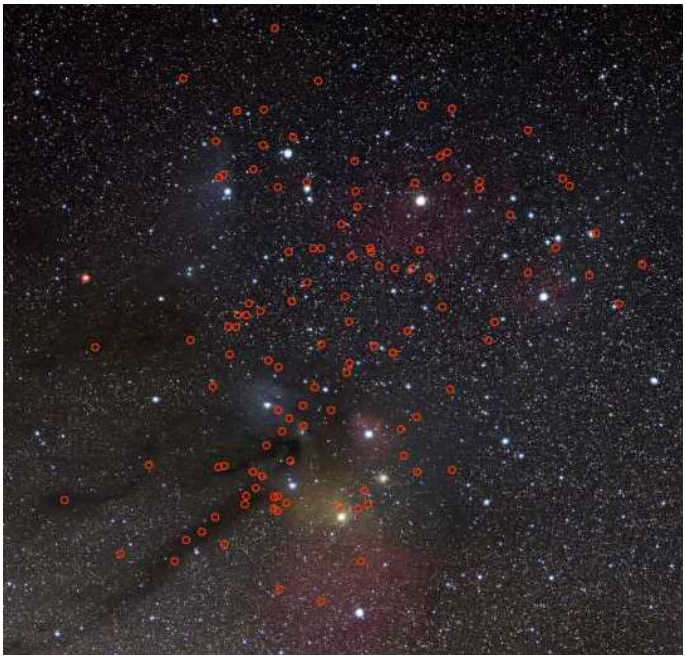
If you have a telescope or other astronomy items to spare please visit the website below to find out how you can help this very active group encourage more to get involved in astronomy,

See: https://scopes4sen.weebly.com/

Please Remember

The first three monthly meetings of 2022 are via Zoom and the Observatory and Pavilion will not be open on these nights

Largest Collection of Free-Floating Planets Found in the Milky Way



This image shows the locations of 115 potential free-floating planets recently discovered

Using observations and archival data from several of NSF's NOIRLab's observatories, with observations from telescopes around the world and in orbit, astronomers have discovered at least 70 new free-floating planets - planets that wander through space without a parent star - in a nearby region of the Milky Way. This is the largest sample of such planets found in a single group and it nearly doubles the number known over the entire sky.

Researchers have discovered a group of free-floating planets - planets not orbiting a star - in a nearby region of the Milky Way known as the Upper Scorpius OB stellar association. At least 70, and as many as 170 of these Jupiter-sized planets have been found by examining data from over 20 years of observations. The first free-floating planets were discovered in the 1990s, but the latest findings have almost doubled the total number known.

To find these planets, a team of astronomers, used observations and archival data from a number of large observatories, including facilities from NSF's NOIRLab, telescopes of the European Southern Observatory, the Canada-France-Hawaii Telescope, and the Subaru Telescope, amounting to 80,000 wide-field images over 20 years of observations.

The data include 247 images from the NEWFIRM extremely wide-field infrared imager at Kitt Peak National Observatory in Arizona, 1348 images from the same NEWFIRM instrument after it was relocated to the Cerro Tololo Inter-American Observatory in Chile, 2214 images from the Infrared Side Port Imager that was previously operating on the Víctor M. Blanco 4-meter Telescope at CTIO, and 3744 images from the Dark Energy Camera.

The wide-field CCD Dark Energy Camera was designed for the Dark Energy Survey funded by the Department of Energy (DOE). It was built and tested at DOE's Fermilab, and was operated by the DOE and National Science Foundation (NSF) between 2013 and 2019.

The free-floating planets lie in the Upper Scorpius OB association, which is 420 light-years away from Earth. This region contains a number of the most famous nebulae, including the Rho Ophiuchi cloud, the Pipe Nebula, Barnard 68, and the Coalsack.

Free-floating planets have mostly been discovered via microlensing surveys, in which astronomers watch for a brief chance alignment between an exoplanet and a background star. However, microlensing events only happen once, meaning follow-up observations are impossible.

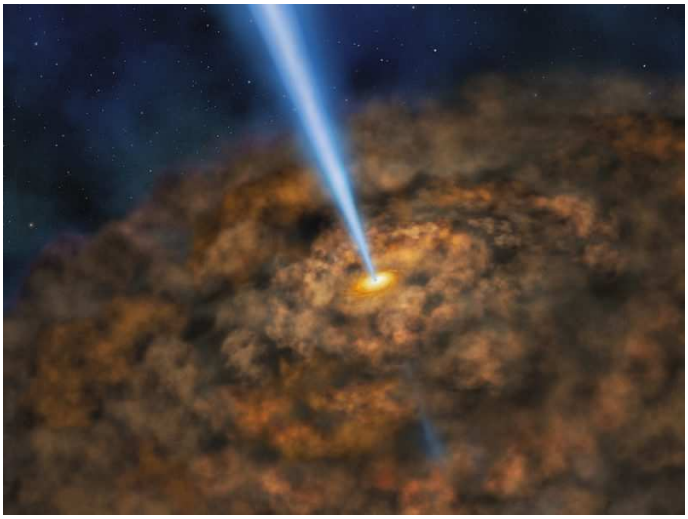
These new planets were discovered using a different method. These planets, far away from any star illuminating them, would normally be impossible to image. However, the fact that, in the few million years after their formation, these planets are still hot enough to glow, making them directly detectable by sensitive cameras on large telescopes. The team used the 80,000 observations to measure the light of all the members of the association across a wide range of optical and near-infrared wavelengths and combined them with measurements of how they appear to move across the sky.

The discovery also sheds light on the origin of free-floating planets. Some scientists believe these planets can form from the collapse of a gas cloud that is too small to lead to the formation of a star, or that they could have been kicked out from their parent system. But which is the actual mechanism remains unknown.

The ejection model suggests that there could be even greater numbers of free-floating planets that are Earth-sized. “The free-floating Jupiter-mass planets are the most difficult to eject, meaning that there might even be more free-floating Earth-mass planets wandering the galaxy,” says Miret-Roig.

More at: https://phys.org/

Dwarf Galaxies Shed Light On Black Hole Origins



Artist's impression of an outflow coming from a supermassive black hole at the center of a galaxy. Astronomers can find massive black holes even in dwarf galaxies by looking for emission related to their outflows. NASA / SOFIA / Lynette Cook

Massive black holes in the cores of puny dwarf galaxies are much more common than previously thought, according to new results presented at an American Astronomical Society press conference Monday. The findings will help astronomers to understand how the newly born universe spawned supermassive black holes in the first place.

Most large galaxies like our own Milky Way harbor supermassive black holes, weighing in at millions or even billions of solar masses. If actively accreting material from their surroundings, they can sometimes outshine their host galaxy. Such quasars have been observed in the early universe, indicating that massive black holes grew incredibly fast from smaller "seeds."

However, astronomers don't know the nature of these first seeds. Maybe the growth process started with the ubiquitous remnants of the very first generation of extremely massive stars, known as Population III stars. These black hole "seeds" would have had up to about 100 times the mass of the Sun and could have gained additional bulk through subsequent collisions and mergers.

Alternatively, huge unstable masses of primordial gas could have fallen into galactic centers, directly collapsing into very massive black holes (up to a few hundred thousand solar masses) in one fell swoop.

Since the early universe is difficult to study in detail, astronomers focus on nearby dwarf galaxies. While larger galaxies like the Milky Way are the result of mergers, "dwarf galaxies have remained relatively untouched over cosmic time," explains Mallory Molina (Montana State University). So if dwarfs host massive black holes, these provide a window into the past.

So far, a handful of giant black holes have been found in dwarf galaxies, mainly in rather massive ones with little star-forming activity. But in a December 1st paper in The Astrophysical Journal, a team led by Molina and Amy Reines (also at Montana State) presents evidence for the existence of supermassive black holes in 81 dwarfs that are both smaller and more actively forming stars.

Previous surveys missed these black holes because their broad visible-light emission is washed out by the stronger glow of star-forming regions. To see past the light of newborn stars, the astronomers looked for a red emission line of highly ionized iron atoms in spectroscopic data from the Sloan Digital Sky Survey for tens of thousands of dwarf galaxies. Starlight is not energetic enough to produce this extreme level of ionization, but X-rays from hot gas blown away by a central black hole can.

The team's systematic search only revealed active black holes, so the total percentage of dwarf galaxies harboring supermassive black holes is still unknown. "That's the million-dollar question in the field," says Molina. "What we have found is only the tip of the iceberg." Still, the new result has implications for our ideas about the growth of supermassive black holes in the early universe.

As Ryan Hickox (Dartmouth College) explains, the direct collapse scenario cannot have been very common. "It's hard to compress large volumes of gas in a tiny region of space, as they would tend to fragment," he says. So the more supermassive black holes you find in dwarf galaxies, the less likely it is that they are all due to direct collapse.

At the same press conference, Hickox presented unpublished Chandra X-ray Observatory data of the dwarf galaxy Markarian 462, which indicate the presence of a supermassive black hole heavily obscured by dust. "This is one of the first obscured black holes in a dwarf galaxy," he says. "Such objects might have been missed so far in earlier surveys, so this also points to a much larger population."

Unfortunately, observations of dwarf galaxies in the local universe are not going to entirely answer the question of the origin of supermassive black holes. "Although growth from smaller seeds now starts to look like the more reasonable scenario," Molina says, "what we really need is to watch their formation in the early universe. The James Webb Space Telescope may finally nail it down."

More at: https://skyandtelescope.org/

Webb Could Help Protect Earth

The James Webb Space Telescope, the most complex and expensive space laboratory ever created, is less than two weeks away from its ultimate destination a million miles from Earth. It will send information about parts of space and time never seen before. It will also send previously unattainable information about parts of our own solar system.

UC Riverside astrophysicist Stephen Kane's group will be using the telescope to look for planets like Venus in other parts of the galaxy. In addition to work with the Webb mission, Kane is also joining NASA on missions to Venus expected to launch after 2028. Here, he breaks down some unique aspects of the Webb, explains how the separate Venus projects intersect, and how both might benefit Earth.

Q: The Webb telescope cost $10 billion. What contributed to the cost, and what makes it different from other telescopes?

A: Webb is often described as a successor to NASA's Hubble Space Telescope, which is remarkably still going strong. It was launched in the early 90s and is well past its expiration date - it was never intended to last this long. Its primary mirror is just under 8ft in diameter. The Webb's mirror is more than 21ft across. It's way bigger. But there are a few other important differences.

Hubble orbits the Earth, and there's an advantage to that. We can and have accessed it to fix it when something goes wrong. But the disadvantage is that Earth gets in the way of its observations and can limit some of the science it can do. In contrast, Webb is headed to a Lagrange point, a location in space where Earth and the sun's gravity cancel out, so it can remain in a stable orbit. That location is about a million miles from Earth. From there, it can look anywhere in space without having Earth in the way.

In addition, the Hubble primarily operates at optical wavelengths. Webb is primarily designed to “see” infrared light with extreme sensitivity. This will help us detect a number of things, including stars and planets that are just forming and aren't yet otherwise visible.

Q: How will you be using Webb's technology to help you understand more about Venus? Also, why are you studying Venus?

A: Venus has surface temperatures of up to 800° F, no water, and floats in a nest of sulfuric acid clouds. In my work, I'm trying to answer two questions: 1) how did Venus get to be the way it is? and 2) how commonly does this hellish state occur elsewhere?

Our separate mission to Venus is about answering the former question, studying Venus itself. Our work with the Webb is about the latter - are there other Venuses? We'll be using Webb to measure the atmospheres of exoplanets - planets around stars other than our sun - and trying to determine whether they're more like Earth or Venus. Specifically, Webb will help us look for CO_2 and other gases that could indicate runaway greenhouse states.

We are going to do these measurements on planets where we already know how long it takes them to orbit their stars, how close they are to their stars, their size and their mass. But we don't know much about their atmospheres, or whether they're in Venus-like states. Webb can tell us this. And it will help us see whether the fate of Venus is a common fate or not.

Q: Greenhouse gases are causing devastating changes to the climate here on Earth. Can Venus science help solve this planet's problems?

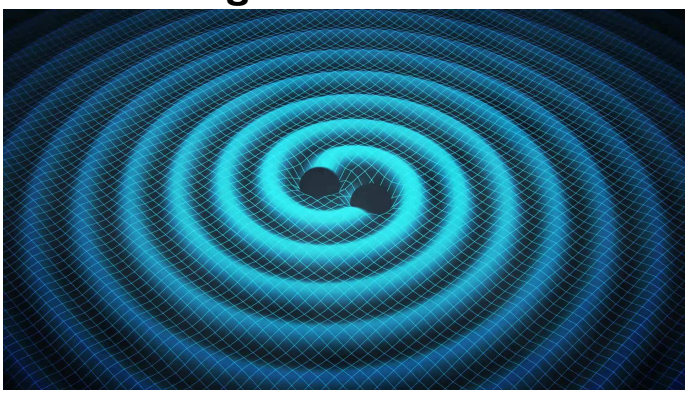
A: Whatever happened to Venus was through non-human processes, but the effect is very similar. Venus is a preview of Earth's future. Understanding how runaway greenhouse gases work can tell us how to prevent that future. We know that climate change is real, that temperatures are rising. But there's a lot of variability in predictions 50 or 100 years out because there are limits to how much we know about how planetary processes influence each other.

Volcanic outgassing, ocean currents, air currents - there are many pieces in a complex puzzle, and we're trying to determine our fate based only data from Earth. We need another source of data where things have already gone wrong, that's Venus.

It's possible Venus could always have been in its current state, but we don't think so. We believe it could have had water in the past because it rotates slowly, which could allow clouds to form and cool the surface enough to get water. That's one reason we're going back, to see the geology on the surface and get clues about its origins.

More at: https://phys.org

New Evidence of a Gravitational Wave Background



The results of a comprehensive search for a background of ultra-low frequency gravitational waves has been announced by an international team of astronomers including scientists from the Institute for Gravitational Wave Astronomy at the University of Birmingham.

These light-year-scale ripples, a consequence of Einstein's theory of general relativity, permeate all of spacetime and could originate from mergers of the most massive black holes in the Universe or from events occurring soon after the formation of the Universe in the Big Bang. Scientists have been searching for definitive evidence of these signals for several decades.

The International Pulsar Timing Array (IPTA), joining the work of several astrophysics collaborations from around the world, recently completed its search for gravitational waves in their most recent official data release, known as Data Release 2 (DR2).

This data set consists of precision timing data from 65 millisecond pulsars - stellar remnants which spin hundreds of times per second, sweeping narrow beams of radio waves that appear as pulses due to the spinning - obtained by combining the independent data sets from the IPTA's three founding members: The European Pulsar Timing Array (EPTA), the North American Nanohertz Observatory for Gravitational Waves (NANOGrav), and the Parkes Pulsar Timing Array in Australia (PPTA).

These combined data reveal strong evidence for an ultra-low frequency signal detected by many of the pulsars in the combined data. The characteristics of this common-among-pulsars signal are in broad agreement with those expected from a gravitational wave "background."

The gravitational wave background is formed by many different overlapping gravitational-wave signals emitted from the cosmic population of supermassive binary black holes (i.e. two supermassive black holes orbiting each other and eventually merging) -- similar to background noise from the many overlapping voices in a crowded hall.

Professor Alberto Vecchio, Director of the Institute for Gravitational Wave Astronomy at the University of Birmingham, and member of the EPTA, says: "The detection of gravitational waves from a population of massive black hole binaries or from another cosmic source will give us unprecedented insights into how galaxy form and grow, or cosmological processes taking place in the infant universe. A major international effort of the scale of IPTA is needed to reach this goal, and the next few years could bring us a golden age for these explorations of the universe."

"This is a very exciting signal! Although we do not have definitive evidence yet, we may be beginning to detect a background of gravitational waves," says Dr Siyuan Chen, a member of the EPTA and NANOGrav, and the leader of the IPTA DR2 search and publication.

Dr Boris Goncharov from the PPTA cautions on the possible interpretations of such common signals: "We are also looking into what else this signal could be. For example, perhaps it could result from noise that is present in individual pulsars' data that may have been improperly modeled in our analyses."

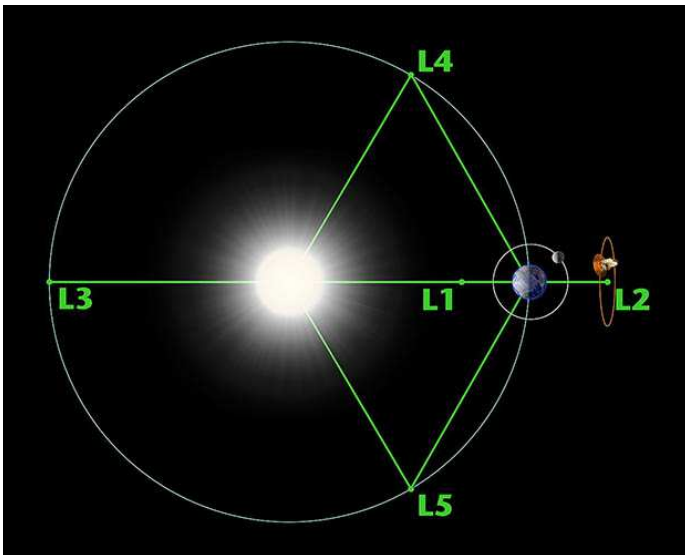
To identify the gravitational-wave background as the origin of this ultra-low frequency signal, the IPTA must also detect spatial correlations between pulsars. This means that each pair of pulsars must respond in a very particular way to gravitational waves, depending on their separation on the sky.

These signature correlations between pulsar pairs are the "smoking gun" for a gravitational-wave background detection. Without them, it is difficult to prove that some other process is not responsible for the signal. Intriguingly, the first indication of a gravitational wave background would be a common signal like that seen in the IPTA DR2. Whether or not this spectrally similar ultra-low frequency signal is correlated between pulsars in accordance with the theoretical predictions will be resolved with further data collection, expanded arrays of monitored pulsars, and continued searches of the resulting longer and larger data sets.

Dr Maura McLaughlin of the NANOGrav collaboration says, "If the signal we are currently seeing is the first hint of a gravitational wave background, then based on our simulations, it is possible we will have more definite measurements of the spatial correlations necessary to conclusively identify the origin of the common signal in the near future."

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

Webb Telescope Arrives at L2



It's really happening. The James Webb Space Telescope has successfully reached its orbital destination in space, 1.5 million km (1 million miles) from Earth. A final 5-minute thruster firing on January 24, 2022 put JWST in its halo orbit at the Sun-Earth Lagrange 2 (L2) point. The formal commissioning process can now begin.

"We're excited to announce today that Webb is officially on station at its L2 orbit, capping off a remarkable 30 days," said Webb's commissioning manager Keith Parrish in a January 24 news conference. "It's an incredible achievement by our team."

Since it launched on December 25, Webb has been undergoing the nail-biting and complicated unfolding and deploying while cruising through space. Everything so far has gone perfectly.

"During the past month, JWST has achieved amazing success and is a tribute to all the folks who spent many years and even decades to ensure mission success," said Bill Ochs, Webb project manager at NASA's Goddard Space Flight Center, in a blog post. "We are now on the verge of aligning the mirrors, instrument activation and commissioning, and the start of wondrous and astonishing discoveries."

Parrish reiterated how efficient the launch by the Ariane 5 rocket and the course correction maneuvers have been, potentially giving the JWST mission twice the lifetime as originally announced, as long as 20 years.

"We used a tiny amount of fuel in today's manoeuvre," he said, "We're very, very happy with our estimated lifetime, and it's going to extensively exceed our 10 year estimate. Everybody's thrilled by it. It's just a degree of how thrilled." Parrish added that the team will review the data and put an exact number on that lifetime over the next few months.

Parrish said approximately once every 21 days, the telescope's orbit around L2 will need to be tweaked by briefly firing JWST's thrusters.

The telescope team will now begin the months-long process of calibrating its mirrors and turning on the science instruments.

Lee Feinberg, JWST's Optical Telescope Element Manager said the 3-month process of aligning the 18 mirror segments to act as one large 6.5 meter telescope will begin in about a week, after the primary near-infrared camera, NIRCam, is cold enough to turn on. That instrument will help align the mirrors.

"We'll look at a bright, isolated star," Feinberg said, "and we'll get 18 different images - which will all be blurry because the individual mirror won't be aligned. Then we can begin the slow process that we call phasing, which will align the mirrors to work as one."

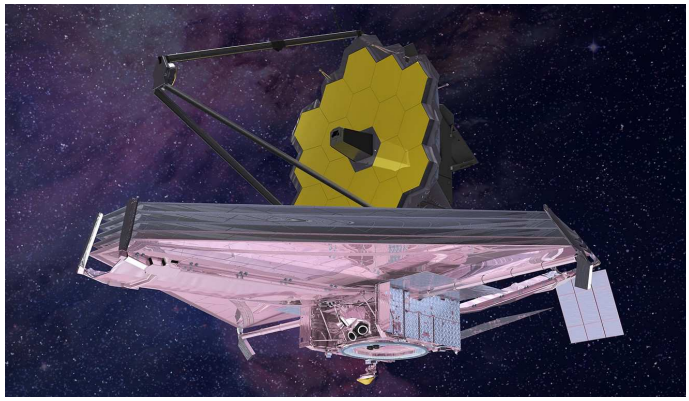
Feinberg said the mirrors will be aligned to within 1/5000th the width of a human hair. He also revealed the identity of the star they will use: HD 84406, a G-type main sequence star that is a lot like our own Sun.

"It's a Ursa Major near the bowl of the Big Dipper," he said noting that the star is not visible to the naked eye, but it can be seen with binoculars.

While everything has gone well so far, there is still a lot of work to get the telescope ready for action.

"We're a month in and the baby hasn't even opened its eyes yet," said Jane Rigby of NASA Goddard Space Flight Center. "Everything we're doing is about getting the observatory ready to do transformative science. That's why we're here."

From: https://www.universetoday.com/



Tug of Sun & Moon Driving Plate Motions on 'Imbalanced' Earth?

A study led by geophysicist Anne M. Hofmeister in Arts & Sciences at Washington University in St. Louis proposes that imbalanced forces and torques in the Earth-moon-sun system drive circulation of the whole mantle.

The new analysis provides an alternative to the hypothesis that the movement of tectonic plates is related to convection currents in the Earth's mantle. Convection involves buoyant rise of heated fluids, which Hofmeister and her colleagues argue does not apply to solid rocks. They argue that force, not heat, moves large objects. The new research is published in a special paper of the Geological Society of America, as part of a forthcoming collection assembled in honor of geologist Warren B. Hamilton.

Earth's internal workings are popularly modeled as dissipating heat generated by internal radioactivity and from leftover energy created during collisions when our planet formed. But even mantle convection proponents recognize that that amount of internal heat-energy is insufficient to drive large-scale tectonics. And there are other problems with using convection to explain observed plate motions.

Instead, Earth's plates might be shifting because the sun exerts such a strong gravitational pull on the moon that it has caused the moon's orbit around Earth to become elongated.

Over time, the position of the barycenter - the center of mass between the orbiting bodies of the Earth and the moon - has moved closer to Earth's surface and now oscillates 600 km per month relative to the geocenter, Hofmeister said. This sets up internal stresses, as the Earth continues to spin.

"Because the oscillating barycenter lies ~4600 km from the geocenter, Earth's tangential orbital acceleration and solar pull are imbalanced except at the barycenter," Hofmeister said. "The planet's warm, thick and strong interior layers can withstand these stresses, but its thin, cold, brittle lithosphere responds by fracturing."

Daily spin flattens the Earth from a perfect spherical shape, which contributes to this brittle failure of the lithosphere. These two independent stresses create the mosaic of plates observed in the outer shell, the authors suggest. The variety of plate motions comes from the changes in size and direction of the imbalanced gravitational forces with time.

But how to test this alternative? Hofmeister suggested: "One test would be a detailed examination of the tectonics of Pluto, which is too small and cold to convect, but has a giant moon and a surprisingly young surface."

The study includes a comparison of rocky planets that shows that the presence and longevity of volcanism and tectonism depend on the particular combination of moon size, moon orbital orientation, proximity to the sun and rates of body spin and cooling.

Earth is the only rocky planet with all the factors needed for plate tectonics, Hofmeister noted.

"Our uniquely large moon and particular distance from the sun are essential," she said.

From: https://phys.org/

Just Another Reminder!

The Watery Lane Observatory is now open again on Thursday evenings (*Hooray!*)

Whilst COVID isn't over, the restrictions we have got used to over the last months are being lifted and we can re-open

Please remember, the Observatory is a confined space so be aware of others who may be in there

Please have a face covering available when you visit - *you may need it if visitors come pouring through the doors!*

Let's hope this a brighter start to the year!

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 **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

Moon Phases

This image shows the phases of the Moon and why they happen. The centre ring shows the Moon as it orbits around the Earth, as seen from above the north pole. Sunlight illuminates half the Earth and half the moon at all times. But as the Moon orbits around the Earth, at some points in its orbit the sunlit part of the Moon can be seen from the Earth. At other points, we can only see the parts of the Moon that are in shadow. The outer ring shows what we see on the Earth during each corresponding part of the moon's orbit. NASA

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 relevant content. Contact details on page 1.

Strange Facts

Tyromancy is the practice of predicting the future with cheese

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The brain is our fattiest organ and is composed of nearly 60% fat

****

Your nose is always visible to you. Your mind ignores it through a process called Unconscious Selective Attention

****

Sunsets on Mars are blue

****

Astronaut is a compound word derived from the two Ancient Greek words meaning 'star' and naut meaning 'sailor'. So astronaut literally means star sailor

****

The human eye is so sensitive that, if the Earth were flat and it was a dark night, a candle flame could be seen from 30 miles away

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Pluto is sometimes closer to the Sun than Neptune, one of these times was from 1979 to 1999