https://www.hermanus.astronomy@gmail.com

"The Southern Cross"

The Hermanus Astronomy Centre Monthly Newsletter

February 2025

MONTHLY MEETINGS

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

The **January** meeting was held at Onrus Manor on **Tuesday 21st**:

Prof Hennie Mouton presented ***"A Short History of the so-called Mini-Moon Of 2024".***

- **Size**: The asteroid was about 33 feet wide, or about the length of a school bus.
- **Visibility**: It was too small and dim to be seen with the naked eye or through amateur telescopes, but was observed with large, research-grade telescopes.
- **Orbit**: It followed a horseshoe-shaped path around Earth for about two months.
- **Origin**: Scientists suspect that it could be a large chunk of rock ejected from the moon's surface after an asteroid impact.
- **Discovery**: It was first spotted in August 2024 by astronomers at Complutense University of Madrid using a powerful telescope in Sutherland, South Africa.
- **Departure**: It broke free of Earth's influence on 25 November 2024 and resumed its regular orbit of the sun. It's expected to pass by again in 2055.

(when examining the trails presented, I found it essential, for understanding the logic, to remember that they are three-dimensional graphs but depicted in two dimensions – ed.)

The meeting **YouTube** link is https://www.youtube.com/watch?v=YTX474_nDZQ

February meeting:

Scheduled for **18th February**, this will be our **Annual General Meeting** followed by a short presentation, the topic yet to be announced.

This will be a virtual meeting on Zoom.

SPECIAL INTEREST GROUP ACTIVITIES

Cosmology

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

For further information regarding the Cosmology group, contact Derek Duckitt – derek.duckitt@gmail.com

The **February** meeting, scheduled for **Tuesday 4th**, will be a continuation of the series THE ENTIRE HISTORY OF THE UNIVERSE. Episode 26: *"How did the Universe Begin?"*. A very long video at 2h26m, this will be split into two sessions and will be completed in March.

Study Group

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

Our last meeting, scheduled for 28th January was h

Our next meeting is scheduled for **Tuesday February 25th**. The topic is yet to be decided.

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

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Observing

This section includes suggested dates for observation of astronomical phenomena.

Optimal dates for **February 2024**:

SUGGESTED EVENING OBSERVATION WINDOWS
(Lunar observations notwithstanding)

Date	*Moon*		*Dusk end*
February 20	*Rises*	**23h27 (50%)**	**21h30**
to **March 2**	*Sets*	**21h44 (6%)**	**21h00**

Skynotes - Moon feature *Rupes Recta*

Skynotes – Object of the month: *The Flame Nebula (NGC 2024)*

Moonwatch Within a few days either side of the **First Quarter** (Wednesday 5th February).

The Sun The Sun and Auroral Activity: https://www.spaceweatherlive.com/en/solar-activity.html

Meteors α Centaurids and γ Normids are predicted but observation prospects look poor for both of these showers.

Comets From **Tim Cooper** - CAMNotes 2025 No. 1 is online:

MNASSA

The Monthly Notes of the Astronomical Society of Southern Africa is available on

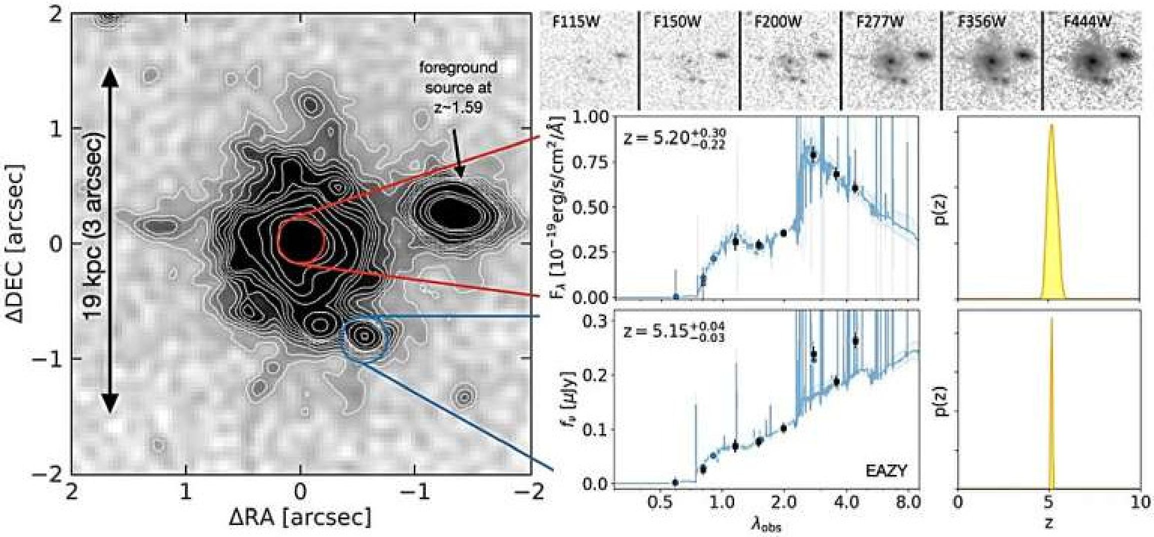
http://www.mnassa.org.za/

ASTRONOMY NEWS: January 2025 overleaf…

ASTRONOMY NEWS JANUARY 2025

(Compiled by Pieter Kotzé)

Astronomers discover an ultra-massive grand-design spiral galaxy

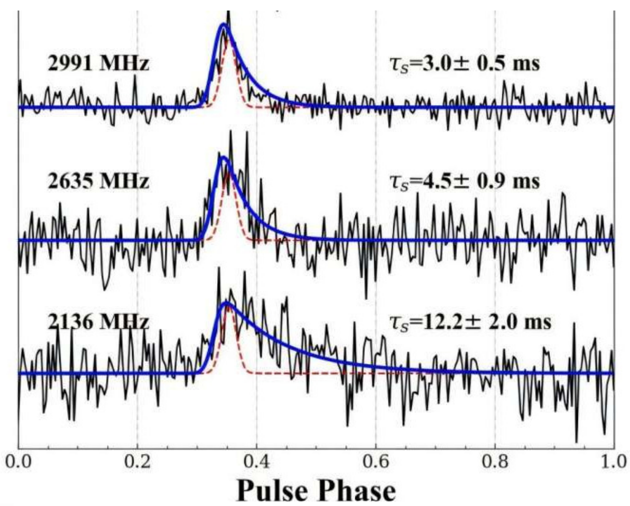


The morphology and photometric redshift of Zhúlóng. Credit: Xiao et al., 2024.

Using the James Webb Space Telescope (JWST), an international team of astronomers has detected a new grand-design spiral galaxy as part of the PANORAMIC survey. The newfound galaxy, named Zhúlóng, is extremely massive and appears to be the most distant spiral galaxy identified so far. The finding was detailed in a paper published December 17 on the pre-print server *arXiv*. Grand-design spiral galaxies are characterized by their prominent, well-defined arms, which circle outwards from a clear core. It is assumed that the arms in such galaxies are actually overdense regions of the disk which trigger star formation as incoming material is compressed in that region. It is still not well understood when and how spiral galaxies first emerged in the early universe and such galaxies are generally rare at high redshifts. To date, only a few individual spirals have been found at a redshift higher than 3.0.

https://phys.org/news/2024-12-astronomers-ultra-massive-grand-spiral.html

Observations detect young and energetic pulsar in a supernova remnant

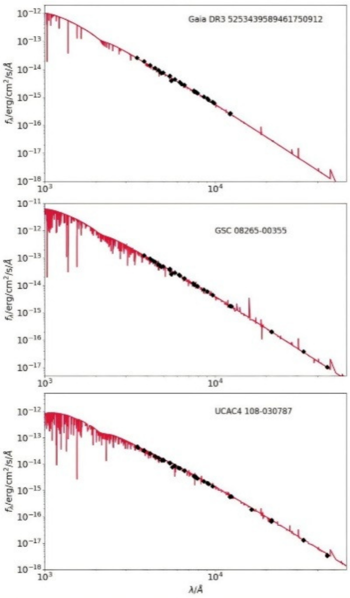


The multi-frequency pulse profiles of the PSR J1631–4722 above 2 GHz. Credit: arXiv (2024). DOI: 10.48550/arxiv.2412.11345

An international team of astronomers has reported the discovery of a new pulsar which received the designation PSR J1631–4722. The newfound pulsar, young and energetic, turns out to be associated with a supernova remnant known as SNR G336.7+0.5. 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. Pulsars directly associated with known supernova remnants (SNRs) are generally rare as only dozens of such objects have been discovered to date. Finding these associations is crucial for astronomers as they could shed more light on pulsar formation history and supernova explosion mechanisms. In the recently published study, a group of astronomers led by Adeel Ahmad of Western Sydney University in Australia, reports the finding of such a rare pulsar-SNR association. Using Murriyang, the 64-m CSIRO Parkes Radio Telescope, they identified a new radio pulsar within the SNR G336.7+0.5

https://phys.org/news/2024-12-young-energetic-pulsar-supernova-remnant.html

German astronomers discover three new hydrogen-deficient pre-white dwarfs



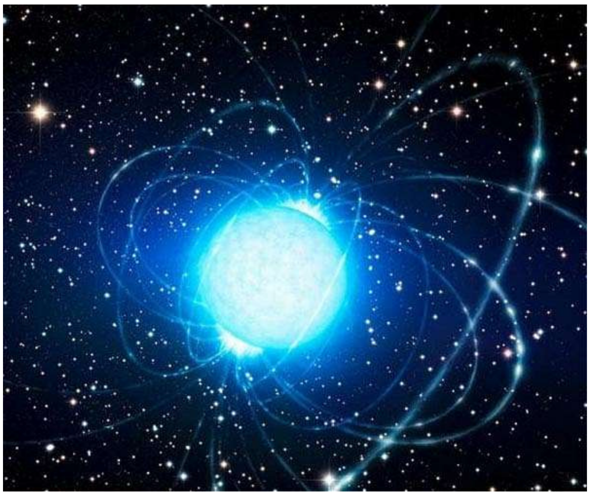
Spectral energy distribution fits for the pre-white dwarfs. Black dots correspond to observed photometry, and the red lines are the best-fit models corrected for interstellar reddening. Credit: Werner et al., 2024.

Using the X-shooter instrument at ESO's Very Large Telescope (VLT), German astronomers have detected three new pre-white dwarfs, which turned out to be strongly hydrogen-deficient. White dwarfs (WDs) are stellar cores left behind after a star has exhausted its nuclear fuel. Due to their high gravity, they are known to have atmospheres of either pure hydrogen or pure helium. However, a small fraction of WDs shows traces of heavier elements. Although WDs have a relatively small size, comparable to that of the Earth, they are a few million times more massive than our planet. Pre-white dwarfs (PWDs) are a few times larger and slated to shrink in size, eventually becoming WDs within about a few thousand years.Now, a team of astronomers led by Klaus Werner of the University of Tübingen in Germany, reports the finding of three new PWDs with extremely low hydrogen mass fraction.

https://phys.org/news/2024-12-german-astronomers-hydrogen-deficient-pre.html

Researchers identify neutron stars as sources of fast radio bursts

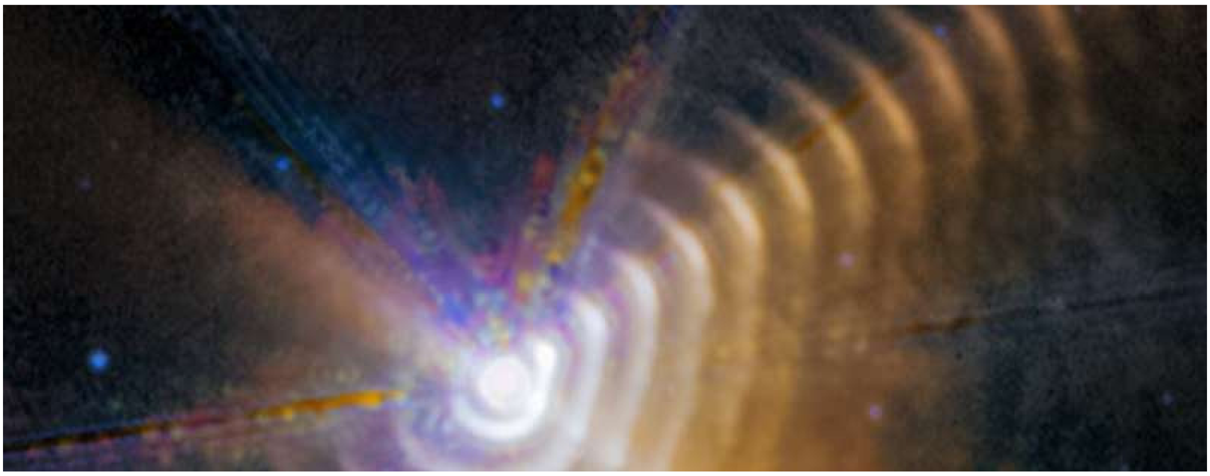
An international team of researchers, led by McGill University scientists, has confirmed a key link between fast radio bursts (FRBs) and neutron stars - extremely dense remnants of massive stars that explode as supernovae. This milestone discovery, derived from a detailed analysis of a single FRB, sheds light on the enigmatic radio flashes that have puzzled astronomers for over a decade.



"This result reaffirms long-held suspicions about the connection between FRBs and neutron stars," said Ryan Mckinven, a doctoral researcher in McGill's Department of Physics. He is the lead author of a study published in Nature. "However, our findings also challenge popular theoretical models, providing evidence that the radio emission occurs significantly closer to the neutron star than previously thought."FRBs release energy in milliseconds comparable to what the sun produces in an entire day. Thousands of these bursts have been recorded since their discovery in 2007, yet their exact origins remain elusive. Using the Canadian Hydrogen Intensity Mapping Experiment (CHIME) radio telescope, Mckinven and his team discovered a striking similarity between FRB behaviour and pulsars - a well-studied class of radio-emitting neutron stars. The team analyzed the FRB's polarization, a property of radio waves that describes their oscillation direction. Over the burst's 2.5-millisecond duration, the signal's polarization angle swung dramatically, mirroring traits seen in pulsars but rare for FRBs. Initially, the researchers considered the possibility of a misclassified pulsar.

https://www.spacedaily.com/reports/Researchers_identify_neutron_stars_as_sources_of_fast_radio_bursts_999.html

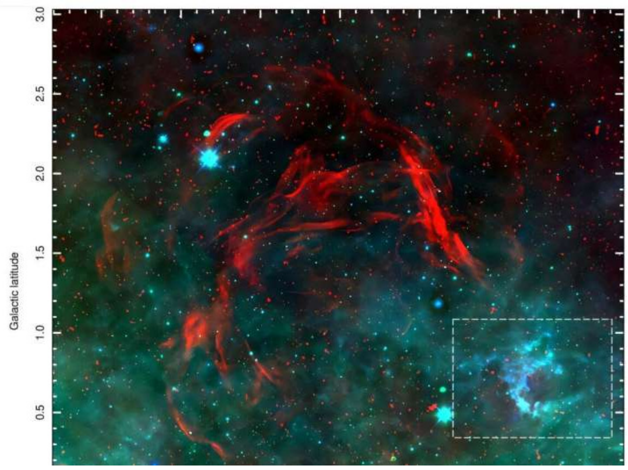
Webb watches carbon-rich dust shells form and expand in star system



A portion of Webb’s 2023 observation of Wolf-Rayet 140. Credits: Image: NASA, ESA, CSA, STScI; Science: Emma Lieb (University of Denver), Ryan Lau (NSF NOIRLab), Jennifer Hoffman (University of Denver)

Astronomers have long tried to track down how elements like carbon, which is essential for life, become widely distributed across the universe. Now, NASA's James Webb Space Telescope has examined one ongoing source of carbon-rich dust in our own Milky Way galaxy in greater detail: Wolf-Rayet 140, a system of two massive stars that follow a tight, elongated orbit.As they swing past one another (within the central white dot in the Webb images), the stellar winds from each star slam together, the material compresses, and carbon-rich dust forms. Webb's latest observations show 17 dust shells shining in mid-infrared light that are expanding at regular intervals into the surrounding space.https://phys.org/news/2025-01-webb-carbon-rich-shells-star.html

Astronomers find massive supernova remnant closer than previously thought



RGB image of G278.94+1.35 made of ASKAP smoothed 15′′ (red), WISE W3 (green) and WISE W4 (blue). The dash box marks the nearby HII region that is in the line of sight. Credit: Filipović et al., 2024.

An international team of astronomers have investigated a large Galactic supernova remnant designated G278.94+1.35. Results of the study, published Dec. 30 on the pre-print server *arXiv*, shed more light on the properties of this remnant. Supernova remnants (SNRs) are diffuse, expanding structures resulting from a supernova explosion. They contain ejected material expanding from the explosion and other interstellar material that has been swept up by the passage of the shockwave from the exploded star.G278.94+1.35 is a supernova remnant in the Milky Way, discovered in 1988. It has an estimated linear diameter of about 320 light years and its age is assumed to be about 1 million years. The distance to G278.94+1.35 is estimated to be some 8,800 light years.

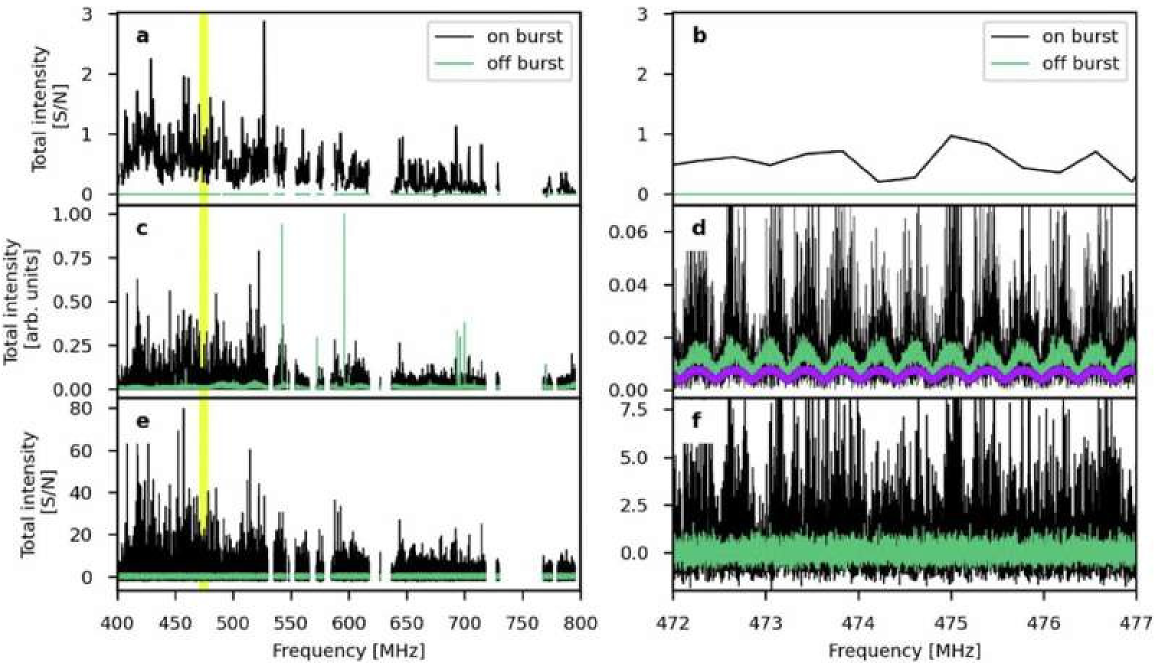
https://phys.org/news/2025-01-astronomers-massive-supernova-remnant-closer.html

Astronomers observe X-ray flashes from a nearby supermassive black hole that accelerate mysteriously

In this artist's rendering, a stream of matter trails a white dwarf orbiting within the innermost accretion *disk surrounding 1ES 1927's supermassive black hole. Credit: Aurore Simonnet/Sonoma State University*

One supermassive black hole has kept astronomers glued to their scopes for the last several years. First came a surprise disappearance, and now, a precarious spinning act. The black hole in question is 1ES 1927+654, which is about as massive as a million suns and sits in a galaxy that is 100 million light-years away. In 2018, astronomers at MIT and elsewhere observed that the black hole's corona—a cloud of whirling, white-hot plasma—suddenly disappeared, before reassembling months later. The brief though dramatic shut-off was a first in black hole astronomy.https://phys.org/news/2025-01-astronomers-ray-nearby-supermassive-black.html

Fast radio burst confirmed to originate from neutron star



On-burst and off-burst spectra across the CHIME observing band from 400–800 MHz (left panels). A zoom-in around 472–477 MHz (the yellow bar in the left panels) is plotted in the right panels. Credit: Nature (2025). DOI: 10.1038/s41586-024-08297-w

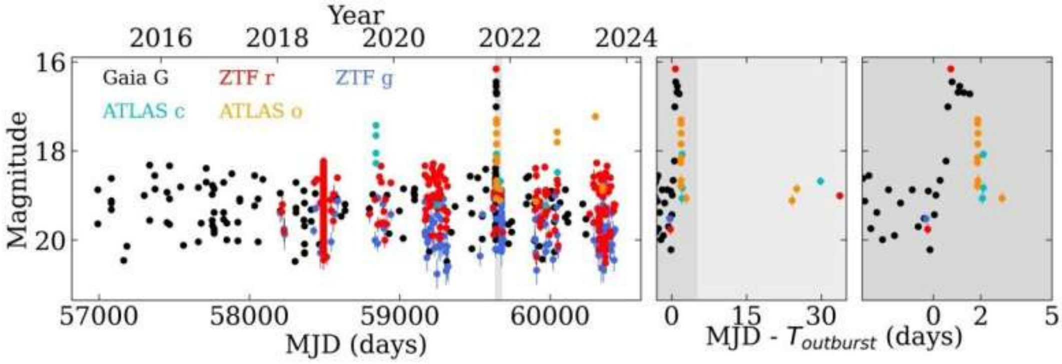
Fast radio bursts (FRBs) are notoriously difficult to study. They are flashes of radio light that can outshine a galaxy but often last for only a fraction of a second. For years, all we could do was observe them by random chance and wonder about their origins. Now, thanks to wide-field radio telescopes such as CHIME, we have some general understanding as to their cause. They seem to originate from highly magnetic neutron stars known as magnetars, but the details are still a matter of some debate. Now a team has used a method known as scintillation to reveal more clues about this mysterious phenomenon. Most FRBs occur in distant galaxies, meaning that their light must travel through the intergalactic medium and through the interstellar medium of the Milky Way to reach us. As a result, the light can be affected by gas and dust, causing it to distort a bit in frequency and polarization. Since different media affect different wavelengths of radio light, this can help us understand the origins of an FRB. In a study published in *Nature*, the team focused on an FRB named 20221022A, which originated in a galaxy 200 million light-years away. As the light travelled to us, interaction with the intergalactic medium caused the burst to flicker in brightness,

https://phys.org/news/2025-01-fast-radio-neutron-star.html

Gaia22ayj is a magnetic accreting white dwarf, astronomers find

An international team of astronomers has conducted multiwavelength observations of a variable star designated Gaia22ayj. Results of the observation campaign indicate that this star is a magnetic accreting white dwarf. The findings are detailed in a paper published Jan. 2 on the pre-print server *arXiv*. Detecting and studying variable stars could offer important insights into aspects of stellar structure and evolution. Investigation of variables could also be helpful for a better understanding of the distance scale of the universe.

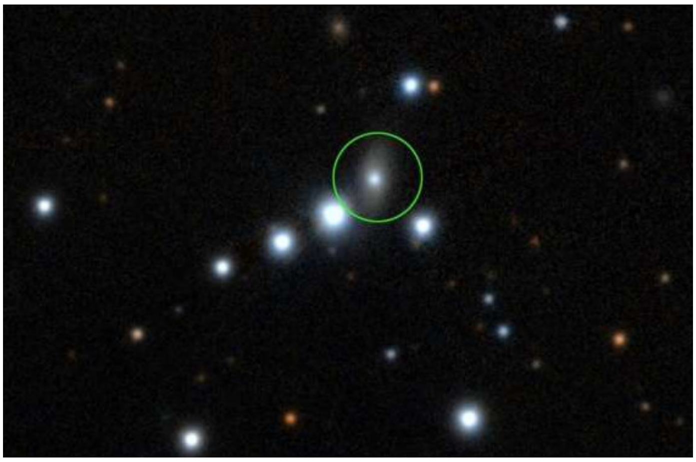
Cataclysmic variables (CVs) are binary star systems comprising a white dwarf (WD) and a normal star companion. They irregularly increase in brightness by a large factor, then drop back down to a quiescent state.



Gaia coverage from 2014–2024 shows consistent high amplitude modulation, while both ZTF (2018–onwards) and Gaia show a ∼ 3-mag outburst beginning on 3 April 2022. ATLAS coverage demonstrates that the outburst lasts two days, during which the high amplitude modulation seen in quiescence disappears. The low amplitude and short duration of the outburst more closely resembles those seen in IPs than those in non-magnetic dwarf novae. In either case, this outburst suggests ongoing accretion in Gaia22ayj. Credit: Rodriguez et al., 2025.

https://phys.org/news/2025-01-gaia22ayj-magnetic-accreting-white-dwarf.html

Astronomers catch unprecedented features at brink of active black hole



Active galaxy 1ES 1927+654, circled, has exhibited extraordinary changes since 2018, when a major outburst occurred in visible, ultraviolet, and X-ray light. The galaxy harbours a central black hole weighing about 1.4 million solar masses and is located 270 million light-years away. Credit: Pan-STARRS

International teams of astronomers monitoring a supermassive black hole in the heart of a distant galaxy have detected features never seen before using data from NASA missions and other facilities. The features include the launch of a plasma jet moving at nearly one-third the speed of light and unusual, rapid X-ray fluctuations likely arising from near the very edge of the black hole. The source is 1ES 1927+654, a galaxy located about 270 million light-years away in the constellation Draco. It harbours a central black hole with a mass equivalent to about 1.4 million Suns. "In 2018, the black hole began changing its properties right before our eyes, with a major optical, ultraviolet, and X-ray outburst," said Eileen Meyer, an associate professor at UMBC (University of Maryland Baltimore County). https://phys.org/news/2025-01-astronomers-unprecedented-features-brink-black.html

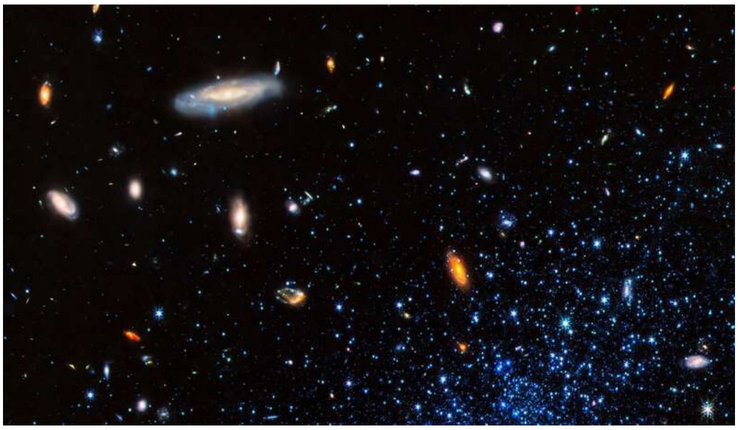
Young stars in the Milky Way's back yard challenge our understanding of how they form

A composite image created using JWST NIRCam and ALMA data. Light from stars is shown in yellow, while blue and purple represent the dust and gas fuelling star formation. Credit: NSF/AUI/NSF NRAO/S.Dagnello

Astronomers have made new discoveries about young star formation in the Large Magellanic Cloud (LMC), using the James Webb Space Telescope (JWST), along with observations from the Atacama Large Millimetre/submillimetre Array (ALMA). The study, published in *The Astrophysical Journal*, gives new insight into the early stages of massive star formation outside our galaxy. Six- to seven-billion years ago, super clusters were the main way stars were formed, producing hundreds of new stars every year. This type of star formation has been on the decline, with super star clusters found very rarely in our local universe. Only two super star clusters are now known in the Milky Way, and one in the LMC, all of which are millions of years old.

https://phys.org/news/2025-01-young-stars-milky-yard.html

Tiny galaxy reignites, shedding light on star formation and cosmic evolution



This image from NASA's James Webb Space Telescope shows a portion of the Leo P dwarf galaxy (stars at lower right represented in blue). Leo P is a star-forming galaxy located about 5 million light years away in the constellation Leo. A team of scientists collected data from about 15,000 stars in Leo P to deduce its star formation history. Credit: Kristen McQuinn/NASA's James Webb Space Telescope

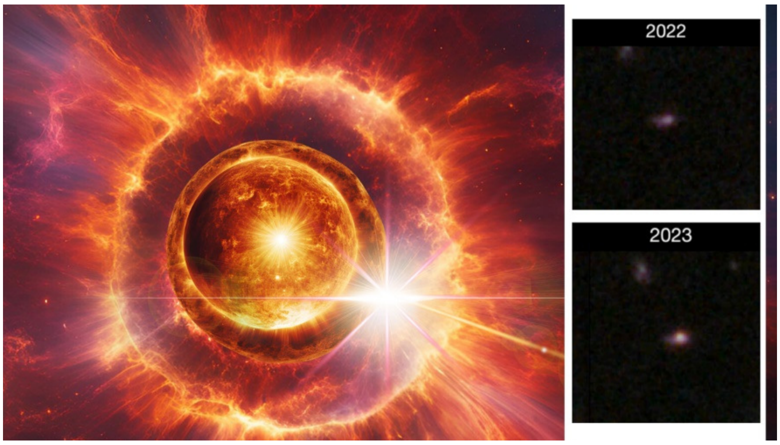
In a study published in the *Astrophysical Journal*, a team of researchers led by Kristen McQuinn, a scientist at the Space Telescope Science Institute and an associate professor in the Department of Physics and Astronomy at the Rutgers University-New Brunswick School of Arts and Sciences, has reported finding that Leo P, a small galaxy and a distant neighbour of the Milky Way, "reignited," reactivating during a significant period on the timeline of the universe, producing stars when many other small galaxies didn't. By studying galaxies early in their formation and in different environments, astronomers said they may gain a deeper understanding of the universe's origins and the fundamental processes that shape it. McQuinn and other members of the research team studied

Leo P through NASA's James Webb Space Telescope, a space-based apparatus that features a large, segmented mirror and an expansive sunshield, both of which enable it to capture detailed images of distant celestial objects.

https://phys.org/news/2025-01-tiny-galaxy-reignites-star-formation.html

James Webb Space Telescope discovers one of the earliest 'truly gargantuan' supernovas ever seen

"The high explosion energy of AT 2023adsv could indicate that the properties of supernova explosions might have been different in the early universe."



(main) An illustration of a massive star going supernova in the early universe (inset) the supernova 2023adsv as seen by the JWST in 2022 and 2023 (Image credit: Robert Lea (created with Canva)/NASA, ESA, CSA, STScI, JADES Collaboration)

Supernovas in the early universe just hit different. Especially when the stars that exploded was a stellar monster 20 times the mass of the sun. Using the James Webb Space Telescope (JWST), astronomers have discovered one of the most distant and, thus, earliest star-killing supernovas ever seen. This blast, which rocked the cosmos around 2 billion years after the Big Bang, marked the death of just such a monster star. This supernova, detected as part of the JWST Advanced Deep Extragalactic Survey (JADES) program, could help scientists add more detail to the cosmic picture of stellar life and death they are currently building. The supernova, designated AT 2023adsv, erupted around 11.4 billion years ago in a massive early galaxy. Excitingly, this stellar explosion may be somewhat different from the supernovas that have occurred more recently in the local universe. In particular, the high-energy blast seems to have been excessively violent.https://www.space.com/James-Webb-Space-Telescope-earliest-distant-supernova

South Africa's MeerKAT Telescope Uncovers Rare Giant Radio Galaxy, "Inkathazo"

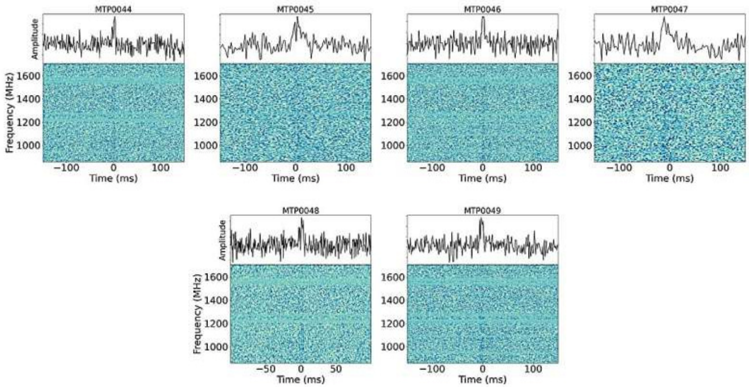
The University of Cape Town (UCT) researchers and South Africa's MeerKAT radio telescope have made a monumental discovery of a rare giant radio galaxy, "Inkathazo," helping astronomers further understand the largest structures in the universe. This groundbreaking study, published on Monday, 20 January 2025 in the *Monthly Notices of the Royal Astronomical Society*, features contributions from researchers and scientists worldwide.

Caption: South Africa's MeerKAT telescope. Credit: South African Radio Astronomy Observatory (SARAO)

Giant radio galaxies (GRGs) are extraordinary cosmic phenomena—massive galaxies emitting plasma jets millions of light-years across intergalactic space, powered by supermassive black holes at their centres. While previously considered rare, a surge of GRG discoveries has been made possible by cutting-edge telescopes like MeerKAT, transforming the understanding of these cosmic behemoths."The number of GRG discoveries has absolutely exploded in the past five years thanks to powerful new telescopes like MeerKAT," said Kathleen Charlton, a Master's student at UCT and the first author of the study. "Research into GRGs is developing so rapidly that it's becoming hard to keep up. It's incredibly exciting!"

https://thenewspaper.co.za/south-africas-meerkat-telescope-uncovers-rare-giant-radio-galaxy-inkathazo/

New radio transients discovered with MeerKAT



Timing solutions for five RRATs reported in the study. Credit: arXiv (2025). DOI: 10.48550/arxiv.2501.08224

Using the MeerKAT telescope in South Africa, an international team of astronomers has detected 26 new Galactic radio transients. Most of them turned out to be rotating radio transients (RRATs). The finding is detailed in a research paper published Jan. 14 on the *arXiv* preprint server. In general, radio transients are bursts of radio emission of uncertain origin. In the case of radio-emitting neutron stars, such objects are known as pulsars if they appear to flash or pulse as their magnetic axis sweeps across the line of sight to an observer. RRATs are a subclass of pulsars characterized by sporadic emission. The first objects of this type were identified in 2006 as sporadically appearing dispersed pulses, with frequencies varying from several minutes to several hours. However, the nature of these transients is still unclear. It is assumed that they are ordinary pulsars that experience strong pulses.

https://phys.org/news/2025-01-radio-transients-meerkat.html

COMMITTEE MEMBERS

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Pieter Kotzé	(“Southern Cross” Astronomy News, Speaker Selector)	082 581 3233

Non-committee member with portfolio:

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