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

"The Southern Cross"

The Hermanus Astronomy Centre Monthly Newsletter

May 2025

MONTHLY MEETINGS

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

Our last meeting was held on **Tuesday 15th May**.

Dr Christian Hettlage, an astrophysicist with the **South African Astronomical Observatory (SAAO)** and former chairman of the **Cape Centre**, presented ***"Black Holes: The Dark Mysteries of the Universe Unveiled"***.

Black holes lurk in the darkness of space, warping reality itself. But how do we *know* they exist? And what happens if you fall into one? And the fear of *spaghettification* (it's an accepted technical term!).

A concise but superb walk-through of classical mechanics (with its inherent problems!) leading to relativity and time dilation (with *its* problems), proving that it can be achieved without too much stumbling! A revisit of this talk, and it is highly recommended, is available on YouTube: https://youtu.be/J2EI5VaPBE0 .

On **Tuesday 20th May**, we shall be welcoming another presentation by **Amanda Sickafoose,** the topic yet to be revealed. More on this via email as the information becomes available.

SPECIAL INTEREST GROUP ACTIVITIES

Cosmology

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

On Tuesday 4th March we watched and discussed the second half of THE ENTIRE HISTORY OF THE UNIVERSE, episode 26: *"How did the Universe Begin?"*. The video link:

https://www.youtube.com/watch?v=3Illx0WkCxU&list=PLROBLlvnR7BEF9b1NOvRf_zhboibmywJb&index=26&t=26s&pp=iAQB

The discussion link: https://youtu.be/2k4SithdnFY

The next meeting, scheduled for **Tuesday 1st May**, will be episode 27: *"What is Hidden in the Darkness at the Beginning of Time?"*

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

Study Group

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

On **Tuesday 29th April** at Onrus Manor, we watched **Paul Kestens** presenting *"An Introduction to SpaceX"*.

With a fair serving of tables and technical details (it *is* rocket science, remember!), a revisit could be beneficial. The YouTube link: https://www.youtube.com/watch?v=9fIWg8igHBs.

Our next meeting is scheduled for **Tuesday 27th May** and is yet to be prepared.

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

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Astrophotography

The Astrophotography SIG, lead by Deon Krige (krige.deon44@outlook.com) has been dormant for some time as members have not requested meetings as a group. However, Derek Duckitt and Peter Kogel have been busy on the quiet producing some fine images.

Some of these have been displayed in *"Skynotes"*, our monthly observing magazine, and will in future also be presented in this newsletter. In addition to just enjoying the fine work of these artists, it is hoped they may encourage others to "try their hand", so to speak, at this challenging and rewarding addition to their astronomy hobby.

Derek has developed an in-depth knowledge of the hardware and software involved, plus of course a dedication to late-night hours, having reached the stage where he is contributing to the international app *"Telescopius"* https://telescopius.com/ .

Pete Kogel has achieved some astonishing results with his cellphone camera.

Pete Kogel's north-down image of the lunar occultation of Antares, α Sco, taken about a minute before occultation. Just for interest, the crater just "inland" from Antares, is Grimaldi.

Observing

No suitable evenings occurred during April.

Optimal dates for **May 2025**:

SUGGESTED EVENING OBSERVATION WINDOWS

(Lunar observations notwithstanding)

Date	*Moon*		*Dusk end*
May 18	*Rises*	**22h38 (71%)**	**19h15**
to **May 29**	*Sets*	**19h55 (6%)**	**19h11**

Skynotes ***Mare Imbrium***

Skynotes Object of the month: ***Praesepe cluster in Cancer***

Moonwatch Within a few days either side of the **First Quarter** (May 4th)

From Tim Cooper

The latest circular of the Comet Asteroid and Meteor Section, CAMNotes 2025 No.2, has been uploaded to the ASSA website and contains details of meteor showers and asteroid observations required for April to June. There are no bright comets visible during this period.

The issue can be downloaded from : https://assa.saao.ac.za/wp-content/uploads/sites/23/2025/03/ASSA-CAMnotes-2025-Number-2.pdf

MNASSA

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

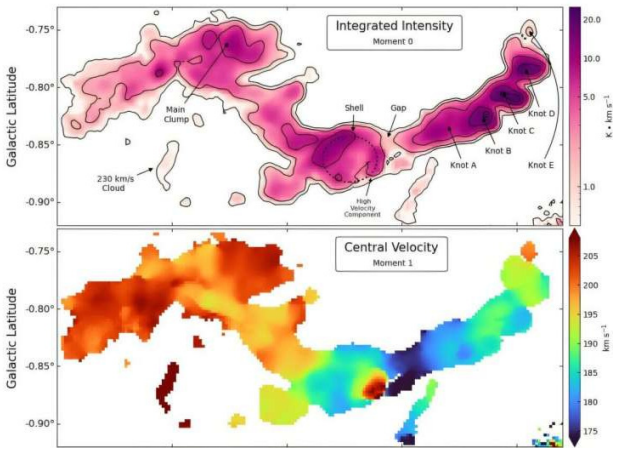
http://www.mnassa.org.za/

ASTRONOMY NEWS: April 2025 overleaf…

ASTRONOMY NEWS APRIL 2025

(Compiled by Pieter Kotzé)

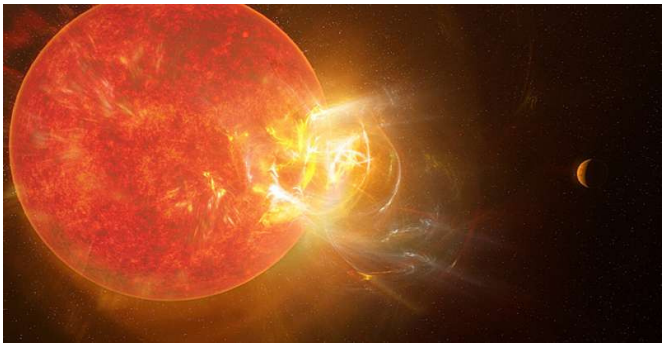
Astronomers discover new giant molecular cloud in the Milky Way



Integrated Intensity (Moment 0; top panel), Central Velocity (Moment 1; middle panel) and Velocity Dispersion (Moment 2; bottom panel) for the NH3 (3,3) transition in the M4.7-0.8 cloud. Credit: arXiv (2025). DOI: 10.48550/arxiv.2503.14174

Using the Green Bank Telescope (GBT), astronomers have detected a new giant molecular cloud in the Milky Way galaxy. The newfound cloud has a size of nearly 200 light years and its mass is estimated to be some 160,000 solar masses. Molecular clouds are huge complexes of interstellar gas and dust left over from the formation of galaxies, composed mostly of molecular hydrogen. Molecular clouds with masses greater than 100,000 solar masses are called giant molecular clouds (GMCs). In general, GMCs are 15–600 light years in diameter and are the coldest and densest parts of the interstellar medium. GMCs are gas reservoirs where most star formation takes place.https://phys.org/news/2025-03-astronomers-giant-molecular-cloud-milky.html

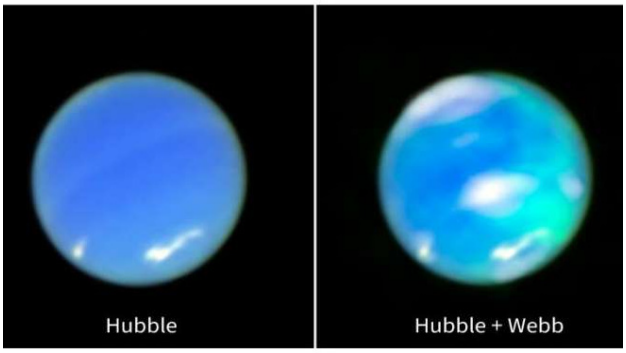
Small star, mighty flares: ALMA shares new view of Proxima Centauri



Artist's concept of a stellar flare from Proxima Centauri. Credit: NSF/AUI/NSF NRAO/S. Dagnello

At a distance of just over four light years, Proxima Centauri is our nearest stellar neighbour and is known to be a very active M dwarf star. Its flare activity has been well-known to astronomers using visible wavelengths of light, but a new study using observations with the Atacama Large Millimeter/submillimeter Array (ALMA) array highlights this star's extreme activity in radio and millimetre wavelengths, offering exciting insights about the particle nature of these flares as well as potential impacts to the liveability of its terrestrial, habitable-zone planets. Known to host a potentially habitable planet, the star Proxima Centauri exhibits very active flare activity in optical wavelengths. Similar to flares on our sun, these outbursts release light energy across the electromagnetic spectrum as well as bursts of particles known as stellar energetic particles. Depending on the energy and frequency of these flares, nearby planets in the habitable zone might be rendered uninhabitable as the flares strip planetary atmospheres of necessary ingredients such as ozone and water.https://phys.org/news/2025-03-small-star-mighty-flares-alma.html

Webb captures Neptune's auroras for first time



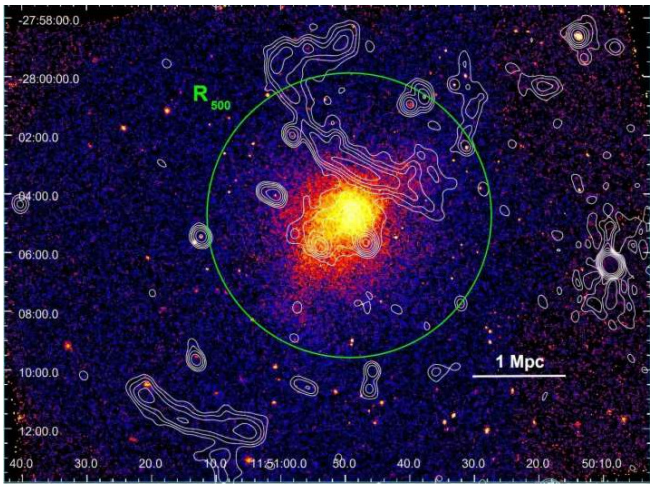
Credit: Webb Space Telescope

Neptune lies in the frigid, dark, vast frontier of the outer edges of our solar system, about 3 billion miles away from the sun. For the first time, NASA's James Webb Space Telescope has captured bright auroral activity on Neptune. Auroras occur when energetic particles, often originating from the sun, become trapped in a planet's magnetic field and eventually

strike the upper atmosphere. The energy released during these collisions creates the signature glow.In the past, astronomers have seen tantalizing hints of auroral activity on Neptune, for example, in the flyby of NASA's Voyager 2 in 1989. However, imaging and confirming the auroras on Neptune has long evaded astronomers despite successful detections on Jupiter, Saturn, and Uranus. Neptune was the missing piece of the puzzle when it came to detecting auroras on the giant planets of our solar system.

https://phys.org/news/2025-03-webb-captures-neptune-auroras.html

X-ray observations reveal dynamic features of galaxy cluster PLCKG287

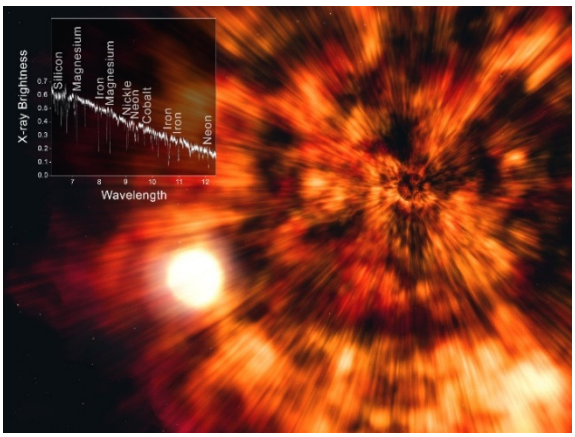


Background-subtracted, exposure-corrected Chandra mosaic of PLCKG287 in the [0.5-7.0] keV band. Credit: arXiv (2025). DOI: 10.48550/arxiv.2503.13735

Using NASA's Chandra X-ray observatory, astronomers have observed a massive and hot galaxy cluster known as PLCKG287.0+32.9 (or PLCKG287 for short). Results of the observational campaign, presented March 17 on the *arXiv* pre-print server, deliver important insights into the morphological and thermodynamic properties of this cluster. Galaxy clusters contain up to thousands of galaxies bound together by gravity. They generally form as a result of mergers and grow by accreting sub-clusters. These processes provide an excellent opportunity to study matter in conditions that cannot be explored in laboratories on Earth. In particular, merging galaxy clusters could help us better understand the physics of shock and cold fronts seen in the diffuse intra-cluster medium, the cosmic ray acceleration in clusters, and the self-interaction properties of dark matter.

https://phys.org/news/2025-03-ray-reveal-dynamic-features-galaxy.html

Finding Clues in Ruins of Ancient Dead Star With NASA's Chandra

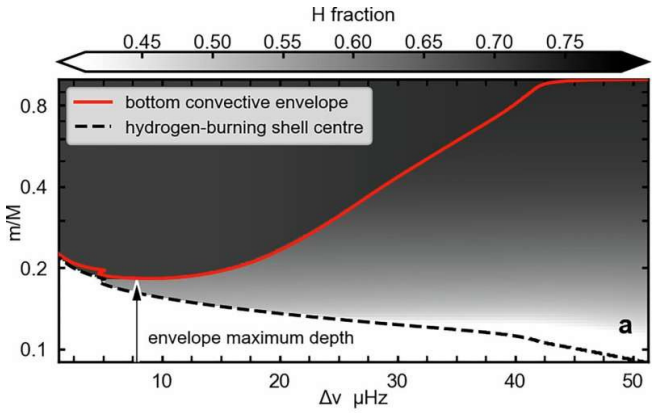


X-ray: NASA/CXC/Technion/N. Keshet et al.; Illustration: NASA/CXC/SAO/M. Weiss

People often think about archaeology happening deep in jungles or inside ancient pyramids. However, a team of astronomers has shown that they can use stars and the remains they leave behind to conduct a special kind of archaeology in space. Mining data from NASA's Chandra X-ray Observatory, the team of astronomers studied the relics that one star left behind after it exploded. This "supernova archaeology" uncovered important clues about a star that self-destructed – probably more than a million years ago. Today, the system called GRO J1655-40 contains a black hole with nearly seven times the mass of the Sun and a star with about half as much mass. However, this was not always the case.With its outer layers expelled, including some striking its neighbour, the rest of the exploded star collapsed onto itself and formed the black hole that exists today. The separation between the black hole and its companion would have shrunk over time because of energy being lost from the system, mainly through the production of gravitational waves. When the separation became small enough, the black hole, with its strong gravitational pull, began pulling matter from its companion, wrenching back some of the material its exploded parent star originally deposited.

https://www.nasa.gov/image-article/finding-clues-in-ruins-of-ancient-dead-star-with-nasas-chandra/

Astronomers listened to the 'music' of flickering stars—and discovered an unexpected feature



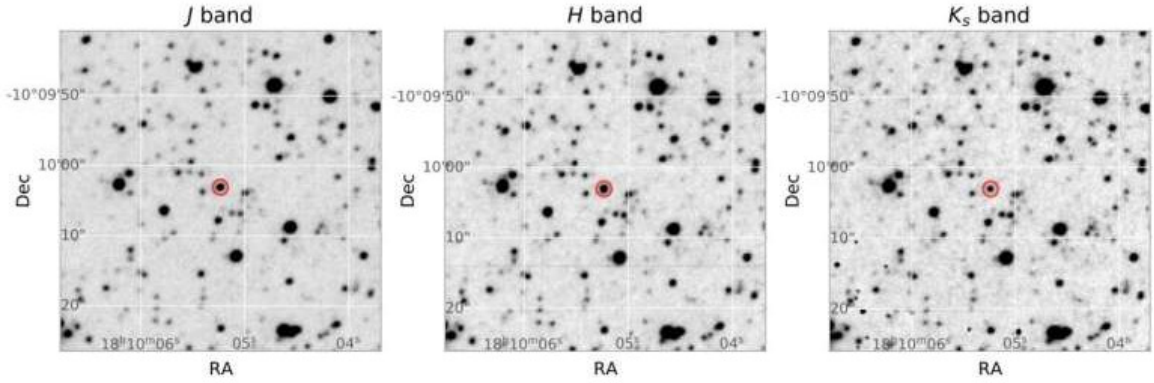
Hydrogen and helium fractions and the bottom of the convective envelope. Credit: Nature (2025). DOI: 10.1038/s41586-025-08760-2

The "music" of starquakes—enormous vibrations caused by bursting bubbles of gas that ripple throughout the bodies of many stars—can reveal far more information about the stars' histories and inner workings than scientists thought. In new research published in *Nature*, we analyzed the frequency signatures of starquakes across a broad range of giant stars in the M67 star cluster, almost 3,000 light years from Earth. Using observations from the Kepler space telescope's K2 mission, we had a rare opportunity to track the evolution of stars during most of their journey through the giant phase of the stellar life cycle.Among the key frequency signatures is the so-called small spacing—a group of resonant frequencies quite close together. In younger stars, such as the sun, this signature can provide clues about how much hydrogen the star still has left to burn in its core.Then we found something else unexpected: at a certain stage, the small spacings stalled. It was like a record skipping on a note. We discovered that this stalling appears during a specific stage in the life of a giant star—when its outer envelope, the "boiling" layer that transports heat, grows so deep that it makes up about 80% of the star's mass. At this point the inner boundary of the envelope reaches into a highly sensitive region of the star.

https://phys.org/news/2025-04-astronomers-music-flickering-stars-unexpected.html

https://phys.org/news/2025-04-melodies-musical-starquakes-galaxy.html

Methane detected in the atmosphere of the nearest T dwarf



Images of the position of WISE1810 on 21 July 2024 from GTC/EMIR in the J, H and Ks bands. The object is marked with a red circle. The field of view of each image is 45″×45″. North is up and East left. Credit: arXiv (2025). DOI: 10.48550/arxiv.2503.22289

Using the 10.4-m Gran Telescopio Canarias (GTC), European astronomers have detected methane in the atmosphere of WISEA J181006.18−101000.5—the closest T dwarf to Earth. Brown dwarfs are intermediate objects between planets and stars. Astronomers generally agree that they are substellar objects occupying the mass range between 13 and 80 Jupiter masses. One subclass of brown dwarfs (with effective temperatures between 500 and 1,500 K) is known as T dwarfs, and represents the coolest and least luminous substellar objects so far detected. Studies of T dwarfs could help astronomers better understand objects near the disputed planet/star boundary, for instance, giant exoplanets. However, although many brown dwarfs have been detected to date, T dwarfs are not so common, as only about 400 such objects have been identified. WISEA J181006.18−101000.5, or WISE1810 for short, is a metal-poor T dwarf at a distance of just 29 light years from the Earth. It has a

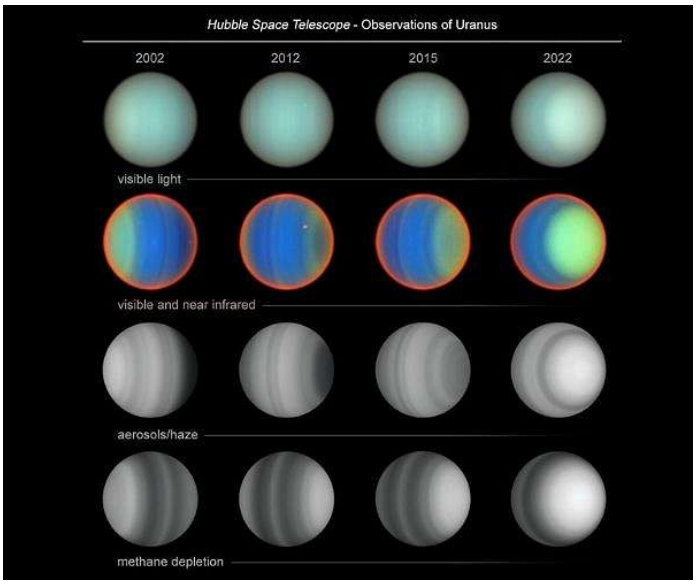
radius of about 0.65 Jupiter radii and is some 17 times more massive than Jupiter. The effective temperature of WISE1810 is estimated to be within the range of 800–1,300 K.
https://phys.org/news/2025-04-methane-atmosphere-nearest-dwarf.html

Extreme magnetic fields near our galaxy's black hole are preventing stars from being born, JWST discovers

This image of Sagittarius C from the Webb telescope reveals several bands of plasma, which seem to have been formed by strong magnetic fields. (Image credit: NASA, ESA, CSA, STScI, SARAO, Samuel Crowe (UVA), John Bally (CU), Ruben Fedriani (IAA-CSIC), Ian Heywood (Oxford))

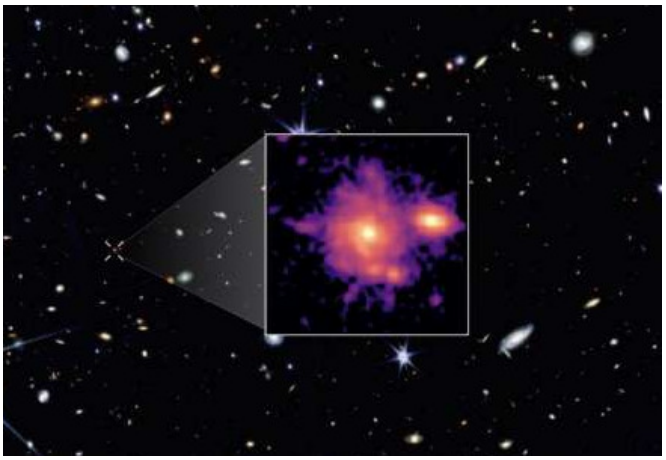
Stars are the architects of nearly all the chemical elements in the universe, including ones crucial to life as we know it, such as carbon and oxygen. Yet, despite decades of research, aspects of star formation are as mysterious as the dense, dark clouds of gas in which baby stars are embedded. The James Webb Space Telescope's observations of Sagittarius C (Sgr C), a star-forming region at the Milky Way's heart that appears to form fewer stars than expected, are shedding new light on some of these enigmatic processes. Despite residing in one of the galaxy's most extreme star-forming environments — just 200 light-years from the supermassive black hole Sagittarius A* — and containing vast reserves of molecular gas, Sgr C doesn't birth as many stars as astronomers estimate it should. In 2023, the James Webb Space Telescope (JWST) provided astronomers with the first infrared data of this stellar nursery, enabling them to peer through the obscuring blanket of gas and dust and study its young stellar population in greater detail. A fresh analysis of those observations has now revealed dozens of bright, needle-like filaments of hot plasma, some several light-years long, weaving in and out of the Sgr C nursery. https://www.space.com/space-exploration/james-webb-space-telescope/extreme-magnetic-fields-near-our-galaxys-black-hole-are-preventing-stars-from-being-born-jwst-discovers

20 years of Hubble data reveals evolving weather patterns on Uranus



The ice giant Uranus, known for its peculiar sideways rotation, has revealed new atmospheric secrets thanks to a 20-year observational campaign using NASA's Hubble Space Telescope. Through precise imaging and spectral data collected over two decades, researchers have mapped long-term atmospheric dynamics and composition changes that offer key insights into this distant world. This extensive dataset has allowed scientists to assess how Uranus's atmosphere responds to its unique solar exposure, improving models of how similar exoplanets might behave. Hubble's long operational life and powerful imaging tools made these discoveries possible, providing astronomers with a valuable reference for understanding ice giants beyond our solar system. These observations revealed that methane is unevenly distributed in the planet's atmosphere. Specifically, methane concentrations are significantly lower near both poles, a pattern that remained stable across the two-decade timeframe. Meanwhile, haze and aerosol levels shifted dramatically, especially in the northern polar region, which brightened as the planet moved toward its northern summer solstice, expected in 2030.
https://www.spacedaily.com/reports/20_years_of_Hubble_data_reveals_evolving_weather_patterns_on_Uranus_999.html

The most distant twin of the Milky Way ever observed

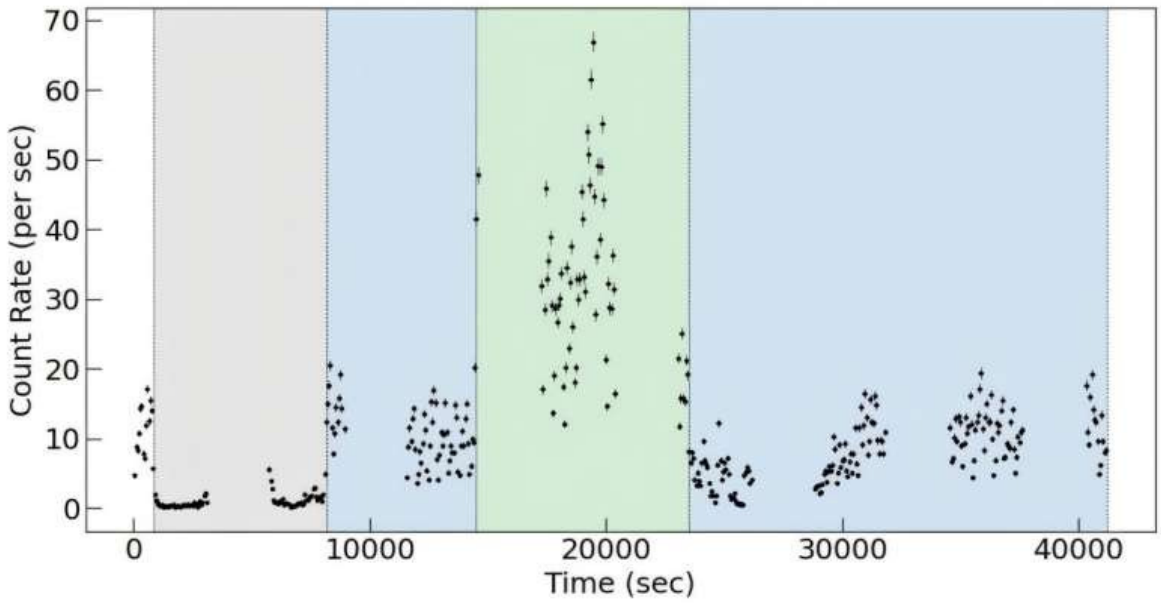


The image of Zhúlóng shows its spiral arms, an old central bulge and a large star-forming disk, which resembles the Milky Way. Credit: NASA/CSA/ESA, M. Xiao (University of Geneva), G. Brammer (Niels Bohr Institute), Dawn JWST Archive

An international team led by the University of Geneva (UNIGE) has discovered the most distant spiral galaxy candidate known to date. This ultra-massive system existed just one billion years after the Big Bang and already shows a remarkably mature structure, with a central old bulge, a large star-forming disk, and well-defined spiral arms.The discovery was made using data from the James Webb Space Telescope (JWST) and offers important insights into how galaxies can form and evolve so rapidly in the early universe. The study is published in *Astronomy & Astrophysics*. Large spiral galaxies like the Milky Way are expected to take several billion years to form. During the first billion years of cosmic history, galaxies are thought to be small, chaotic, and irregular in shape. Among these new findings is Zhúlóng, the most distant spiral galaxy candidate identified to date, seen at a redshift of 5.2—just 1 billion years after the Big Bang. Despite this early epoch, the galaxy exhibits a surprisingly mature structure: a central old bulge, a large star-forming disk, and spiral arms—features typically seen in nearby galaxies.

https://phys.org/news/2025-04-distant-twin-milky.html

X-ray binary 4U 1907+09: NuSTAR observations reveal flux variability and spin-down



NuSTAR light curve of 4U 1907+09 in 3-79 keV energy range. Credit: arXiv (2025). DOI: 10.48550/arxiv.2504.02791

Using NASA's Nuclear Spectroscopic Telescope Array (NuSTAR), Indian astronomers have performed X-ray observations of an X-ray binary designated 4U 1907+09. Results of the observational campaign, published April 3 on the *arXiv* preprint server, yield new insights into the variability of this source, shedding more light on its nature. X-ray binaries are composed of a normal star or a white dwarf transferring mass onto a compact neutron star or a black hole. Some of them are supergiant X-ray binaries (sgXBs), which consist of a compact object and a massive O/B supergiant star. The accretion of stellar wind from the supergiant star onto a compact object is responsible for the X-ray emission in these systems.4U 1907+09 is a classical sbXB identified in 1971, located some 6,200 light years away.

It consists of a pulsar and a companion supergiant donor of the O8-O9 Ia type. The binary has an orbital period of 8.37 days and an orbital eccentricity of approximately 0.28.

https://phys.org/news/2025-04-ray-binary-4u-nustar-reveal.html

Drier far side of the Moon deepens understanding of lunar evolution

The Chang'e 6 mission has unveiled that the Moon's far side mantle holds significantly less water than its near side, offering crucial insight into the Moon's geological history. Analysis of rock samples from the mission indicates water content in the far side's mantle is as low as 1 to 1.5 micrograms per gram-less than 2 parts per million-marking the driest values ever recorded in lunar geology. Published in Nature, the study was led by Professor Hu Sen of the Chinese Academy of Sciences' Institute of Geology and Geophysics. "Even the driest desert on Earth contains around 2,000 parts per million of water - over a thousand times more than what's found on the lunar far side surface," Hu noted.Past estimates of lunar water content relied exclusively on near side samples, which have recorded levels as high as 200 micrograms per gram. The new far side data challenges those earlier assumptions, reaffirming the prevailing theory that the Moon formed from a high-temperature impact event 4.5 billion years ago that stripped away volatiles like water.

https://www.spacedaily.com/reports/Drier_far_side_of_the_Moon_deepens_understanding_of_lunar_evolution_999.html

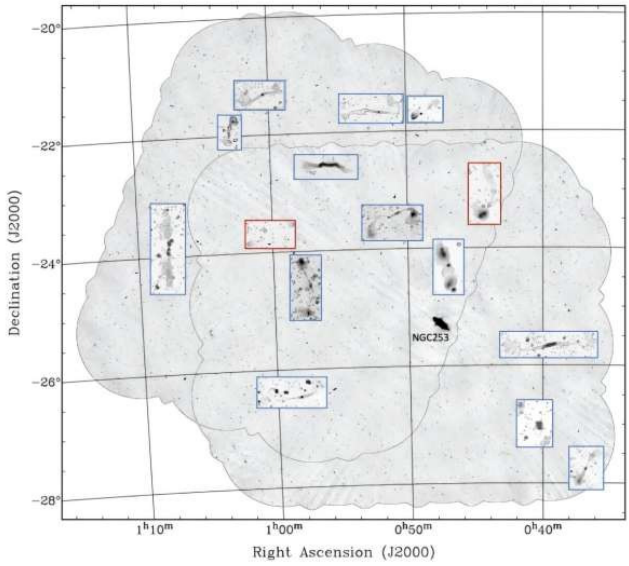
Indicators of alien life may have been found. An astrophysicist explains what the new research means

Credit: Pixabay/CC0 Public Domain

When astronomers are searching for extraterrestrial life, it is usually in the form of emissions from bacteria or other tiny organisms. A new research paper in the *Astrophysical Journal* suggests that Cambridge scientists have managed to find this type of emission with a certainty of 99.7% from a planet called K2-18b, 124 light-years away. They used NASA's James Webb Space Telescope to analyze the chemical composition of the planet's atmosphere and say they found promising evidence K2-18b could host life.It's an exciting breakthrough but it doesn't confirm alien life. The graph produced by the study's authors shows evidence for dimethyl sulfide and dimethyl disulfide (DMS). Some scientists think of DMS as a biomarker—a molecular indicator of life on Earth. However, DMS is not only produced by bacteria, but has also been found on comet 67P and in the gas and dust of the interstellar medium, the space between stars. It can even be generated by shining UV light onto a simulated atmosphere. The authors acknowledge this and claim the amount they determined was present cannot be produced by any of these conditions.

https://phys.org/news/2025-04-indicators-alien-life-astrophysicist.html

Fifteen new giant radio galaxies discovered with ASKAP



Overview of the ASKAP 944 MHz Sculptor field. Overlaid are enlarged images of the 15 giant radio galaxies in the sample. Credit: arXiv (2025). DOI: 10.48550/arxiv.2504.07314

Using the Australian Square Kilometre Array Pathfinder (ASKAP), astronomers have discovered 15 new giant radio galaxies with physical sizes exceeding 3 million light years. The finding was reported in a research paper published April 9 on the *arXiv* preprint server. The so-called giant radio galaxies (GRGs) have an overall projected linear length exceeding at least 2.3 million light years. They are rare objects grown usually in low-density environments and display jets and lobes of synchrotron-emitting plasma. GRGs are important for astronomers studying the formation and the evolution of radio sources. ASKAP is a 36-dish radio-interferometer operating at 700 to 1,800 MHz. It uses novel technology to achieve extremely high survey speed, making it one of the best instruments in the world for mapping the sky at radio wavelengths. Due to its large field of view, high resolution, dynamic range and good sensitivity to low-surface brightness structures, ASKAP has been essential in the search for new GRGs.

https://phys.org/news/2025-04-fifteen-giant-radio-galaxies-askap.html

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Committee Members

Derek Duckitt	(Chairman, Speaker Selector, website editor, "Southern Cross" editor, Cosmology SIG co-ordinator)	082 414 4024 derek.duckitt@gmail.com
Pierre de Villiers	(Vice-chairman, Speaker Selector, Projects and Outreach, Science and Technology Club)	082 854 2277
Elaine Sykes	(Treasurer)	083 286 2683
Peter Harvey	(Secretary, Membership, "Skynotes", "Southern Cross", Study Group SIG co-ordinator, Observing co-ordinator)	081 212 9481 petermh@hermanus.co.za
Mick Fynn	(Educational outreach)	082 443 0848

Non-committee members with portfolio:

Deon Krige	Astro-photography (SIG coordinator)
Pieter Kotzé	"Southern Cross" (Astronomy News)