New Zenith

The Monthly Newsletter of the Vectis Astronomical Society

Vol 30 Issue 11 — February 2023 *When Printed, this Newsletter costs VAS at least £1*

Society News

We have a had a good few clear Thursday nights lately and quite a few visitors have turned up at the observatory. As most of you probably realise, this time of year is usually a particularly good time for all kinds of observation.

Unfortunately probably more Wednesdays and Fridays have been even clearer!

We'll keep with our usual efforts though. Please don't forget that the observatory is open every from 19.30 (for members and 20.00 for visitors and there is a committee member there every week. It's your facility and there is always something to get on with.

School and Other Outreach

Several members have been involved with our continuing Space Camp events and there are currently bookings for another four off site astronomy evenings.

There is also the 'Isle of Wight Dark Skies Festival' which will be taking place on Fri 17th and Sat 18th February half term, at the Isle of Wight Pearl on the Military Road. **The festival will be free to attend. It starts at 15.00 hrs on each day.**

Whilst VAS have not organised this event we will be attending.

https://www.eventbrite.com/cc/iow-dark-skies-festival-1552419

NZ Delays

Yet again I must apologize for the late publication of NZ. I have been called to a couple of family illness emergencies. Things have calmed a bit now but unfortunately haven't gone away completely. Please bear with me.

Late News

Plans to dim City of London's skyscrapers to save energy.

https://www.bbc.co.uk/news/uk-england-london-64609246

Brian Curd

VAS Website: wightastronomy.org

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

The Editor, New Zenith
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St John's Crescent
Sandown
Isle of Wight
PO36 8EE
Tel: 07594 339950 or email: **editor@wightastronomy.org**

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

Registered Charity No 1046091

Observatory Diary

Monday, 19.30hrs	Members Only and by arrangement Telescope and night sky training.
Thursday	Members (19.30hrs) and Public (20.00hrs). Informal meeting and observing

VAS Website: wightastronomy.org

Contents this Month

2023 Monthly Meetings

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

Date	Subject	Speaker
24 Feb	**ZOOM only** - Astronomical Spectroscopy	Steve Broadbent
24Mar	Not Booked	
28 Apr	Sundials	Peter Ransom
26 May	Not Booked	
23 Jun	**ZOOM only** - Stellar Evolution - the life cycle of a star and its implications for life in our Solar System	Dr Elizabeth Cunningham
28 Jul	Variable Stars	Bryn Davis
25 Aug	AGM	**Meeting in the Observatory**
22 Sep	Not Booked	
27 Oct	Not Booked	
24 Nov	EM-bridge technology and applications	Alan Thomson

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.

GDPR rules mean we must maintain accurate membership records, please tell us if any of your contact details changes

VAS Contacts 2023

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NZ Distribution	Brian Curd distribution@wightastronomy.org
Others	Dudley Johnson

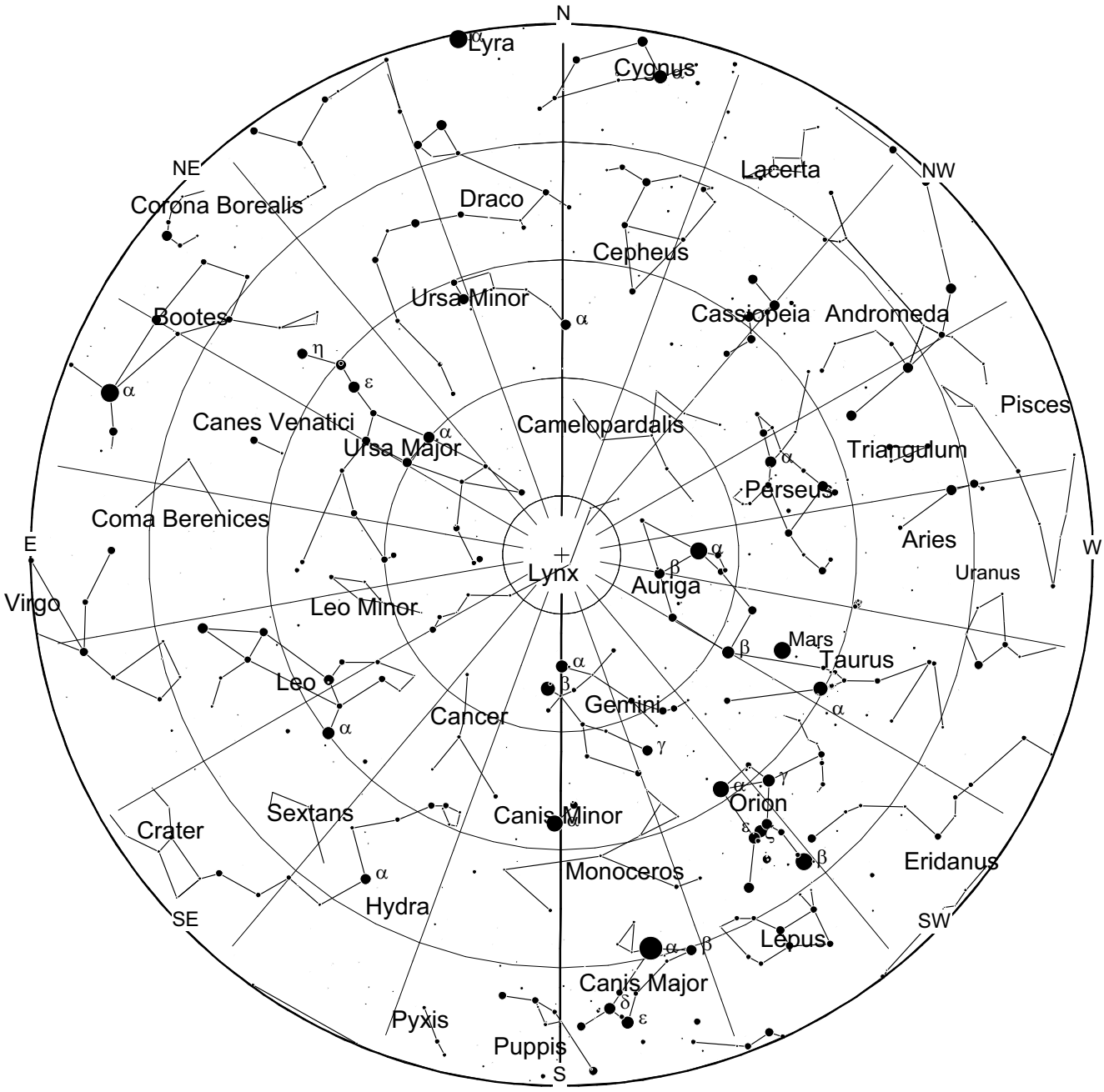
Important

Members using the observatory MUST enter a line or two in the Observatory Log Book.

On several occasions, lights, heaters and the Meade LX200 have been left on!

When leaving, please ensure all is secure and all lights, heaters and telescopes are TURNED OFF.

February 2023 - Sky Map



View from Newchurch Isle of Wight UK - 2200hrs - 15 February 2023

Star clusters are large groups of stars. Two main types of star clusters can be distinguished: *globular clusters* (shown here) are tight groups of ten thousand to millions of old stars which are gravitationally bound, while *open clusters* are more loosely clustered groups of stars, generally containing fewer than a few hundred members, and are often very young. Open clusters become disrupted over time by the gravitational influence of giant molecular clouds as they move through the galaxy, but cluster members will continue to move in broadly the same direction through space even though they are no longer gravitationally bound; they are then known as a stellar association, sometimes also referred to as a moving group.

February 2023 - Night Sky

Moon Phases Jan

New	First Qtr	Full	Last Qtr
20th	28th	5th	13th
			

Planets

Mercury

Mercury rises just over a half an hour before the Sun, and is too close the horizon to be visible this month. Next month's apparition in the evening sky will give a much better viewing opportunity.

Venus

The Evening Star can be seen low in the west southwest for an hour or so after sunset. During the coming spring evenings Venus will be a very prominent object in the western sky.

Mars

During the early to mid evening Mars is high in the southern sky. It is not now as bright as it was at the turn of the year, but still easily visible and a good target for telescopic observation.

Jupiter

Jupiter is easily visible in the south-western sky after sunset. It is higher in the sky than Venus and although not as bright is still visible before the sky becomes truly dark. As the month progresses it gets closer to Venus and is in close conjunction on the first of March. On the 22nd there is a photo opportunity with the crescent moon and Venus.

Saturn

Saturn rises only very shortly before the Sun, so is not visible this month.

Uranus

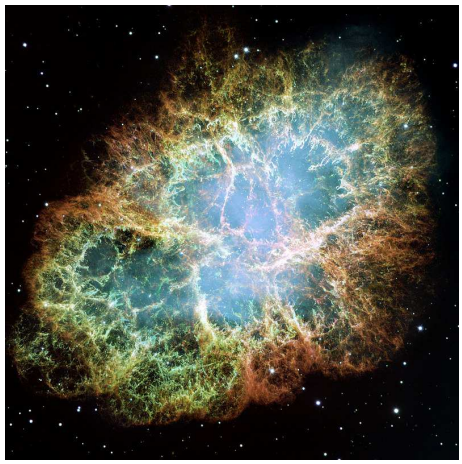
Uranus, in the constellation of Ares can be found about half way between the fourth magnitude stars Mu Ceti and Epsilon Erietis. As there are no bright guide stars close by, the best way of locating this ice giant is to use a planetarium program. It is just below naked eye visibility so is an easy target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

Neptune

The sky is too bright to observe Neptune before it has set, it will become visible again in the morning sky later in the year.

Deep Sky

M1 Crab Nebula, Supernova Remnant
RA 5h 35m Dec 22° 1' mag 8.4



It must be remembered that Charles Messier's catalogue is a list of objects that could be mistaken for comets, not a list of must see objects in the night sky. Many of them can be a disappointment to the casual observer. The first entry in the catalogue the crab nebula is one of these, it could easily be taken for a tailless comet. In a small telescope it appears as an oval smudge with no detail, larger instruments do however show some mottling. The remains of the star which exploded in 1054 and was recorded by the Chinese is a 16th magnitude neutron star in the heart of the nebula spinning at 30 times per second. Despite its visual appearance this object is one of the most studied in the night sky, it is a nearby natural particle accelerator that dwarfs anything we can create here on Earth.

M41 Open Cluster
RA 6h 46m Dec -20° 46' mag 4.5

Under a clear dark sky this cluster can be seen with the naked eye as a bright spot towards the edge of the winter milky way about 4 degrees beneath Sirius. A small telescope will show it as a large if somewhat sparsely populated cluster.

M48 Open Cluster
RA 8h 14m Dec -5° 49' mag 5.5

M48 Is one of the 'lost' Messier objects, at the original coordinates there is no object to be found. It is believed that the great comet hunter made an error in either his records or calculations and that this is the object he actually observed. Under dark skies it can be seen with the naked eye and several stars can be resolved even on binoculars. A telescope shows what has been variously described as an arrowhead or boomerang shaped collection of stars.

Peter Burgess

A New Model For Dark Matter

This NASA Hubble Space Telescope image shows the distribution of dark matter in the center of Abell 1689

Dark matter remains one of the greatest mysteries of modern physics. It is clear that it must exist, because without dark matter, for example, the motion of galaxies cannot be explained. But it has never been possible to detect dark matter in an experiment.

Currently, there are many proposals for new experiments: They aim to detect dark matter directly via its scattering from the constituents of the atomic nuclei of a detection medium, i.e., protons and neutrons.

A team of researchers - Robert McGehee and Aaron Pierce of the University of Michigan and Gilly Elor of Johannes Gutenberg University of Mainz in Germany - has now proposed a new candidate for dark matter: HYPER, or "HighlY Interactive ParticlE Relics."

In the HYPER model, some time after the formation of dark matter in the early universe, the strength of its interaction with normal matter increases abruptly - which on the one hand, makes it potentially detectable today and at the same time can explain the abundance of dark matter.

New Diversity in the Dark Matter Sector

Since the search for heavy dark matter particles, or so-called WIMPS, has not yet led to success, the research community is looking for alternative dark matter particles, especially lighter ones. At the same time, one generically expects phase transitions in the dark sector - after all, there are several in the visible sector, the researchers say. But previous studies have tended to neglect them.

"There has not been a consistent dark matter model for the mass range that some planned experiments hope to access. However, our HYPER model illustrates that a phase transition can actually help make the dark matter more easily detectable," said Elor, a postdoctoral researcher in theoretical physics at JGU.

The challenge for a suitable model: If dark matter interacts too strongly with normal matter, its (precisely known) amount formed in the early universe would be too small, contradicting astrophysical observations. However, if it is produced in just the right amount, the interaction would conversely be too weak to detect dark matter in present-day experiments.

"Our central idea, which underlies the HYPER model, is that the interaction changes abruptly once - so we can have the best of both worlds: the right amount of dark matter and a large interaction so we might detect it," McGehee said.

And this is how the researchers envision it: In particle physics, an interaction is usually mediated by a specific particle, a so-called mediator - and so is the interaction of dark matter with normal matter. Both the formation of dark matter and its detection function via this mediator, with the strength of the interaction depending on its mass: The larger the mass, the weaker the interaction.

The mediator must first be heavy enough so that the correct amount of dark matter is formed and later light enough so that dark matter is detectable at all. The solution: There was a phase transition after the formation of dark matter, during which the mass of the mediator suddenly decreased.

"Thus, on the one hand, the amount of dark matter is kept constant, and on the other hand, the interaction is boosted or strengthened in such a way that dark matter should be directly detectable," Pierce said.

New model covers almost the full parameter range of planned experiments

"The HYPER model of dark matter is able to cover almost the entire range that the new experiments make accessible," Elor said.

Specifically, the research team first considered the maximum cross section of the mediator-mediated interaction with the protons and neutrons of an atomic nucleus to be consistent with astrophysical observations and certain particle-physics decays. The next step was to consider whether there was a model for dark matter that exhibited this interaction.

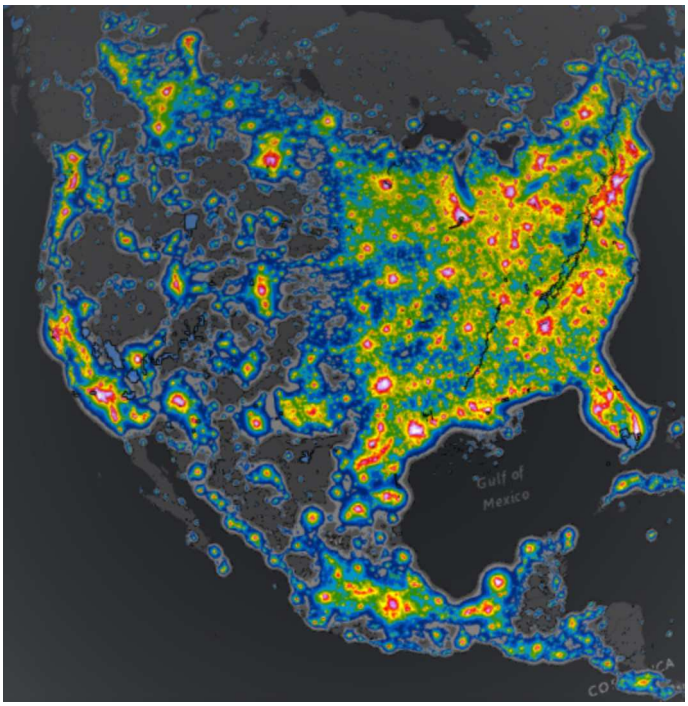
"And here we came up with the idea of the phase transition," McGehee said. "We then calculated the amount of dark matter that exists in the universe and then simulated the phase transition using our calculations."

https://phys.org/news/2023-01-dark.html

Light Pollution Is Creeping Up On The World's Observatories

Astronomical observatories enjoy some of the world's darkest night skies. But even there light pollution is spreading, a new study suggests.

If you want to escape light pollution and experience a truly dark sky, go where the pros go. The World Atlas of Artificial Sky Brightness, first compiled in 2000 and updated in 2016, shows that most major professional observatories in the world lie in black spots, meaning their sky is almost as dark as it was when humans first started lighting up the night.



The World Atlas view of North America shows light pollution is strongest in the eastern half. But light pollution is also creeping up on observatories in the western half. (Explore light pollution all over the globe.)

Esri / HERE / Garmin / FAO / NOAA; Source: Airbus / USGS / NGA / NASA / CGIAR / NLS / OS / NMA / Geodatastyrelsen / GSA / GSI / GIS User Community

To put it into numbers: The measured sky brightness over these telescopes is less than 1% brighter than the assumed natural sky brightness. In some of those regions, laws have even been enacted to stop the spread of light pollution and secure an unhindered view into the cosmos.

But this strategy isn't working particularly well, according to a new study published in the Monthly Notices of the Royal Astronomical Society. Light pollution is spreading even where the night was truly dark. As of 2021, only a handful of all large observatories resulted to remain below the 1%-line, while almost two-thirds have already seen their night skies brighten 10% over the assumed natural levels, the researchers report. Which means their locations in the World Atlas are no longer "black" or even "dark-grey."

Eyes From Orbit

Fabio Falchi (Light Pollution Science and Technology Institute, Italy) and colleagues analyzed data gathered in 2021 by the Suomi NPP satellite's Visible Infrared Imaging Radiometer Suite (VIIRS), collecting all the sources of light in a radius of 500km of major observatories. The sites investigated include all active or planned professional observatories with telescope apertures of 3 meters or larger, as well as potential and historic sites. They also included a selection of spots used by amateur astronomers, such as observatories offering rental telescopes.

Falchi's team then employed a light propagation model to compute the sky brightness created by the visible light sources that VIIRS found, taking into account the difference between light sources' and observatories' elevation and the general topography between them. From this model, they then calculated five indicators of sky brightness, including the radiance at different altitudes above the horizon as well as an average all-sky radiance.

Volcanoes, "Friendly Fire," And Streetlights

The sharp resolution VIIRS affords enables scientists to disentangle individual light sources contributing to a site's sky brightness. Some of them were quite unexpected: For example, the active Kilauea volcano on Hawai'i, 50 km from the Mauna Kea observatory, emits mostly at infrared wavelengths, but some of its light spills into visible wavelengths.

Also surprising was strong light pollution affecting the Tokyo Atacama Observatory (TAO) in Chile, which turned out to be "friendly fire" from the Atacama Large Millimeter/submillimeter Array. The radio astronomers who operate ALMA might not appreciate the problem visible light presents. Without their pollution however, TAO would have won the contest for darkest observatory, as measured by the amount of radiance direct overhead.

As it stands, though, the Paranal Observatory, also in the Atacama Desert in Chile, is the winner. This is despite the temporary nuisance of light emitted by workers' lodging near the European Southern Observatory's under-construction Extremely Large Telescope. Once completed, the telescope's 39-meter mirror will be the largest in the world.

Other findings are more troublesome. A single partially illuminated highway 40 km away heavily affects the Las Campanas Observatory, home of the twin 6.5-meter Magellan telescopes and future site of the Giant Magellan Telescope (GMT). The highway contributes more than 50% of overhead radiance in the otherwise pitch-dark Chilean desert.

Losing The Night

There's some hope that such sources of light pollution could be removed or at least reduced relatively easy, the researchers say. However, the general trend seems more complicated. The lowest light pollution level in the World Atlas, which is a maximum of 1% over the assumed natural level of 22.0 magnitudes per square arcsecond at zenith, only occurs over seven major observatories. The only one of these on U.S. soil, on Mauna Kea in Hawai'i, is already at the critical 1% mark.

"All other major astronomical observatories in the continental U.S. have already crossed the 10% limit," Falchi and colleagues write, "while most Chilean ones are still below it, even if some are relatively close." Potential future sites, like the GMT's, may cross critical limits even before they become operational, the researchers worry.

The sky brightness at zenith can be relatively forgiving, since most of the light directed overhead escapes to space rather than scattering around the sky. But sky radiance at lower angles matters, too. While professional telescopes rarely observe at angles lower than 30° above the horizon, the radiance in the first 10° above the horizon matters to night-sky observers of any stripe. Thanks to the effect of forward scattering, even very far away sources can ruin the nocturnal landscape: The city of Antofagasta can be seen from Paranal, Honolulu from Mauna Kea and Las Vegas from the Grand Canyon National Park. The impact on the near-horizon therefore serves as an early warning, Falchi and his team suggest.

The results are "the last call for a serious, collective, unambiguous, no-compromise action to lower light pollution now," Falchi's team concludes. "Failing to take action implies a progressive decline of the ability to explore our universe."

Astronomical observatory sites, due to their remote locations, are the least affected by light pollution, which makes them the proverbial canary in the coal mine: "If we are not able to keep the canary alive, then we can forget being able to solve the problem of light pollution as a global environmental issue."

https://skyandtelescope.org/astronomy-news/light-pollution-is-creeping-up-on-worlds-observatories/

For Sale

A Williams Optics ZS80 FD Doublet Anniversary Model

Fully cased and complete telescope which is in extremely good condition. These is some slight fading of the red paint on the body but this only shows when the primary lens cap is removed.

Labelled only as 10th Anniversary. An enquiry email to Williams Optics about the telescope revealed that it is in fact a ZS80FD Doublet.

The telescope has a Red Dot Laser Finder, mounting rings and a standard mounting bar. A diagonal and several eyepieces are also available. There may be other accessories but these are not all identified yet.

So far, no original owner's manual has been found for this telescope but a PDF is available.

Telescope, mounting bars, Red Dot finder etc, £470

Alter M56 MN f6 Maksutov-Newtonian (Russian)

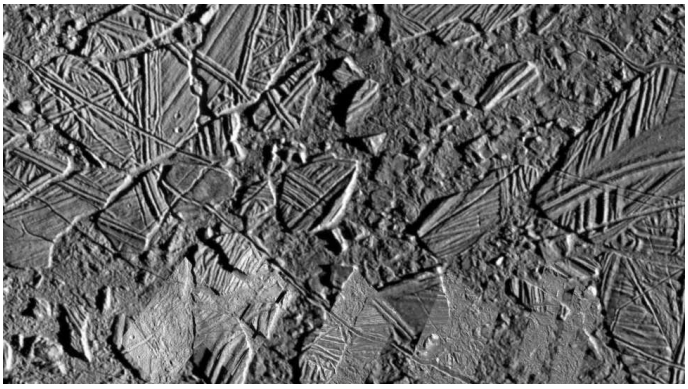
This telescope is in particularly good condition. There is no case but it does have a manual HEQ E3 mount with tripod The telescope is unmarked with minimal dust on the optics.

This was originally an expensive device for its size but it has proved to be a good astrophotography platform. No original owner's manual has been found for this telescope.

Telescope, with the HEQ 3 mount and Tripod £460

Both will shortly be available for viewing
Contact brian@briancurd.com for details

How AI is Helping us Explore the Solar System



A view from the Galileo spacecraft of a "chaos" region on Jupiter's icy moon Europa.
(Image credit: NASA/JPL-Caltech)

Let's be honest - it's much easier for robots to explore space than us humans. Robots don't need fresh air and water, or to lug around a bunch of food to keep themselves alive. They do, however, require humans to steer them and make decisions. Advances in machine learning technology may change that, making computers a more active collaborator in planetary science.

At the 2022 American Geophysical Union (AGU) Fall Meeting, planetary scientists and astronomers discussed how new machine-learning techniques are changing the way we learn about our solar system, from planning for future mission landings on Jupiter's icy moon Europa to identifying volcanoes on tiny Mercury.

Machine learning is a way of training computers to identify patterns in data, then harness those patterns to make decisions, predictions or classifications. Another major advantage to computers - besides not requiring life-support - is their speed. For many tasks in astronomy, it can take humans months, years or even decades of effort to sift through all the necessary data.

One example is identifying boulders in pictures of other planets. For a few rocks, it's as easy as saying "Hey, there's a boulder!" but imagine doing that thousands of times over. The task would get pretty boring, and eat up a lot of scientists' valuable work time.

"You can find up to 10,000, hundreds of thousands of boulders, and it's very time consuming," Nils Prieur, a planetary scientist at Stanford University in California said during his talk at AGU. Prieur's new machine-learning algorithm can detect boulders across the whole moon in only 30 minutes. It's important to know where these large chunks of rock are to make sure new missions can land safely at their destinations. Boulders are also useful for geology, providing clues to how impacts break up the rocks around them to create craters.

Computers can identify a number of other planetary phenomena, too: explosive volcanoes on Mercury, vortexes in Jupiter's thick atmosphere and craters on the moon, to name a few.

During the conference, planetary scientist Ethan Duncan, from NASA's Goddard Space Flight Center in Maryland, demonstrated how machine learning can identify not chunks of rock, but chunks of ice on Jupiter's icy moon Europa. The so-called chaos terrain is a messy-looking swath of Europa's surface, with bright ice chunks strewn about a darker background. With its underground ocean, Europa is a prime target for astronomers interested in alien life, and mapping these ice chunks will be key to planning future missions.

Upcoming missions could also incorporate artificial intelligence as part of the team, using this tech to empower probes to make real-time responses to hazards and even land autonomously. Landing is a notorious challenge for spacecraft, and always one of the most dangerous times of a mission.

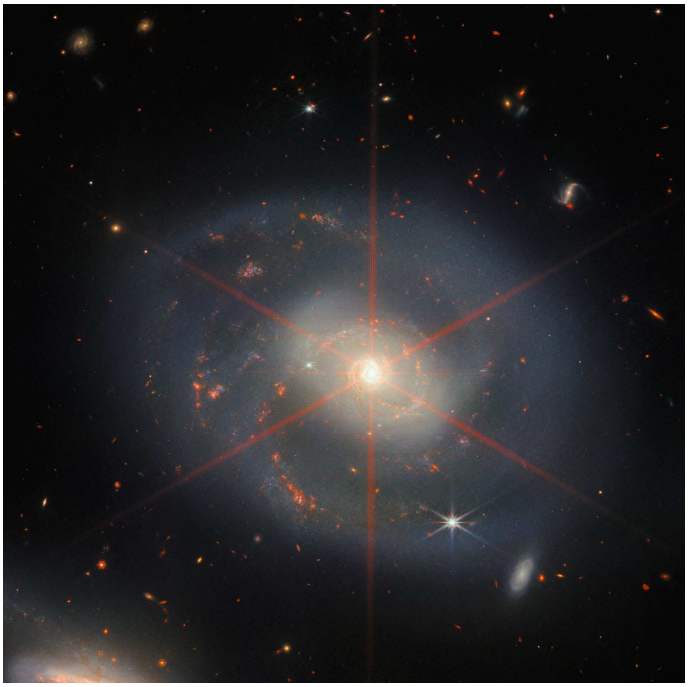
"The 'seven minutes of terror' on Mars [during descent and landing], that's something we talk about a lot," Bethany Theiling, a planetary scientist at NASA Goddard, said during her talk. "That gets much more complicated as you get further into the solar system. We have many hours of delay in communication."

A message from a probe landing on Saturn's methane-filled moon Titan would take a little under an hour and a half to get back to Earth. By the time humans' response arrived at its destination, the communication loop would be almost three hours long. In a situation like landing where real-time responses are needed, this kind of back-and-forth with Earth just won't cut it. Machine learning and AI could help solve this problem, according to Theiling, providing a probe with the ability to make decisions based on its observations of its surroundings.

"Scientists and engineers, we're not trying to get rid of you," Theiling said. "What we're trying to do is say, the time you get to spend with that data is going to be the most useful time we can manage." Machine learning won't replace humans, but hopefully, it can be a powerful addition to our toolkit for scientific discovery.

https://www.space.com/solar-system-planetary-science-machine-learning

Webb Captures Luminous, Face-on Spiral Galaxy NGC 7469



Credit: ESA/Webb, NASA & CSA, L. Armus, A. S. Evans

Webb's picture of the month for December was dominated by NGC 7469, a luminous, face-on spiral galaxy approximately 90,000 light-years in diameter that lies roughly 220 million light-years from Earth in the constellation Pegasus.

This spiral galaxy has recently been studied as part of the Great Observatories All-sky LIRGs Survey (GOALS), which aims to study the physics of star formation, black hole growth, and feedback in four nearby, merging luminous infrared galaxies. Other galaxies studied as part of the survey include previous ESA Webb Pictures of the Month II ZW 096 and IC 1623.

NGC 7469 is home to an active galactic nucleus (AGN), which is an extremely bright central region that is dominated by the light emitted by dust and gas as it falls into the galaxy's central black hole. This galaxy provides astronomers with the unique opportunity to study the relationship between AGNs and starburst activity because this particular object hosts an AGN that is surrounded by a starburst ring at a distance of a mere 1500 light-years.

While NGC 7469 is one of the best studied AGNs in the sky, the compact nature of this system and the presence of a great deal of dust have made it difficult for scientists to achieve both the resolution and sensitivity needed to study this relationship in the infrared. Now, with Webb, astronomers can explore the galaxy's starburst ring, the central AGN, and the gas and dust in between.

Using Webb's MIRI, NIRCam and NIRspec instruments to obtain images and spectra of NGC 7469 in unprecedented detail, the GOALS team has uncovered a number of details about the object. This includes very young star-forming clusters never seen before, as well as pockets of very warm, turbulent molecular gas, and direct evidence for the destruction of small dust grains within a few hundred light-years of the nucleus - proving that the AGN is impacting the surrounding interstellar medium.

Furthermore, highly ionized, diffuse atomic gas seems to be exiting the nucleus at roughly 6.4 million kilometers per hour - part of a galactic outflow that had previously been identified from the ground, but is now revealed in stunning detail with Webb. With analysis of the rich Webb datasets still underway, additional secrets of this local AGN and starburst laboratory are sure to be revealed.

A prominent feature of this image is the striking six-pointed star that perfectly aligns with the heart of NGC 7469. Unlike the galaxy, this is not a real celestial object, but an imaging artifact known as a diffraction spike, caused by the bright, unresolved AGN. Diffraction spikes are patterns produced as light bends around the sharp edges of a telescope.

Webb has three struts, with two angled at 150 degrees from its vertical strut, and its primary mirror is composed of hexagonal segments that each contain edges for light to diffract against. Webb's struts are designed so that their diffraction spikes partially overlap with those created by the mirrors. Both of these lead to Webb's complex star pattern.

https://phys.org/news/2022-12-webb-captures-luminous-face-on-spiral.html

Very Generous Donation

VAS have recently received the very generous donation of a 10” Meade SCT, wedge and tripod along with a large collection of high quality eyepieces and accessories including a large solar filter.

The telescope is in very good condition and comes with all paperwork covering it’s history and modifications.

Many thanks to Mr D for his gift.

We intend to use this telescope at large outreach events but, before this is started, we need to make a few small cosmetic repairs and a secure protective box to prevent any damage while transporting the device.

Aztec Science: Precise Solar Observations Fed Millions in Ancient Mexico

Rising sun viewed from the stone causeway of the solar observatory on Mount Tlaloc, Mexico. The view aligns with the rising sun on February 24, coinciding with the Mexica calendar's new year. Credit: Ben Meissner

Without clocks or modern tools, ancient Mexicans watched the sun to maintain a farming calendar that precisely tracked seasons and even adjusted for leap years.

Before the Spanish arrival in 1519, the Basin of Mexico's agricultural system fed a population that was extraordinarily large. Whereas Seville in Spain, had a population of fewer than 50,000, the Basin, now known as Mexico City, was home to as many as 3 million people.

To feed so many people in a region with a dry spring and summer monsoons required advanced understanding of when seasonal variations in weather would arrive. Planting too early, or too late, could have proved disastrous. The failure of any calendar to adjust for leap-year fluctuations could also have led to crop failure.

Though colonial chroniclers documented the use of a calendar, it was not previously understood how the Mexica, or Aztecs, were able to achieve such accuracy. New University of California, Riverside (UCR) research demonstrates how they did it. They used the mountains of the Basin as a solar observatory, keeping track of the sunrise against the peaks of the Sierra Nevada mountains.

"We concluded they must have stood at a single spot, looking eastwards from one day to another, to tell the time of year by watching the rising sun," said Exequiel Ezcurra, distinguished UCR professor of ecology who led the research.

To find that spot, the researchers studied Mexican manuscripts. These ancient texts referred to Mount Tlaloc, which lies east of the Basin. The research team explored the high mountains around the Basin and a temple at the mountain's summit. Using astronomical computer models, they confirmed that a long causeway structure at the temple aligns with the rising sun on Feb. 24, the first day of the Aztec new year.

"Our hypothesis is that they used the whole Valley of Mexico. Their working instrument was the Basin itself. When the sun rose at a landmark point behind the Sierras, they knew it was time to start planting," Ezcurra said.

The sun, as viewed from a fixed point on Earth, does not follow the same trajectory every day. In winter, it runs south of the celestial equator and rises toward the southeast. As summer approaches, because of the Earth's tilt, sunrise moves northeast, a phenomenon called solar declination.

This study may be the first to demonstrate how the Mexica were able to keep time using this principle, the sun, and the mountains as guiding landmarks. Though some may be familiar with the "Aztec calendar," that is an incorrect name given to the Sun Stone, arguably the most famous work of Aztec sculpture used solely for ritual and ceremonial purposes.

"It did not have any practical use as a celestial observatory. Think of it as a monument, like Nelson's Column in Trafalgar Square," Ezcurra said.

Learning about Aztec tools that did have practical use offers a lesson about the importance of using a variety of methods to solve questions about the natural world.

"We don't always need to rely solely on modern technology," Ezcurra said. "The Aztecs were just as good or better as the Europeans at keeping time, using their own methods."

The Aztec observatory could also have a more modern function, according to Ezcurra.

Comparing old images of the Basin of Mexico to current ones shows how the forest is slowly climbing up Mount Tlaloc, likely as a result of an increase in average temperatures at lower elevation.

"In the 1940s the tree line was way below the summit. Now there are trees growing in the summit itself," Ezcurra said. "What was an observatory for the ancients could also be an observatory for the 21st century, to understand global climate changes."

https://scitechdaily.com/aztec-science-precise-solar-observations-fed-millions-in-ancient-mexico/

Thirteen New Pulsars Discovered

Pulsars are highly magnetized, rotating neutron stars emitting a beam of electromagnetic radiation. They are usually detected in the form of short bursts of radio emission; however, some of them are also observed via optical, X-ray and gamma-ray telescopes.

Now, a team of astronomers led by MPIfR's Weiwei Chen reports the discovery of 13 new pulsars in Omega Centauri (NGC 5139) - the largest globular cluster in our galaxy, located some 17,000 light years away. To date, only five pulsars have been identified in this cluster.

"We used the superior sensitivity of the MeerKAT radio telescope to search for pulsars in Omega Centauri.... In this paper, we presented the discovery of 13 new pulsars in Omega Centauri, which more than tripled the population of known pulsars in this cluster," the researchers wrote.

The new pulsars (designated from PSR J1326-4728F to PSR J1326-4728R) were found within the core and also between the core and half light radius of Omega Centauri. All the new objects can be classified as millisecond pulsars (MSPs) as they have rotation periods below 30 milliseconds (between 2.27 and 18.95 ms). Seven of them turned out to be binary systems, while the remaining six are isolated pulsars.

The pulsars reported in the study have dispersion measures within the range of 94.27 pc/cm3. When it comes to the orbital periods of the seven binaries, it was found that they are between approximately 0.094 and 1.18 days. The astronomers added that six binaries have very light companions and two of them have apparent eclipses.

The discovery made by Chen's team increases the number of pulsars in Omega Centauri to 18 and makes the pulsar population of this cluster dominated by the isolated ones (10 pulsars). Moreover, all the binary pulsars in this GC, with the exception of PSR J1326-4728Q, have very low-mass companions (with a mass smaller than 0.1 solar masses), typical for the so-called "black widow" systems.

The authors of the paper hope to find more pulsars in Omega Centauri as part of the ongoing survey (TRAPUM).

"We also note that future TRAPUM observations with UHF-band (550–1100 MHz) and S-band (1750–3500 MHz) receivers will very likely further increase the population of known pulsars in Omega Centauri in all regions by probing different spectral windows," the researchers wrote.

https://phys.org/news/2023-01-thirteen-pulsars-meerkat.html

Other Interesting Science

Ancient Footprints Reveal the Presence of Man in Spain 200,000 Years Earlier Than Thought

This discovery is critical for studying the evolutionary model of hominins during the Middle Pleistocene period in Europe.

Jorge Rivera, a researcher and technician from the University of Seville's GRS Radioisotopes department, has made a significant discovery in Europe involving hominin footprints found in Matalascañas. The team used optically-stimulated luminescence techniques at the University of Seville's Centre for Research, Technology, and Innovation (CITIUS) and CENIEH, to determine that the footprints are 200,000 years older than previously thought, dating back to 295,800 years ago in the Middle Pleistocene period.

This suggests that pre-Neanderthals lived in the Doñana area during this time. The research, led by Professor of Paleontology Eduardo Mayoral at the University of Huelva, was recently published in the journal Scientific Reports.

https://scitechdaily.com/prehistoric-surprise-ancient-footprints-reveal-the-presence-of-man-in-spain-200000-years-earlier-than-thought/

Experiment Proves Bacteria Really Eat Plastic - Broken Down Into Harmless Substances

Laboratory experiment shows that bacteria really eat and digest plastic.

The bacterium Rhodococcus ruber eats and actually digests plastic. This has been shown in laboratory experiments by PhD student Maaike Goudriaan at Royal Netherlands Institute for Sea Research (NIOZ). Based on a model study with plastic in artificial seawater in the lab, Goudriaan calculated that bacteria can break down about one percent of the fed plastic per year into CO2 and other harmless substances. "But," Goudriaan emphasizes, "this is certainly not a solution to the problem of the plastic soup in our oceans. It is, however, another part of the answer to the question of where all the 'missing plastic' in the oceans has gone."

https://scitechdaily.com/experiment-proves-bacteria-really-eat-plastic-broken-down-into-harmless-substances/

THE BACK PAGE

LINKS, COMMENTS AND OBSERVATIONS

February Online Zoom Meeting

The Colour of Light - Talk on astronomical spectroscopy by Steve Broadbent

Time: Feb 24, 2023 19:30 PM

Join Zoom Meeting Link

https://us02web.zoom.us/j/87523576773?pwd=MmVQQ3RGaHFZck5aUlRvL1ZKTXNPdz09

Zoom Meeting code and password
Meeting ID: 875 2357 6773
Passcode: unemaZP10_

The Colour of Light
A talk on astronomical spectroscopy

by Steve Broadbent BSc FRAS

The talk introduces the principles of spectroscopy with some simple theory and goes on to show some examples in astronomy of what can be measured using the technique.

The talk will end with a demonstration showing how the spectrum of an obscure planetary nebula can be analysed to give its elemental composition.

Steve Broadbent is Chairman of Hampshire Astronomical Group, a member of the BAA and elected a Fellow of the Royal Astronomical Society in 2014.

He is retired from the University of Portsmouth. Initially a chemist, Steve undertook research into reaction mechanisms. He ran a spectroscopy laboratory and lectured in computational chemistry and programming. Latterly he moved into computer systems management.

Steve mentors final year BSc Students from the University of Portsmouth during their final year projects related to astronomy or the equipment at the Clanfield Observatory. He is a member of the observatory instrument team and of the training team which offers instruction on the use of all the telescope facilities at the observatory.

Steve regularly gives talks to the Hampshire Astronomical Group including "Constellation of the Month" as well as talks on specific interest areas such as astronomical spectroscopy and individual astronomical observatories. He is an experienced speaker at observatory public open evenings, and Vectis Astronomical Society is pleased to welcome him back for this virtual/online presentation

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

Einstein was asked what it was like to be the smartest guy in the world, he answered "I don't know, ask Nikola Tesla"

The very first .com internet domain, symbolics.com, was registered on 15 March 1985

"Hot Neptune" is the name given to a planet in which temperatures of more than 10,800 degrees Fahrenheit prevail, but which due to extremely high air pressure nevertheless consists of solid ice

Uranus is 63 times larger than Earth

The entire world's population could fit in the state of Texas if it were as densely populated at New York City

Foxes use the Earth's magnetic field to estimate distances

The average depth of the oceans is 2.5 miles

Researchers believe that only ten percent of our seas are explored. This means we know less about our oceans than about the moon