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“The Southern Cross”

The Hermanus Astronomy Centre Monthly Newsletter

November 2024

MONTHLY MEETING

These meetings are scheduled for the **Third Tuesday** of each month except December.

Our last Monthly meeting was held at Onrus Manor and virtually on Zoom on **Tuesday October 15th**. This was presented by **Dr Pierre Cilliers** of SANSA; his topic was *“Solar Radio Bursts”* (or When the Sun Sneezes ...)

The Carrington event was the most intense geomagnetic storm in recorded history, peaking on 1-2 September 1859. It created strong auroral displays that were reported globally and caused sparking and even fires in telegraph stations. The storm was most likely the result of a coronal mass ejection from the Sun colliding with Earth's magnetosphere.

Imagine the effect on our present day technology such as satellite navigation and damage due to extended cuts of the electrical power grid. Dr Cilliers covered these and a host of other problems involving Solar Radio Bursts. For a revisit of this compelling presentation click on the link below.

https://www.youtube.com/watch?v=WXYWgZmx-A&ab_channel=DerekDuckitt

Our next attraction, scheduled for **Tuesday November 19th**, is *“Galaxy Formation”* presented by **Dr J Delhaize** (UCT). This will be a virtual meeting on Zoom. More details will be circulated in due course.

SPECIAL INTEREST GROUP ACTIVITIES

Cosmology

These meetings are scheduled for the **First Tuesday** of each month except January.

On **Tuesday October 1st**, in the series “THE ENTIRE HISTORY OF THE UNIVERSE”, we watched episode 24: *“How does Light Actually Work?”* The YouTube video link:

https://www.youtube.com/watch?v=E4CsY5B3BoI&list=PLROBLlvnR7BEF9b1NOvRf_zhboibmywJb&index=23&t=160s&pp=iAQB

Next up is episode 25 of the same series: *“Is Time Travel Possible in our Universe?”*, scheduled for **Tuesday, November 5th**.

https://www.youtube.com/watch?v=JXZpac6TREW&list=PLROBLlvnR7BEF9b1NOvRf_zhboibmywJb&index=26&t=559s&ab_channel=HistoryoftheUniverse

Scheduled for **December 3rd**, the Cosmology meeting will be hybrid, physical at **Onrus Manor** and virtual on Zoom. The topic is to be confirmed.

Study Group

Scheduled for the **Last Tuesday** of each month.

Our last meeting was held on **October 29th**, the topic, *“Does the Brain create Self?”*

From sleep to memory and everything in between, Anil Seth explores the reality we experience in our brains versus the world as it objectively might be.

The link for the presentation – https://www.youtube.com/watch?v=z7_LwuuPsAE

The discussion link – <https://youtu.be/wDYjj2TwW54>

The next meeting is scheduled for **Tuesday November 26th**. The topic is yet to be decided.

For further information regarding the Study Group, contact Peter Harvey petermh@hermanus.co.za

Observing

This section includes recommended dates for observation of **astronomical phenomena** and whatever else deserves a close look.

Optimal dates for **November 2024**:

SUGGESTED EVENING OBSERVATION WINDOWS

(Lunar observations notwithstanding)

<i>Date</i>	<i>Moon</i>		<i>Dusk end</i>
October 21	<i>Rises</i>	22h59 (80%)	20h32
to November 3	<i>Sets</i>	22h14 (5%)	20h48
November 19	<i>Rises</i>	23h41 (80%)	21h09
to December 3	<i>Sets</i>	22h10 (4%)	21h26

Skynotes - Main feature **M31 Andromeda Galaxy**

Skynotes - Moon feature **Gassendi crater**

Moonwatch a few days either side of the **First Quarter** (Saturday November 9).

Eclipses None observable from southern Africa in November 2024.

The Sun **The Sun and Auroral Activity:** Daily solar activity and predictions for auroral activity can be found at the following website: <https://www.spaceweatherlive.com/en/solar-activity.html>

The Solar System –

Meteors **Taurids Southern and Northern** - please see **Skynotes** page 5 and the *2024 Sky Guide* p. 86 for more details.

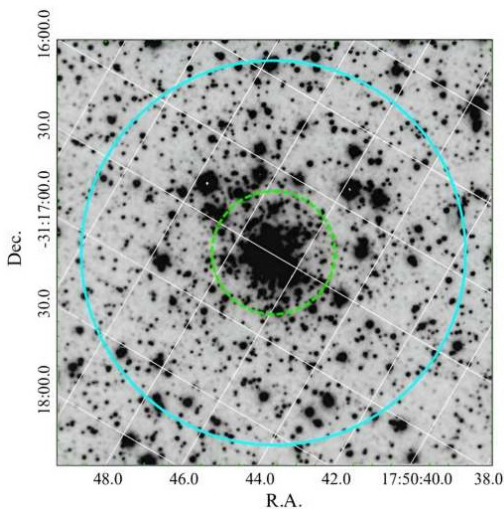
Comets From **Tim Cooper** - CAMNotes 2024 No.4 is online:

<https://assa.saao.ac.za/wp-content/uploads/sites/23/2024/09/ASSA-CAMnotes-2024-Number-4.pdf>

MNASSA (Monthly Notes of the Astronomical Society of Southern Africa) <http://www.mnassa.org.za/>

(Compiled By Pieter Kotzé)

New millisecond pulsar discovered



Ks-band image of Terzan 6. Credit: Gao et al., 2024.

Using the Green Bank Telescope (GBT), astronomers have observed a globular cluster known as Terzan 6. They detected a new millisecond pulsar that is likely associated with this cluster. The finding was reported in a research paper [published](#) September 17 on the pre-print server *arXiv*.

Pulsars are highly magnetized, rotating [neutron stars](#) emitting a beam of electromagnetic radiation. The most rapidly rotating pulsars, with rotation periods below 30 milliseconds, are known as [millisecond pulsars](#) (MSPs). Astronomers assume that they are formed in binary systems when the initially more massive component turns into a neutron star that is then spun up due to accretion of matter from the secondary star. Terzan 6 is a metal-

rich core-collapsed Galactic globular cluster at a distance of about 21,800 light years away. Although the cluster is known for decades, so far no pulsars have been detected in it. <https://phys.org/news/2024-09-millisecond-pulsar.html>

Winds of change: Webb reveals forces that shape protoplanetary disks



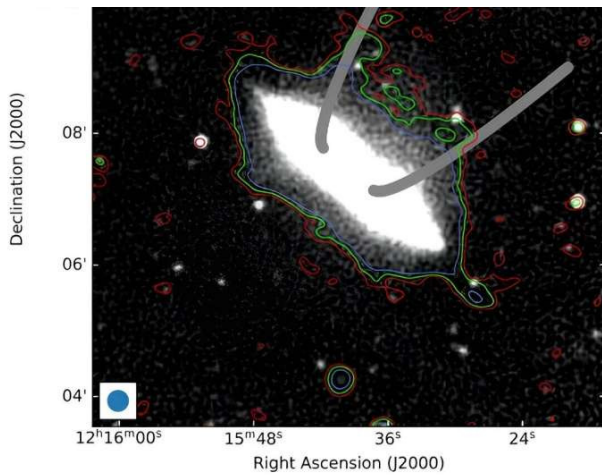
This artist's impression of a planet-forming disk surrounding a young star shows a swirling "pancake" of hot gas and dust from which planets form. Using the James Webb Space Telescope, the team obtained detailed images showing the layered, conical structure of disk winds – streams of gas blowing out into space. Credit: National Astronomical Observatory of Japan (NAOJ)

Every second, more than 3,000 stars are born in the visible universe. Many are surrounded by what astronomers call a protoplanetary disk—a swirling "pancake" of hot gas and dust from which planets form. The exact processes that give rise to stars and planetary systems, however, are still poorly understood. A team of astronomers led by University of Arizona researchers has used NASA's James Webb Space Telescope to obtain some of the most detailed insights into the forces that shape protoplanetary disks. The observations offer glimpses into what our solar system may have looked like 4.6 billion years ago. Specifically, the team was able to trace so-called disk winds in unprecedented detail. These winds are streams of gas blowing from the planet-forming disk out into space. Powered largely by magnetic fields, these winds can travel tens of miles in just one second.

<https://phys.org/news/2024-10-webb-reveals-protoplanetary-disks.html>

Large radio bubble detected in galaxy NGC 4217

An international team of astronomers has performed radio observations of a star-forming galaxy known as NGC 4217. The observational campaign detected a large radio bubble in the galaxy's halo. The finding was reported in a paper [published](#) September 23 on the pre-print server *arXiv*. Located some 61.6 million light years away, NGC 4217 is a nearby edge-on star-forming [spiral galaxy](#). Previous observations of this galaxy have found that it contains dozens of absorbing dust structures with various morphologies. Moreover, a radio halo extending to about 16,000 light years from the galaxy's star-forming disk has been identified. Recently, a group of astronomers led by Volker Heesen of Hamburg University in Germany, has employed the Jansky Very Large Array (JVLA) and with LOW Frequency ARray (LOFAR), to take a closer look at NGC 4217 in radio band.



The gray-scale background map shows the JVL A 3 GHz radio continuum emission in the halo of NGC 4217 at 7'' angular resolution. Credit: Heesen et al., 2024.

NASA's exoplanet hunter TESS spots a record-breaking 3-star system

Using NASA's exoplanet-hunting spacecraft, the

Transiting Exoplanet Survey Satellite (TESS), scientists have spotted a record-breaking triple-star system so tightly bound that it could fit comfortably between the sun and its closest planet, Mercury. The system, designated TIC 290061484 contains [twin stars](#) that race around each other once every 1.8 Earth days as well as a third star that orbits this pair once every 25 Earth days. This [triple star system's](#) super-tight orbit, located just under 5,000 light-years away in the constellation [Cygnus](#), the swan, makes it a record-breaker. The previous record-holder for the tightest three-star system orbit is Lambda Tauri, which set the record in 1956 with its third star taking 33 days to orbit its inner twin stars.

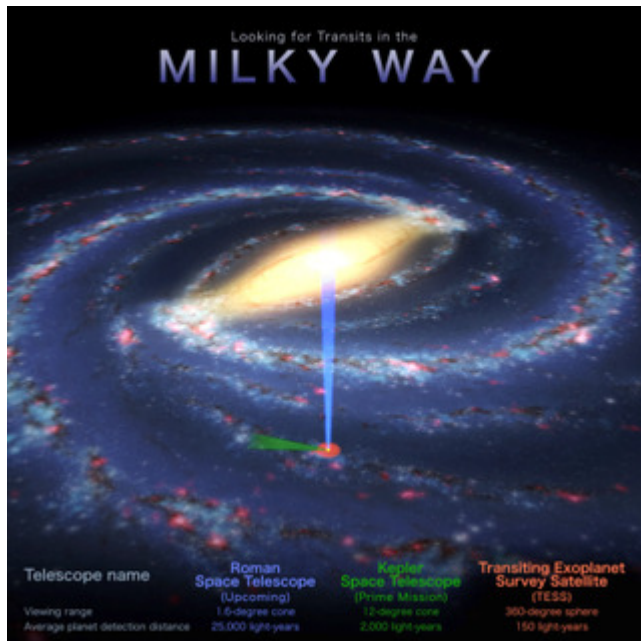
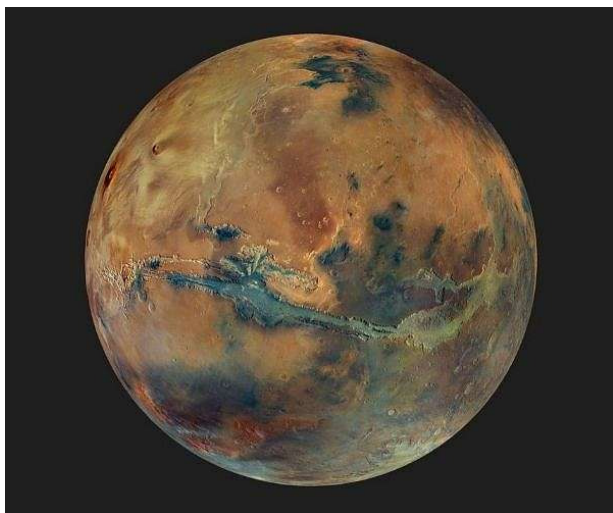


Diagram showing the search areas of three transit-spotting missions: NASA's upcoming Nancy Grace Roman Space Telescope, TESS, and the retired Kepler Space Telescope. Kepler found 13 triply eclipsing triple star systems, TESS has found more than 100 so far, and astronomers expect Roman to find more than 1,000. (Image credit: NASA's Goddard Space Flight Centre)

<https://www.space.com/nasa-tess-record-breaking-three-star-system-tightly-packed>

New insights into how Mars became uninhabitable

NASA's Curiosity rover, currently exploring Gale crater on Mars, is providing new details about how the ancient Martian climate went from potentially suitable for life - with evidence for widespread liquid water on the surface - to a surface that is inhospitable to terrestrial life as we know it.

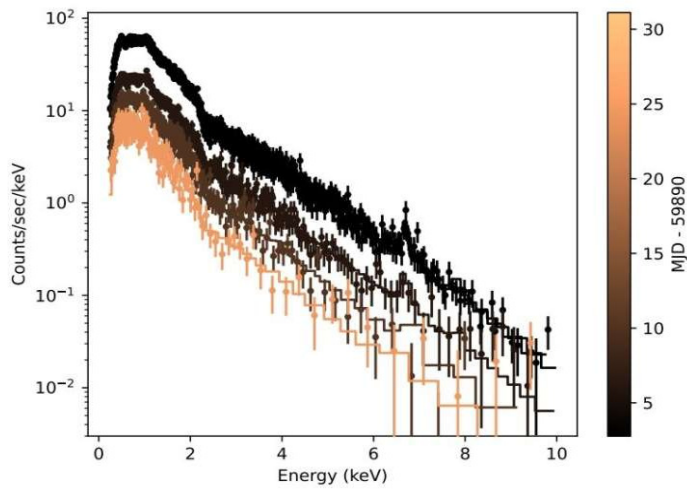


Although the surface of Mars is frigid and hostile to life today, NASA's robotic explorers at Mars are searching for clues as to whether it could have supported life in the distant past. Researchers used instruments on board Curiosity to measure the isotopic composition of carbon-rich minerals (carbonates) found in Gale crater and discovered new insights into how the Red Planet's ancient climate transformed. "The isotope values of these carbonates point toward extreme amounts of evaporation, suggesting that these carbonates likely formed in a climate that could only support transient liquid water," said David Burt of NASA's Goddard Space Flight Centre in Greenbelt, Maryland. "Our samples are not consistent with an ancient environment with life (biosphere) on the surface

of Mars, although this does not rule out the possibility of an underground biosphere or a surface biosphere that began and ended before these carbonates formed."

https://www.spacedaily.com/reports/New_Insights_into_How_Mars_Became_Uninhabitable_999.html

Astronomers observe a strong superflare from giant star



Evolution of NICER spectra during the flare; shown are four spectra from one orbit each. Spectra are binned to a minimum of 25 counts per bin. Colours correspond the time of the observation. Credit: arXiv (2024). DOI: 10.48550/arxiv.2410.03616

Using the Neutron Star Interior Composition Explorer (NICER) and various ground-based telescopes, an international team of astronomers have performed observations of a strong X-ray superflare which occurred in 2022 on a giant star known as HD 251108. Results of the observational campaign, [published](#) Oct. 4 on the pre-print server *arXiv*, provide more insights into the flaring activity of this star. Superflares are massive bursts of energy

from a stellar surface. Detecting new flares of this type and studying them in detail is essential to better understand the origin of these events and the interaction between the magnetic fields and surfaces of stars. Located some 1,646 light years away, HD 251108 is an evolved and magnetically active K-type [giant star](#)—about seven times larger than the sun. The star is relatively cool, with an [effective temperature](#) of 4,460 K, and its mass is comparable to that of the sun.

<https://phys.org/news/2024-10-astronomers-strong-superflare-giant-star.html>

Near-Earth Microquasar found to emit powerful gamma radiation

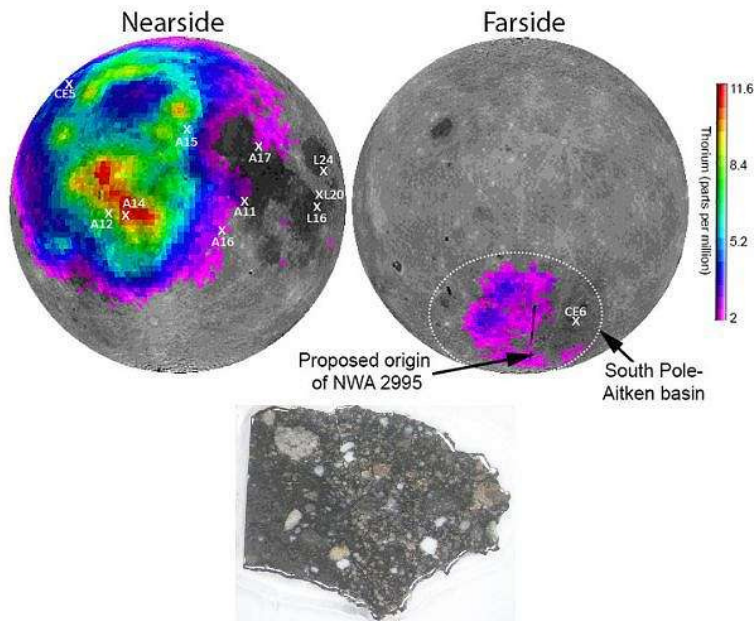


For decades, astronomers have focused on distant galaxies as the source of high-energy electromagnetic radiation. However, new observations from the HAWC observatory have revealed that microquasars - compact binary systems within our own galaxy - are also capable of producing gamma photons with extremely high energies. Researchers from the High-Altitude Water Cherenkov Gamma-Ray Observatory (HAWC) have identified microquasars as a significant source of ultra-high-energy cosmic radiation. The discovery challenges long-standing views that supernova remnants were the primary accelerators of these particles. Typically, quasars - found in the nuclei of distant galaxies - are known for producing such high-energy radiation

through jets of matter expelled by supermassive black holes. However, microquasars, which consist of a massive star and a black hole, can generate similarly powerful jets on a smaller scale. Several dozen microquasars have been identified within the Milky Way, with their jets extending for hundreds of light years.

https://www.spacedaily.com/reports/Near_Earth_Microquasar_found_to_emit_powerful_gamma_radiation_999.html

Researchers date Moon's oldest impact basin, revealing ancient lunar history



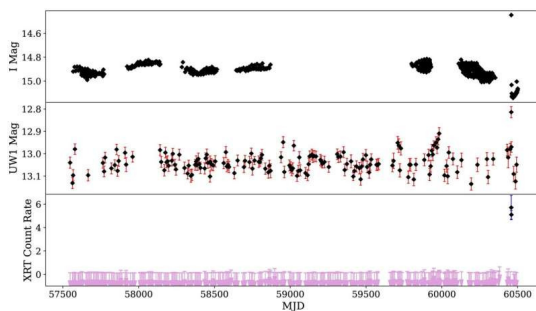
Scientists believe they could have pinpointed the age of the Moon's largest and oldest impact basin to over 4.32 billion years ago. Like Earth, the Moon has been struck by numerous asteroids and comets, creating craters and basins. However, determining the exact timing of these impacts, especially the age of the Moon's oldest and largest basin, has been challenging - until now. A team of researchers from The University of Manchester, studying a lunar meteorite named Northwest Africa 2995, has suggested that the Moon's massive South Pole-Aitken (SPA) basin was formed over 4.32 billion years ago. This enormous basin, located on the Moon's far side, spans more than 2,000 km, making it the Moon's oldest confirmed impact site. The team's proposed date pushes

the basin's formation back about 120 million years earlier than previously believed, during what was thought to be the Moon's most intense period of asteroid bombardment.

https://www.spacedaily.com/reports/Researchers_date_Moons_oldest_impact_basin_revealing_ancient_lunar_history_999.html

Rare ultra-luminous nova spotted in the Small Magellanic Cloud

A rare, extremely luminous X-ray outburst has been observed in the Small Magellanic Cloud, a dwarf galaxy that is a close neighbour of our own Milky Way galaxy. The observations, made by the Neil Gehrels Swift Observatory and other telescopes, were described by an international team of astronomers led Penn State scientists on the Swift team. The researchers attributed the outburst to one of the most luminous nova eruptions ever produced by a white dwarf binary star system.

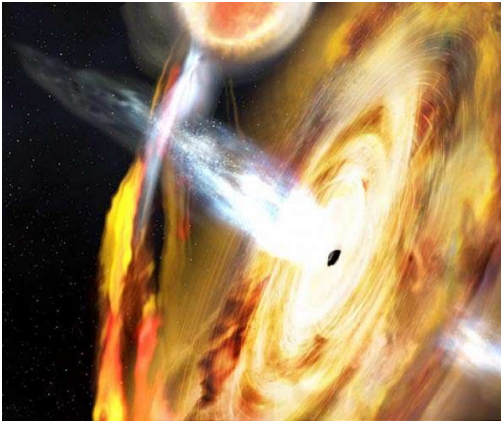


Multiwavelength light curve of CXOU J005245.0-722844 emission behaviour containing I-band data taken by OGLE, uvw1-band data taken by Swift UVOT, and 0.3-10 keV data taken by Swift XRT. In the bottom panel, black points represent observations during which CXOU J005245.0-722844 was detected by Swift XRT. Downward-facing arrows represent upper limits on the count rate during observations where CXOU J005245.0-722844 was not able to be detected. Credit: Monthly Notices of the Royal Astronomical Society (2024). DOI:

[10.1093/mnras/stae2176](https://doi.org/10.1093/mnras/stae2176)

The system that produced this outburst is referred to as CXOU J005245.0-722844. It was recently identified by members of the Einstein Probe team and confirmed by the Swift team as the seventh-known example of a Be/White Dwarf X-ray binary. Be/White Dwarf binaries are binary systems in which a white dwarf star orbits a hot young star surrounded by a disk of stellar material. Astronomers expect these binaries to be commonly observed, Gaudin said, and the lack of known examples is a mystery. <https://phys.org/news/2024-10-rare-ultra-luminous-nova-small.html>

NASA's IXPE reveals black hole corona structure

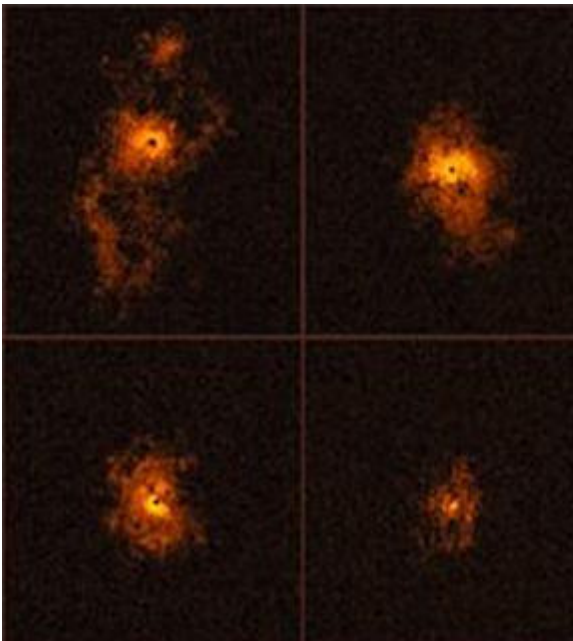


Recent observations from NASA's IXPE (Imaging X-ray Polarimetry Explorer) mission have provided new insights into the shape of black hole coronae, previously only understood through theoretical models. A corona is a plasma region involved in the matter flow toward a black hole, and the IXPE's findings mark the first time its shape has been directly identified. Black holes, which have gravitational forces so intense that even light cannot escape, are often surrounded by accretion disks, swirling masses of gas. Some are also associated with relativistic jets - powerful outflows of matter. However, black holes also feature superheated coronae, much like the outer atmosphere of stars. Unlike the Sun's corona, which burns at around 1.8 million degrees Fahrenheit, a black hole's

corona can reach temperatures of billions of degrees. Astrophysicists have previously recognized coronae around both stellar-mass and supermassive black holes. Stellar-mass black holes are formed from collapsed stars, while supermassive black holes, like the one at the centre of the Milky Way, have much larger masses. IXPE uses X-ray polarization, a characteristic of light that reveals the structure of highly energetic sources, to study the geometry of black hole accretion systems, including the corona. This data gives scientists a clearer picture of the corona's relationship with the black hole's accretion disk.

https://www.spacedaily.com/reports/NASAs_IXPE_reveals_black_hole_corona_structure_999.html

Astronomers detect ancient lonely quasars with murky origins



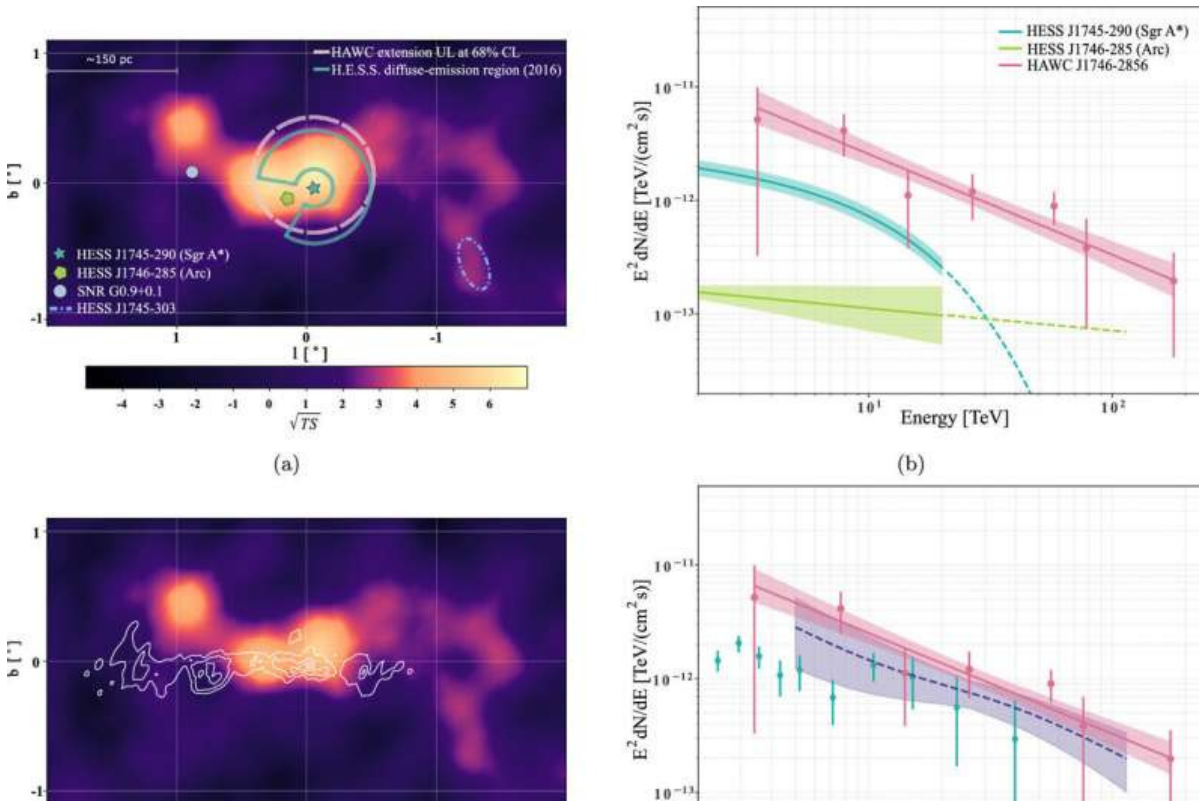
A quasar is the extremely bright core of a galaxy that hosts an active supermassive black hole at its centre. As the black hole draws in surrounding gas and dust, it blasts out an enormous amount of energy, making quasars some of the brightest objects in the universe. Quasars have been observed as early as a few hundred million years after the Big Bang, and it's been a mystery as to how these objects could have grown so bright and massive in such a short amount of cosmic time. Scientists have proposed that the earliest quasars sprang from overly dense regions of primordial matter, which would also have produced many smaller galaxies in the quasars' environment. But in a new MIT-led study, astronomers observed some ancient quasars that appear to be surprisingly alone in the early universe. The astronomers used NASA's James Webb Space Telescope (JWST) to peer back in time, more than 13 billion years, to study the cosmic surroundings of five known ancient quasars. They found a surprising variety in their neighbourhoods, or "quasar fields." While

some quasars reside in very crowded fields with more than 50 neighbouring galaxies, as all models predict, the remaining quasars appear to drift in voids, with only a few stray galaxies in their vicinity.

https://www.spacedaily.com/reports/Astronomers_detect_ancient_lonely_quasars_with_murky_origins_999.html

Record gamma rays detected at Milky Way's core

At the High-Altitude Water Cherenkov (HAWC) observatory, 13,000 feet above sea level on the Sierra Negra volcano of Mexico, researchers are getting a look into a violent mystery in the Milky Way galaxy. An international research team co-led by Los Alamos National Laboratory observed ultrahigh-energy gamma rays at more than 100 teraelectron volts, tracking their origin to the galactic centre for the first time.



GC analysis results. Credit: *The Astrophysical Journal Letters* (2024). DOI: 10.3847/2041-8213/ad772e

"These results are a glimpse at the centre of the Milky Way to an order of magnitude higher energies than ever seen before," said Pat Harding, physicist at Los Alamos and the Department of Energy's principal investigator for the project. "The research for the first time confirms a PeVatron source of ultrahigh-energy gamma rays at a location in the Milky Way known as the Galactic Centre Ridge, meaning the galactic centre is home to some of the most extreme physical processes in the universe.

<https://phys.org/news/2024-10-gamma-rays-milky-core.html>

Astronomers Discover Complex Carbon Molecules in Interstellar Space



Infrared image of the Rosette molecular cloud in Taurus. (ESA/PACS & SPIRE Consortium/HOBYS Key Programme Consortia)

A team led by researchers at MIT in the United States has discovered large molecules containing carbon in a distant interstellar cloud of gas and dust. This is exciting for those of us who keep lists of [known interstellar molecules](#) in the hope that we might work out how life arose in the Universe. But it's more than just another molecule for the collection. The result, reported [today in the journal](#)

[Science](#), shows that complex organic molecules (with carbon and hydrogen) likely existed in the cold, dark gas cloud that gave rise to our Solar System. Furthermore, the molecules held together until after the formation of Earth. This is important for our understanding of the early origins of life on our planet. The molecule in question is called pyrene, a polycyclic aromatic hydrocarbon or PAH for short. The complicated-sounding name tells us these molecules are made of rings of carbon atoms.

<https://www.sciencealert.com/astronomers-discover-complex-carbon-molecules-in-interstellar-space>

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