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

"The Southern Cross"

The Hermanus Astronomy Centre Monthly Newsletter

October 2025

MONTHLY MEETINGS

At our September Monthly Meeting on Tuesday 16th, **Pieter Kotzé** spoke to us in person at Onrus Manor about *"Solar Variability Secrets revealed by Baobab Tree Rings in Southern Africa",*

Plants absorb carbon dioxide from the atmosphere during the process of photosynthesis. This uptake of carbon dioxide is regulated by stomata. To link carbon isotope ratios to rainfall, one is restricted to trees in the drier regions that rely only on precipitation as a water source rather than in the coastal regions where trees have their roots mostly in water. Located in the savannah regions, such as Pafuri in northern Limpopo, the Baobab tree was the choice for research.

For a revisit or for those unfortunate enough to have missed it, the YouTube link:

https://youtu.be/cy_QvzayXsM

In our **October** meeting on **Tuesday 21st**, we shall have **Pieter Kotzé's** update on the **James Webb Telescope**. Launched on Christmas Day of 2021 to start a new era of astronomy/astrophysics research, the JWST is a space telescope specifically designed to conduct infrared astronomy observations and is unprecedented in the history of unravelling the mysteries of the universe.

Again, this will be an in person delivery at the Onrus Manor Activities Hall as well as shared on Zoom for those who cannot attend physically.

SPECIAL INTEREST GROUP ACTIVITIES

Cosmology

On September 2nd, we watched and discussed sections 1 to 3 of episode 32 of the Entire History of the Universe series, *" What Is (Almost) Everything Made Of?"*

The video link:

https://www.youtube.com/watch?v=UYW1lKNVI90&list=PLROBLlvnR7BEF9b1NOvRf_zhboibmywJb&index=32&t=457s&pp=iAQB

The Discussion link: https://youtu.be/N5V6dn2i910

On Tuesday October 7th, we shall watch sections 4 to 6 of the above episode. For further information regarding the Cosmology group, contact Derek Duckitt – derek.duckitt@gmail.com

Study Group

In our meeting on Tuesday September 30th we watched *"The Forbidden Chapter of Human History Unlocked by Ethiopian DNA"*.

The only African country never to have been colonized. Strong resistance to political/military pressures or their mutual will to merge? And why such strong resistance to diseases such as Sleeping Sickness, etc.? They were known to actively incorporate foreigners. Is this a lesson for the world? Is the future written in the past?

The video link:

https://www.youtube.com/watch?v=RN092tsR5nA&pp=ygU7dGhlIGZvcmJpZGRlbiBjaGFwdGVyIG9mIGh1bWFuIGhpc3RvcnkgdW5sb2NrZWQgYnkgRXRoaW9waWE%3D

The discussion link: https://www.youtube.com/watch?v=bbIA0LlUfk8

Our next meeting, scheduled for **Tuesday November 25th** will be advised in due course. For further information regarding the Study Group, contact Peter Harvey petermh@hermanus.co.za

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Observing

No suitable evenings were available during September.

Optimal dates for **October 2025**:

SUGGESTED EVENING OBSERVATION WINDOWS
(Lunar observations notwithstanding)

Date		*Moon*	*Dusk end*
October 10	**Rise**	**21h51 (88%)**	**19h55**
to October 26	**Set**	**23h19 (14%)**	**20h07**

Skynotes contents:

Moon: **Vallis Alpes**
Image of the month: **Derek Duckitt's Eagle Nebula**
Object of the month: **Shaula**

ASSA

From Tim Cooper

The link to the latest Comet, Asteroid and Meteor Section:

https://assa.saao.ac.za/wp-content/uploads/sites/23/2025/09/ASSA-CAMnotes-2025-Number-4.pdf

MNASSA

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

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

Compiled by Pieter Kotzé

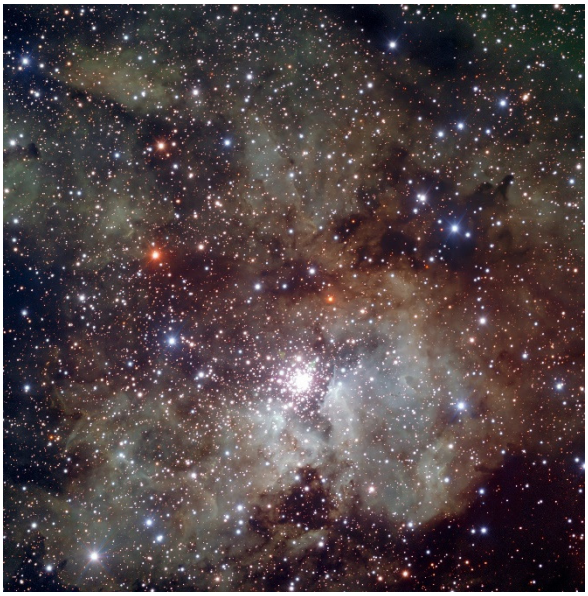
SEPTEMBER ASTRONOMY PICTURE

NGC 7027: The Pillow Planetary Nebula
Image Credit: NASA, ESA, Hubble; Processing: Delio ToliviaCadrecha

Explanation: What created this unusual planetary nebula? Dubbed the Pillow Nebula and the Flying Carpet Nebula, NGC 7027 is one of the smallest, brightest, and most unusually shaped planetary nebulas known. Given its expansion rate, NGC 7027 first started expanding, as visible from Earth, about 600 years ago. For much of its history, the planetary nebula has been expelling shells, as seen in blue in the featured image by the Hubble Space Telescope. In modern times, though, for reasons unknown, it began ejecting gas and dust (seen in brown) in specific directions that created a new pattern that seems to have four corners. What lies at the nebula's centre is unknown, with one hypothesis holding it to be a close binary star system where one star sheds gas onto an erratic disk orbiting the other star. NGC 7027, about 3,000 light years away, was first discovered in 1878 and can be seen with a standard backyard telescope toward the constellation of the Swan (Cygnus).

Astronomers discover one of the most massive binary stars in the galaxy

A research team has used both archival Hubble Space Telescope data and new observations to precisely measure the binary star system NGC3603-A1. One star weighs about 93 times the mass of our sun, while its companion tips the scales at roughly 70 solar masses. Together, they represent one of the most massive binary systems ever discovered in our galaxy.

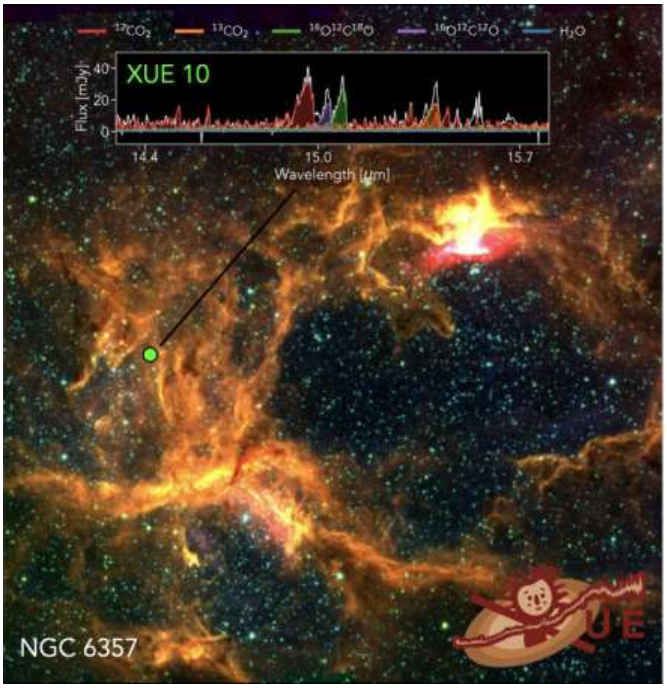


NGC 3603 is a starburst region located 22,000 light years away from the Sun, it's the closest region of this kind known in our Galaxy Credit: ESO

What makes this system truly extraordinary is the speed of its orbital movement. The two giants orbit each other once every 3.8 days, meaning that in the time Earth completes one year around the sun, these stellar titans will have circled each other nearly 100 times. Their proximity and incredible masses create a dynamic relationship that's reshaping both stars. The discovery required detective work that spanned years and relied on a crucial insight from an unlikely source. Sarah Bodansky, then an undergraduate student at Carleton College, was working remotely at Lowell Observatory during the pandemic summer of 2020 when she noticed something everyone had missed in the older Hubble data. The study is published in *The Astrophysical Journal*.

https://phys.org/news/2025-08-astronomers-massive-binary-stars-galaxy.html

Unusual CO_2-rich disk detected around young star challenges planet formation models



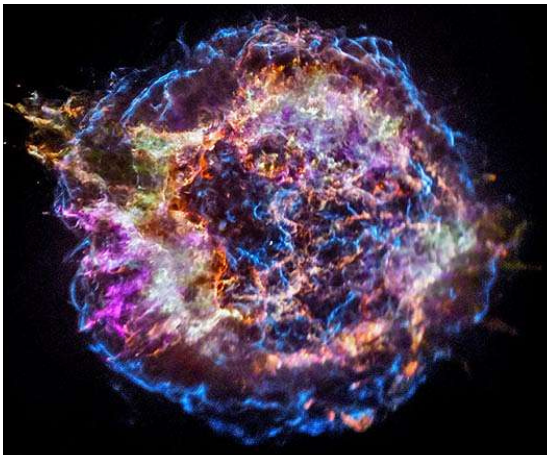
An image of the star-forming region NGC 6357 with the young star XUE 10. Observations with JWST/MIRI reveal a planet-forming disk whose spectrum shows clear detections of four distinct forms of carbon dioxide (CO_2), but only little water, providing new insights into the chemical environment where planets are taking shape. Credit: Stockholm University (SU) and María Claudia Ramírez-Tannus, Max Planck Institute for Astronomy (MPIA).

A study led by Jenny Frediani at Stockholm University has revealed a planet-forming disk with a strikingly unusual chemical composition: an unexpectedly high abundance of carbon dioxide (CO_2) in regions where Earth-like planets may one day form. The discovery, made using the James Webb Space Telescope (JWST), challenges long-standing assumptions about the chemistry of planetary birthplaces. The study is published in *Astronomy & Astrophysics*.

"Unlike most nearby planet-forming disks, where water vapor dominates the inner regions, this disk is surprisingly rich in carbon dioxide," says Jenny Frediani, Ph.D. student at the Department of Astronomy, Stockholm University."In fact, water is so scarce in this system that it's barely detectable—a dramatic contrast to what we typically observe."

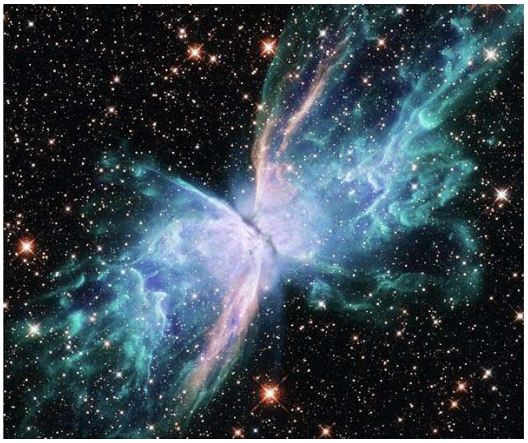
https://phys.org/news/2025-08-unusual-rich-disk-young-star.html

Star's Tumultuous Core Uncovered Before Supernova Blast



New results from NASA's Chandra X-ray Observatory reveal that Cassiopeia A's progenitor star violently reshaped its interior just hours before it exploded. This previously hidden stellar upheaval helps explain the asymmetry of the remnant and may even have triggered the supernova itself. Cassiopeia A, one of the most studied remnants in the night sky, began as a massive star that lived for more than a million years. As with other massive stars, its interior formed onion-like layers of hydrogen, helium, carbon, and heavier elements. When iron accumulated at the core, it collapsed under its own weight, initiating the explosion about three centuries ago. Chandra's X-ray data, combined with advanced simulations, revealed that part of the silicon-rich inner layer broke outward into a neon-rich layer in the star's final hours. This disruption forced silicon to move outward and neon to move inward, leaving clear evidence in Cas A's debris field: regions with abundant silicon but little neon adjacent to areas with the opposite composition."These findings show a violent event where the barrier between layers disappears," said Kai Matsunaga of Kyoto University, a co-author of the study. The survival of these unmixed regions confirms predictions from detailed models of stellar interiors near collapse.https://www.spacedaily.com/reports/Stars_Tumultuous_Core_Uncovered_Before_Supernova_Blast_999.html

JWST observes planetary building blocks in Butterfly Nebula



The James Webb Space Telescope has helped researchers learn new information about how the Earth may have been formed as it gives a deeper look into the Butterfly Nebula.The telescope saw the creation of tiny planetary building blocks around a dead star, as it saw cosmic dust particles that create planets around young stars forming for the first time."For years, scientists have debated how cosmic dust forms in space. But now, with the help of the powerful James Webb Space Telescope, we may finally have a clearer picture," said lead researcher Dr Mikako Matsuura, of Cardiff University." We were able to see both cool gemstones formed in calm, long-lasting zones and fiery grime created in violent, fast-moving parts of space, all within a single object."The Butterfly Nebula is a white dwarf located 3,400 light-years away in the constellation of Scorpius the Scorpion. A new image taken by the telescope showed in regions such as the torus of the Nebula planet show grains of dust aid in the beginning of the planet building process. The size of the dust grains seen in the Butterfly Nebula suggests that it has been growing for a while.

https://www.spacedaily.com/reports/JWST_observes_planetary_building_blocks_in_Butterfly_Nebula_999.html

New isolated early-type dwarf galaxy discovered

dE01+09 as seen in Legacy Survey images. The left panel shows a g − r − z combined color image obtained from the Legacy Survey viewer tool. The right panel displays a greyscale CFHT g-band image with a field of view of 1.5′ × 1.5′. The colour stretching is chosen to best reveal low-surface-brightness features, and unrelated background and foreground objects have been masked. Credit: arXiv (2025). DOI: 10.48550/arxiv.2508.20459

Astronomers from Yonsei University in Seoul, South Korea, and elsewhere report the discovery of a new isolated early-type dwarf galaxy, which appears to have run away from the group environment. Dwarf galaxies are low-luminosity and low-mass stellar systems, usually containing a few billion stars. From this group, early-type dwarf galaxies (dE) are the most common type in nearby galaxy clusters and groups. Recent discoveries of isolated early-type dwarf galaxies, which do not belong to any galaxy cluster or group, have reignited the debate about their formation. It is assumed that some of them may be "runaway" dEs, therefore remnants of galaxies that were tidally stripped during close passages through a group or cluster and subsequently ejected to the outskirts or beyond the virial radius. Now, a team of astronomers led by Yonsei University's Sanjaya Paudel has identified what seems to be a runaway dE, by analyzing the data from various astronomical surveys, including the Sloan Digital Sky Survey (SDSS).https://phys.org/news/2025-09-isolated-early-dwarf-galaxy.html

Fomalhaut star's warped ring shows evidence of sculpting by ancient planets

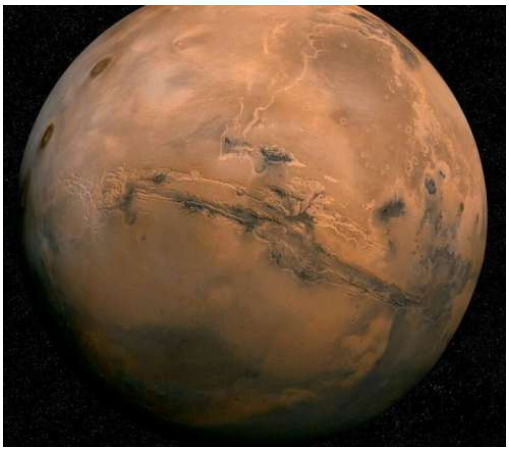
Astronomers using the Atacama Large Millimeter/submillimeter Array (ALMA) have made the highest resolution image to date, revealing new insights into the unusual and mysterious architecture of the debris disk encircling Fomalhaut, one of the brightest and most well-studied stars in our cosmic neighbourhood. Debris disks are vast belts of dust and rocky bodies, similar to our solar system's asteroid belt—but much larger. The lopsidedness (or eccentricity) of Fomalhaut's disk has fascinated astronomers for nearly two decades.

The bright star in the centre, Fomalhaut, is surrounded by an ancient debris disk of uneven brightness. The disk is closer to the star in the south, where the disk is wider and fainter, and further from the star in the north, where the disk is narrower and brighter. The dotted ring shows the possible orbit of a planet implied by Lovell et al. Credit: NSF/AUI/NSF NRAO/B. Saxton

An international research team, led by astronomers at the Centre for Astrophysics | Harvard & Smithsonian and Johns Hopkins University, published two papers analyzing these new observations in *The Astrophysical Journal* and *The Astrophysical Journal Letters*. They have now found that Fomalhaut's disk is not just eccentric—its eccentricity changes with distance from the star.

https://phys.org/news/2025-09-fomalhaut-star-warped-evidence-sculpting.html

Mars has a solid core, resolving a longstanding planetary mystery, according to new study

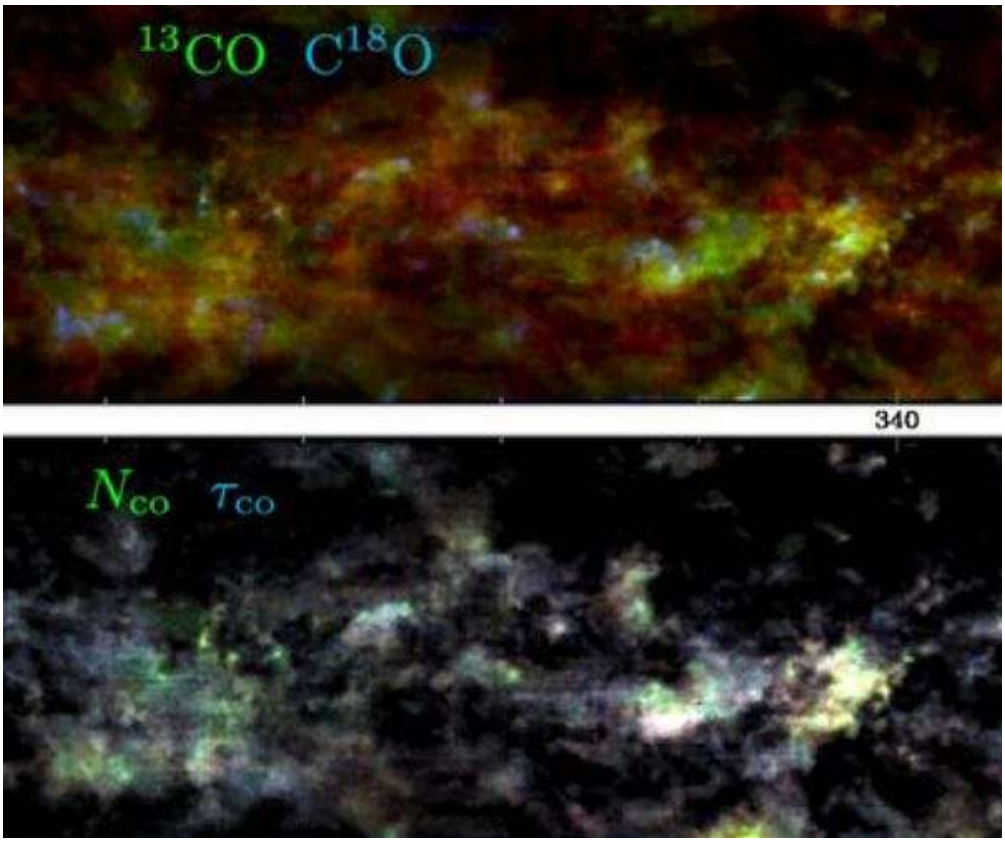


Credit: NASA

Scientists have discovered that Mars has an interior structure similar to Earth's. Results from NASA's InSight mission suggest that the red planet has a solid inner core surrounded by a liquid outer core, potentially resolving a longstanding mystery.The findings, which are published in *Nature*, have important implications for our understanding of how Mars evolved. Billions of years ago, the planet may have had a thicker atmosphere that allowed liquid water to flow on the surface.The solid inner core (610 km radius) found by Huixing Bi and colleagues is hugely significant. The very presence of a solid inner core shows that crystallization and solidification is taking place as the planet cools over time.The core structure is more like Earth's and therefore more likely to have produced a dynamo at some point.https://phys.org/news/2025-09-mars-solid-core-longstanding-planetary.html

New study maps ripples and hidden structures in southern Milky Way

Astronomers have produced the most detailed 3D map yet of the Milky Way's cold gas clouds, revealing large-scale ripples in the Galaxy's midplane and identifying a new structure at the far end of the central bar. The work comes from the Three-millimeter Ultimate Mopra Milky Way Survey (ThrUMMS), led by Peter Barnes of the Space Science Institute.



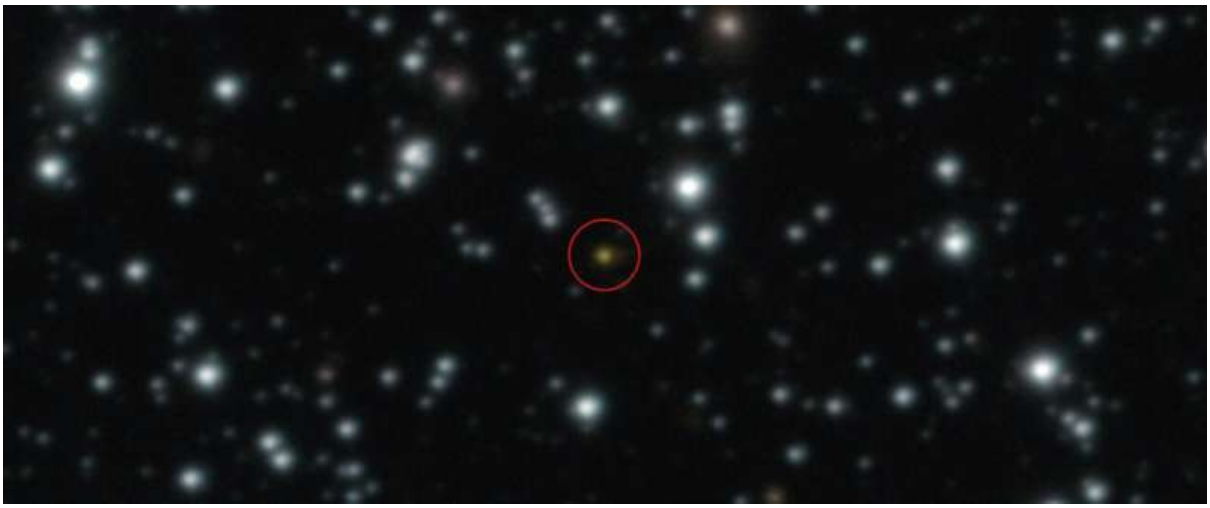
Spiral galaxies like the Milky Way are generally flat, but the team found that the Galaxy's cold gas distribution is warped into a wave-like pattern. These ripples in the disk may have been triggered by a gravitational encounter with the Sagittarius Dwarf Galaxy about 200 million years ago, leaving the Milky Way "ringing like a bell."

In addition, the researchers discovered a set of clouds in the constellation Ara, about 35,000 light-years away, now termed the Far Ara Clouds. These are likely located at the distant end of the Milky Way's bar, a feature only recognized in the last two decades. The bar's ends act as transition zones where circular and plunging orbits intersect, creating mass pileups and stimulating intense star formation.

https://www.spacedaily.com/reports/New_study_maps_ripples_and_hidden_structures_in_southern_Milky_Way_999.html

Unprecedented gamma-ray burst hints at rare black hole

A team of astronomers have observed an explosion in the universe unlike any ever witnessed before. The gamma-ray bursts from outside the Milky Way galaxy repeated several times over the course of a day. Gamma-ray bursts (GRBs) are the most powerful explosions in the universe, normally caused by the catastrophic destruction of stars, but no known scenario can completely explain this new GRB. The discovery, which has just been published in *The Astrophysical Journal Letters,* was made by Dr. Antonio Martin-Carrillo (UCD School of Physics) and colleagues. Dr. Martin-Carrillo is co-lead author on the paper "The day long, repeating GRB 250702B: A unique extragalactic transient." The phenomenon was spotted through the European Southern Observatory (ESO) Very Large Telescope.

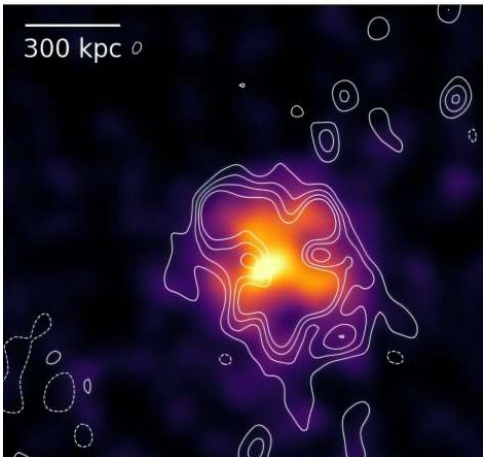


The orange dot at the centre of this image is a powerful explosion that repeated several times over the course of a day, an event unlike anything ever witnessed before. The image, taken with ESO's Very Large Telescope (VLT), allowed astronomers to determine that the explosion didn't take place in the Milky Way but in another galaxy. Credit: ESO/A. Levan, A. Martin-Carrillo et al

Dr. Martin-Carrillo said, "This event is unlike any other seen in 50 years of GRB observations. GRBs are catastrophic events, so they are expected to go off just once because the source that produced them does not survive the dramatic explosion. This event baffled us, not only because it showed repeated powerful activity, but also because it seemed to be periodic, which had never been seen before."

https://phys.org/news/2025-09-unprecedented-gamma-ray-hints-rare.html

New radio halo discovered with MeerKAT



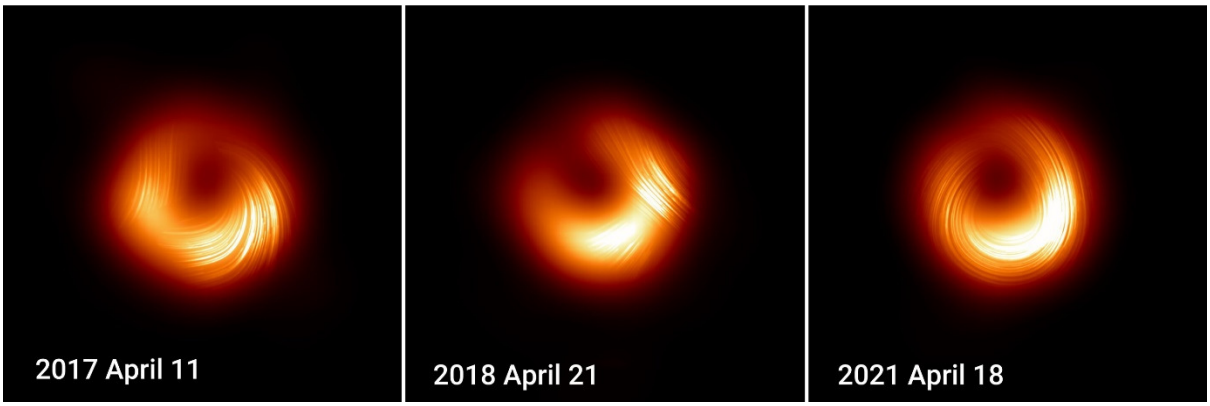
Chandra X-ray image of SPT-CLJ2337–5942 in the 0.5 - 2.0 keV band, smoothed to 12 arcsec. The Gaussian smoothing kernel FWHM is indicated in the bottom-left corner. The radio halo emission is shown as white contours. Credit: arXiv (2025). DOI: 10.48550/arxiv.2509.08062

Using the MeerKAT radio telescope, an international team of astronomers has performed observations of a galaxy cluster designated SPT-CLJ2337−5942. The observational campaign revealed the presence of an ultra-steep spectrum radio halo in this cluster. The finding is presented in a paper published Sept. 9 on the *arXiv* preprint server. Radio halos are enormous regions of diffuse radio emission, usually found at the centres of massive

galaxy clusters. They showcase a regular morphology that tends to trace the turbulent X-ray emitting intracluster medium (ICM).In general, radio halos have very low surface brightness, particularly at GHz frequencies, which makes them hard to detect. Their brightness increases at lower frequencies, unveiling the presence of these regions. Some of them are ultra-steep spectrum radio halos (USSRHs), which can only be produced through turbulent re-acceleration. Therefore, finding new USSRHs could shed more light on the efficiency of particle re-acceleration and the role of cluster mergers. Now, a group of astronomers led by Isaac S. Magolego of the University of the Witwatersrand in Johannesburg, South Africa, reports the detection of a new radio halo of this type. The new USSRH was identified in the galaxy cluster SPT-CLJ2337−5942, as part of the MeerKAT-South Pole Telescope survey.

https://phys.org/news/2025-09-radio-halo-meerkat.html

New images reveal unexpected polarization flips near M87's supermassive black hole



New images from the Event Horizon Telescope (EHT) collaboration have revealed a dynamic environment with changing polarization patterns caused by the magnetic fields of the supermassive black hole M87. Credit: EHT Collaboration*

The Event Horizon Telescope (EHT) collaboration, with a substantial contribution from the Max Planck Institute for Radio Astronomy (MPIfR), has unveiled new, detailed images of the supermassive black hole at the centre of the galaxy M87. These reveal a dynamic environment with changing polarization patterns near the black hole. For the first time in EHT data, scientists have also detected signatures of extended jet emission near the jet base, where it connects to the ring around the black hole. These new observations, published in *Astronomy & Astrophysics*, offer fresh insight into how matter and energy behave in the extreme environments surrounding black holes. Located about 55 million light-years from Earth, M87 harbours a supermassive black hole more than 6 billion times the mass of the sun. The EHT—a global network of radio telescopes acting as an Earth-sized observatory—first captured the iconic image of M87's black hole shadow in 2019, adding polarization maps in 2021.

https://phys.org/news/2025-09-images-reveal-unexpected-polarization-flips.html

Committee Members

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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)