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

"The Southern Cross"

The Hermanus Astronomy Centre Monthly Newsletter

December 2024

Season's greetings to our Members and Visitors.

MONTHLY MEETING

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

Our last **Monthly** meeting was held virtually on Zoom on **Tuesday December 19th**. ***"MeerKAT's View of Galaxy Evolution"*** was presented by **Dr J Delhaize** of UCT.

For those who would like to revisit this excellent and most worthy presentation, herewith the YouTube recording link:

https://www.youtube.com/watch?v=sJfS4O6ZJEU&ab_channel=DerekDuckitt

Our next **Monthly Meeting** is scheduled for **Tuesday January 21st**; the topic and presenter will be advised in due course.

SPECIAL INTEREST GROUP ACTIVITIES

Cosmology

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

On **Tuesday November 5th ,** in the series "THE ENTIRE HISTORY OF THE UNIVERSE", we watched and discussed episode 24: ***"How does Light Actually Work?"***

The YouTube episode link:

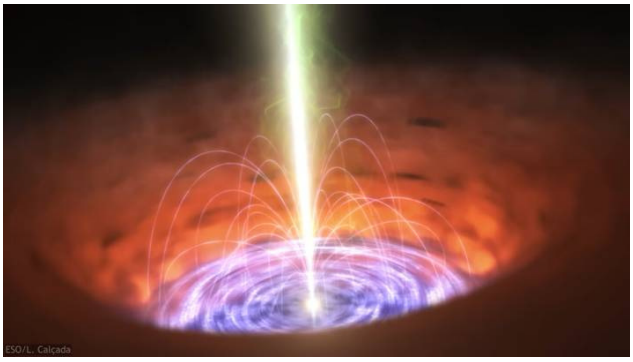
https://www.youtube.com/watch?v=bAedYtUredI&list=PLROBLlvnR7BEF9b1NOvRf_zhboibmywJb&index=24&t=327s&pp=iAQB

The YouTube discussion link:

https://youtu.be/3KRTWzvCgu0

Episode 33 of the same series is scheduled for **Tuesday**, **December 3rd**: ***"What is the Most Powerful Thing in the Universe?"***

Something astronomers could never have expected, something so strange, so bizarre that there must have been some mistake in our observations. A single one of these monsters could easily pump out enough energy, if they were any closer, to flood our solar system and our planet with deadly radiation. And they're hungry! They feed on anything! If our Galaxy is quiet now it will not stay that way forever…



The venue will be **Onrus Manor** as a physical meeting as well as virtually on **Zoom**. Again we strongly urge our members to physically attend. This could give us an opportunity to wish each other the season's greetings.

If you really cannot attend for some reason then please request an invite.

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

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Study Group

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

Our last meeting was held on **November 26th**, the topic, ***"AI Creativity: Genius or Gimmick?"***

"This dynamic discussion urges attendees to consider AI's complex role in the arts, balancing innovation with preservation of human-centred artistry. Will AI enhance creativity, or reduce art to mere "content"? The debate is far from settled, but it's clear that ethical engagement and active dialogue will be essential to navigating AI's role in the future of creative expression."

This is well worth a revisit.

The YouTube video link: https://www.youtube.com/watch?v=wU49MKIhMRU

The YouTube discussion link:

https://www.youtube.com/watch?v=e8l2PVc6gTw&ab_channel=DerekDuckitt

The next meeting is scheduled for **Tuesday January 28th**. 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 **December 2024**:

SUGGESTED EVENING OBSERVATION WINDOWS

(Lunar observations notwithstanding)

Date	*Moon*		*Dusk end*
November 18	*Rises*	**22h48 (88%)**	**20h32**
to **December 4**	*Sets*	**22h57 (9%)**	**20h48**
December 18	*Rises*	**22h54 (89%)**	**21h39**
to **January 2**	*Sets*	**22h14 (14%)**	**21h44**

Skynotes - Moon feature 4 craters and the Moon's occultation of **γ Cap**.

Skynotes - Main feature **Jupiter's** closest approach to **Earth.**

Moonwatch a few days either side of the **First Quarter** (Sunday December 8).

December solstice – December 21st at **11h20**. Sunset is at **19h53.** We plan to gather at GPAED from about 19h30 to witness the event. Confirmation will be by e-mail and on our website calendar. *Subject to conditions*, of course!

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 **Puppid-Velids** and **Geminids** - 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

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

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overleaf…

ASTRONOMY NEWS: December 2024

(Compiled By Pieter Kotzé)

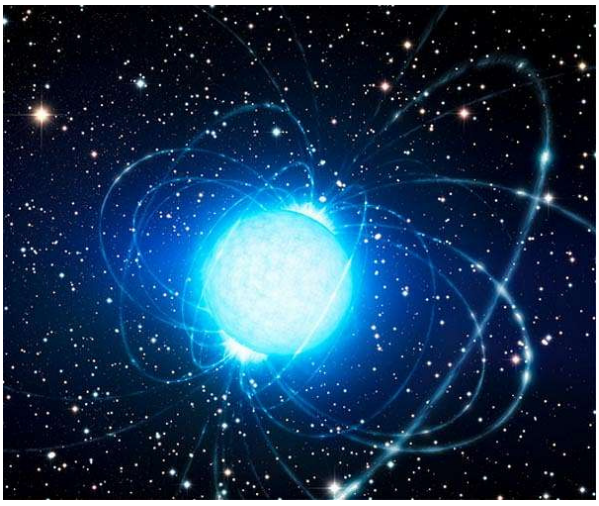
Distorted galaxy whizzes through crowded cluster in new Hubble Telescope image

A vibrant spiral galaxy appears to be whizzing through space as if it were launched out of a cosmic cannon.

A Hubble Space Telescope view of the spiral galaxy IC 3225, which is a member of a large group of galaxies known as the Virgo Cluster. (Image credit: ESA/Hubble & NASA, M. Sun)

A vibrant spiral galaxy appears to be whizzing through space as if it were launched out of a cosmic cannon. The galaxy, IC 3225, is located about 100 million light-years from Earth and is a member of a large group of galaxies known as the Virgo Cluster. A new image from the Hubble Space Telescope captures IC 3225 with a comet-like tail of gas streaming from the galaxy's central disc as it travels speedily past its galactic neighbours. IC 3225 is just one of over 1,300 members of the Virgo Cluster — some of which are also visible in the new image. As IC 3225 moves through space, it experiences resistance from gas and dust in the intra-cluster medium, causing what is known as ram pressure. https://www.space.com/galaxy-ic3225-hubble-space-telescope-photo

DTU researchers reveal record-fast-spinning neutron star in the Milky Way



In a remarkable discovery, researchers from DTU Space have identified one of the universe's fastest-spinning neutron stars using an X-ray telescope stationed on the International Space Station (ISS). This small yet massive object, part of an "X-ray binary star system" called 4U 1820-30, lies in the Sagittarius constellation near the centre of the Milky Way. "We were studying thermonuclear explosions from this system and then found remarkable oscillations, suggesting a neutron star spinning around its centre axis at an astounding 716 times per second," said DTU Space senior scientist Dr. Gaurava K. Jaisawal, part of the international research team behind the finding and the first author on an article published in the 'Astrophysical Journal'. Dr. Jaisawal added, "If future observations confirm this, the 4U 1820-30 neutron star would be one of the fastest-spinning objects ever observed in the universe, matched only by another neutron star called PSR J1748 - 2446."

https://www.skynightly.com/reports/DTU_researchers_reveal_record_fast_spinning_neutron_star_in_the_Milky_Way_999.html

Webb confirms a longstanding galaxy model

JWST image of the grand design spiral galaxy NGC 628. Credit: NASA / ESA / CSA / Judy Schmidt (CC BY 2.0)

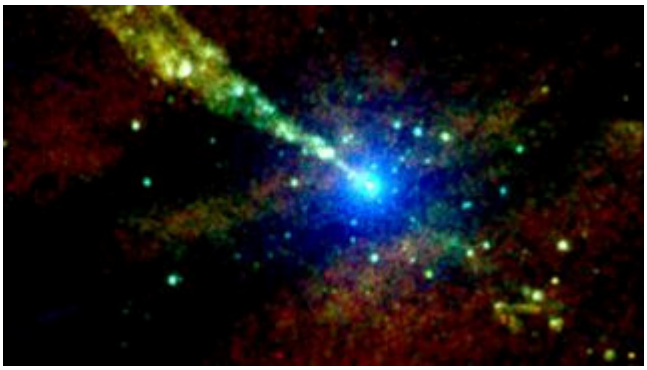
Perhaps the greatest tool astronomers have is the ability to look backward in time. Since starlight takes time to reach us, astronomers can observe the history of the cosmos by capturing the light of distant galaxies.

This is why observatories such as the James Webb Space Telescope (JWST) are so useful. With it, we can study in detail how galaxies formed and evolved. We are now at the point where our observations allow us to confirm long-standing galactic models, as a recent study shows. But as a galaxy nurtures a menagerie of stars from blue supergiants to red dwarfs, which stars play the greatest role in chemical enrichment? One model argues that it is the most massive stars. But about 20 years ago, another model argued that smaller, more sunlike stars played a greater role. Using JWST, the study, published in *Nature Astronomy*, looked at the spectra of three young galaxies. They found a strong presence of carbon and oxygen bands, which is common for AGB remnants, but also the presence of more rare elements such as vanadium and zirconium. Taken altogether, this points to a type of AGB star known as thermally pulsing AGBs, or TP-AGBs. This study indicates that TP-AGBs are particularly efficient at enriching galaxies, thus confirming the 20-year-old model.

https://phys.org/news/2024-11-webb-longstanding-galaxy.html

NASA's Chandra X-ray telescope sees 'knots' blasting from nearby black hole jets

Astronomers continue to stress the value of X-ray science as NASA's flagship Chandra X-ray telescope remains on the chopping block.



Bright "knots" within a jet blasted by a nearby black hole appears to move at different speeds in different wavelengths. (Image credit: Used under a CC-BY 4.0 license from D. Bogensberger et al. Astrophys. J. (2024) DOI: 10.3847/1538-4357/ad73a1)

Astronomers have scoured decades-old data from NASA's Chandra X-ray Observatory, finding bright, lumpy features dotting a jet of energy spit out by a nearby black hole. Puzzlingly, the "knots" clock a faster speed when seen in X-rays than they do in radio wavelengths, scientists said. "The X-ray data traces a unique picture that you can't see in any other wavelength," study lead author David Bogensberger, an astrophysicist at the University of Michigan, who led the new study, said in a recent news release. "We've shown a new approach to studying jets and I think there's a lot of interesting work to be done."

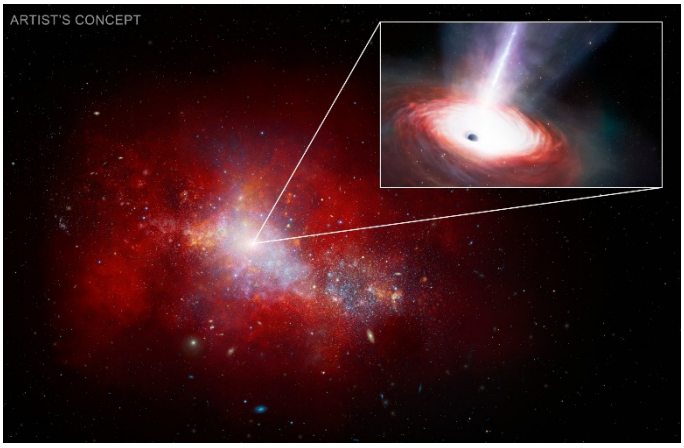
https://www.space.com/the-universe/black-holes/nasas-chandra-x-ray-telescope-sees-knots-blasting-from-nearby-black-hole-jets

Asteroid grains shed light on the outer Solar System's origins

Tiny grains from a distant asteroid are revealing clues to the magnetic forces that shaped the far reaches of the solar system over 4.6 billion years ago. Scientists at MIT and elsewhere have analyzed particles of the asteroid Ryugu, which were collected by the Japanese Aerospace Exploration Agency's (JAXA) Hayabusa2 mission and brought back to Earth in 2020. Scientists believe Ryugu formed on the outskirts of the early solar system before migrating in toward the asteroid belt, eventually settling into an orbit between Earth and Mars. The team analyzed Ryugu's particles for signs of any ancient magnetic field that might have been present when the asteroid first took shape. Their results suggest that if there was a magnetic field, it would have been very weak. At most, such a field would have been about 15 microtesla. (The Earth's own magnetic field today is around 50 microtesla.) Even so, the scientists estimate that such a low-grade field intensity would have been enough to pull together primordial gas and dust to form the outer solar system's asteroids and potentially play a role in giant planet formation, from Jupiter to Neptune.

https://www.spacedaily.com/reports/Asteroid_grains_shed_light_on_the_outer_Solar_Systems_origins_999.html

Astronomers Find Early Fast-Feeding Black Hole Using NASA Telescopes

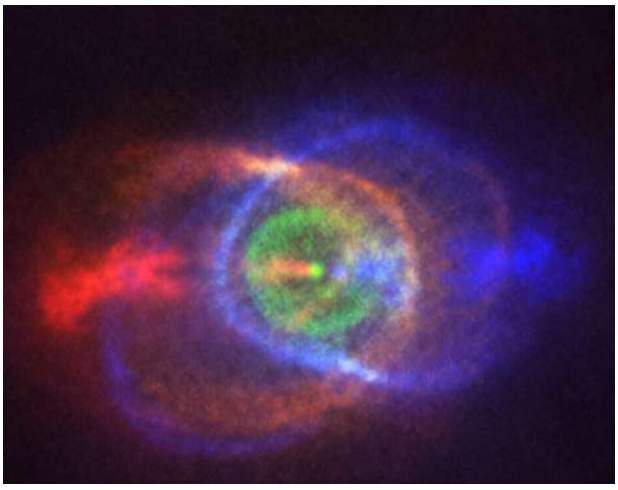


This illustration shows a red, early-universe dwarf galaxy that hosts a rapidly feeding black hole at its centre. Using data from NASA's James Webb Space Telescope and Chandra X-ray Observatory, a team of astronomers have discovered this low-mass supermassive black hole at the centre of a galaxy just 1.5 billion years after the Big Bang. It is pulling in matter at a phenomenal rate — over 40 times the theoretical limit. While short lived, this black hole's "feast" could help astronomers explain how supermassive black holes grew so quickly in the early universe. NOIRLab/NSF/AURA/J. da Silva/M. Zamani

A rapidly feeding black hole at the centre of a dwarf galaxy in the early universe, shown in this artist's concept, may hold important clues to the evolution of supermassive black holes in general. Using data from NASA's James Webb Space Telescope and Chandra X-ray Observatory, a team of astronomers discovered this low-mass supermassive black hole just 1.5 billion years after the big bang. The black hole is pulling in matter at a phenomenal rate — over 40 times the theoretical limit. While short lived, this black hole's "feast" could help astronomers explain how supermassive black holes grew so quickly in the early universe. Supermassive black holes exist at the centre of most galaxies, and modern telescopes continue to observe them at surprisingly early times in the universe's evolution. It's difficult to understand how these black holes were able to grow so big so rapidly. But with the discovery of a low-mass supermassive black hole feasting on material at an extreme rate so soon after the birth of the universe, astronomers now have valuable new insights into the mechanisms of rapidly growing black holes in the early universe. The black hole, called LID-568, was hidden among thousands of objects in the Chandra X-ray Observatory's COSMOS legacy survey, a catalog resulting from some 4.6 million seconds of Chandra observations.

https://www.nasa.gov/missions/chandra/astronomers-find-early-fast-feeding-black-hole-using-nasa-telescopes/

First pairs of white dwarf–main sequence binaries discovered in clusters shine new light on stellar evolution



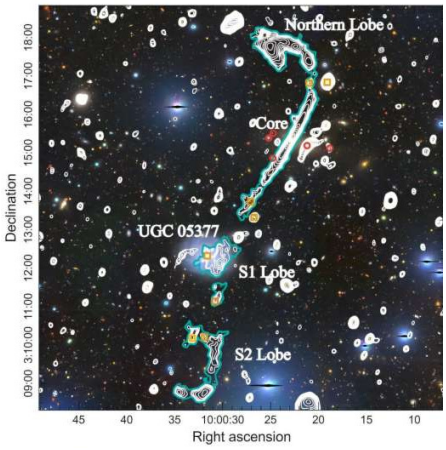
This image from the ALMA telescope shows star system HD101584 and the complex gas clouds surrounding the binary. It is the result of a pair of stars sharing a common outer layer during their last moments. Credit: ALMA (ESO/NAOJ/NRAO), Olofsson et al / Robert Cumming

Astronomers at the University of Toronto (U of T) have discovered the first pairs of white dwarf and main sequence stars—"dead" remnants and "living" stars—in young star clusters. Described in a new study published in *The Astrophysical Journal*, this breakthrough offers new insights into an extreme phase of stellar evolution, and one of the biggest mysteries in astrophysics. Scientists can now begin to bridge the gap between the earliest and final stages of binary star systems—two stars that orbit a shared centre of gravity—to further our understanding of how stars form, how galaxies evolve, and how most elements on the

periodic table were created. This discovery could also help explain cosmic events like supernova explosions and gravitational waves, since binaries containing one or more of these compact dead stars are thought to be the origin of such phenomena.

https://phys.org/news/2024-11-pairs-white-dwarfmain-sequence-binaries.html

New giant radio galaxy discovered with MeerKAT

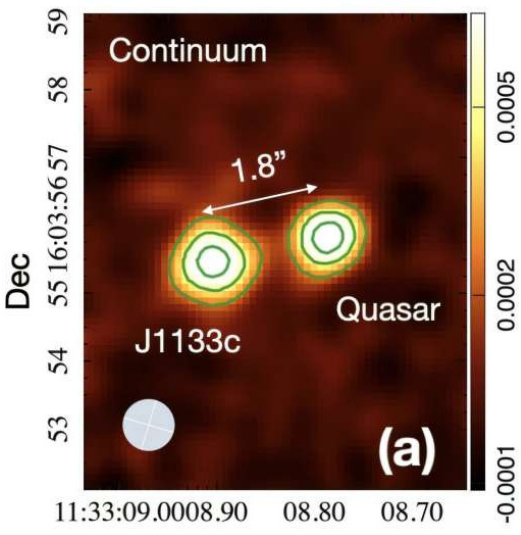


The optical HSC DR2 Wide combined g, r, i band image of MGTC J100022.85+031520.4. Credit: Charlton et al., 2024.

An international team of astronomers has employed the MeerKAT radio telescope to investigate giant radio galaxies in the field of the Cosmological Evolution Survey (COSMOS). They found a new giant radio galaxy that had not been reported before. The finding was presented in a research paper published November 11 on the pre-print server *arXiv*. The so-called giant radio galaxies (GRGs) are radio galaxies with an overall projected linear length exceeding at least 2.3 million light years. They are rare objects grown usually in low-density environments and are observed to display jets and lobes of synchrotron-emitting plasma. GRGs are important for astronomers to study the formation and the evolution of radio sources.

https://phys.org/news/2024-11-giant-radio-galaxy-meerkat.html

Astronomers discover a unique quasi-stellar object–dusty star-forming galaxy system

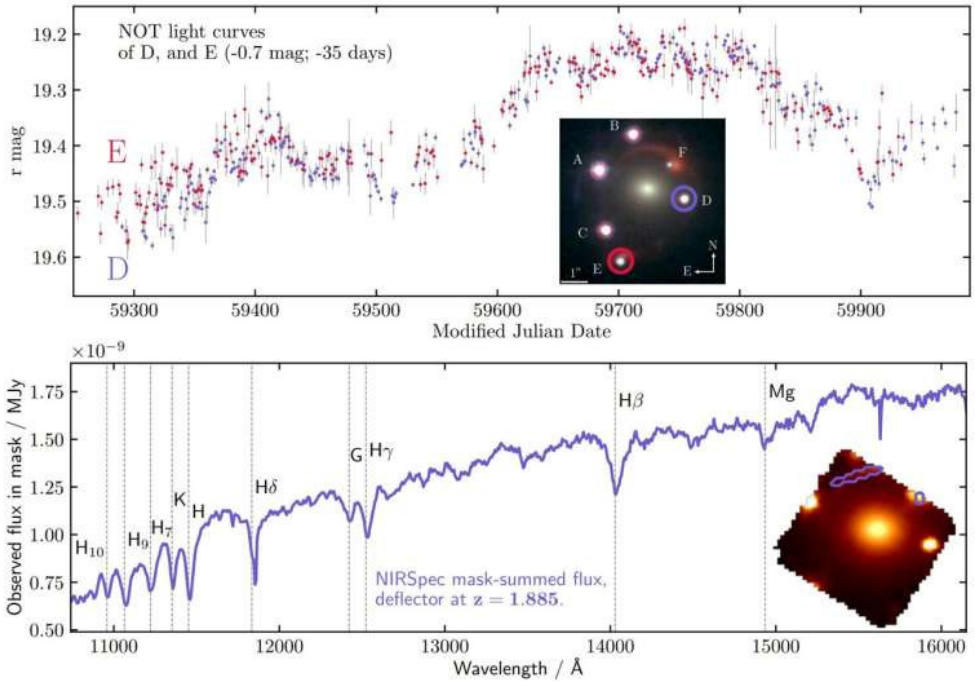


ALMA continuum image of the detected quasar-DSFG system. Credit: Zhu et al., 2024.

Astronomers from the Steward Observatory in Arizona and elsewhere report the discovery of a structure consisting of a quasi-stellar object (QSO) and a dusty star-forming galaxy (DSFG), linked by a bridge of ionized carbon. The finding of this unique system was detailed in a paper published November 11 on the pre-print server *arXiv*. Quasars, or quasi-stellar objects (QSOs), are active galactic nuclei (AGN) of very high luminosity powered by supermassive black holes (SMBHs), emitting electromagnetic radiation observable in radio, infrared, visible, ultraviolet and X-ray wavelengths. They are among the brightest and most distant objects in the known universe, and serve as fundamental tools for numerous studies in astrophysics as well as cosmology.

https://phys.org/news/2024-11-astronomers-unique-quasi-stellar-objectdusty.html

Astronomers discover two galaxies aligned in a way where their gravity acts as a compound lens



Summary of evidence showing the unique source and double lens nature of J1721+8842. Credit: arXiv (2024). DOI: 10.48550/arxiv.2411.04177

An international team of astronomers has discovered an instance of two galaxies aligned in a way where their gravity acts as a compound lens. The group has written a paper describing the findings and posted it on the *arXiv* preprint server. Prior research has led to many findings of galaxies, or clusters of them, bending light in ways that were predicted by Einstein's theory of general relativity. Astronomers have noted that some of them work as imperfect lenses, distorting the light behind them in interesting ways. Some researchers have also noted that elliptical galaxies can serve as a lens, serving to brighten the light behind them. In this new effort, the research team has found, for the first time, two galaxies that align in a way that allows their gravity to work as a compound lens.

https://phys.org/news/2024-11-astronomers-galaxies-aligned-gravity-compound.html

Latest findings from the South Pole Telescope bolster standard cosmological model

A new study uses data collected by the South Pole Telescope, above, to deepen our understanding of how the universe was born and evolved. Credit: Aman Chokshi

Roughly 400,000 years after the Big Bang, the universe cooled just enough to allow photons to escape from the primordial cosmological soup. Over the next 14 billion years, these ancient photons—the universe's first light—continued travelling. This relic light is known as the Cosmic Microwave Background. In a new study, scientists used observational data of this first light—collected from the South Pole Telescope located at the National Science Foundation's Amundsen-Scott South Pole Station in Antarctica—to explore the theoretical underpinnings of the standard cosmological model that describes the history of the universe over the past 14 billion years. The study was conducted by UC Davis researchers and colleagues in the South Pole Telescope collaboration, which is led by the

University of Chicago, and has been submitted to the journal *Physical Review D*. It is currently available on the *arXiv* preprint server.

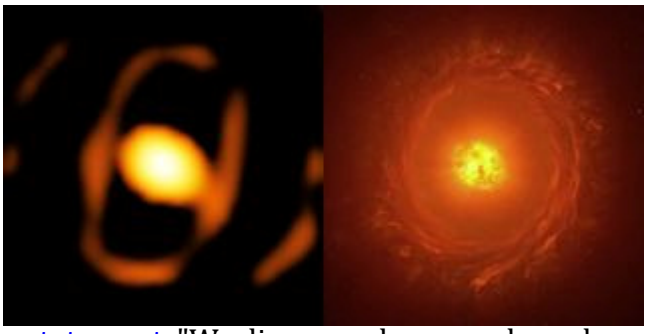
https://phys.org/news/2024-11-latest-south-pole-telescope-bolster.html

Star imaged in detail outside the Milky Way for the 1st time (image, video)

"For the first time, we have succeeded in taking a zoomed-in image of a dying star in a galaxy outside our own Milky Way. "Astronomers have captured a "zoomed-in" image of a star outside the Milky Way for the first time. The team brought the vast red supergiant star designated WOH G64 into focus using the Very Large Telescope Interferometer (VLTI).

WOH G64 is located a staggering 160,000 light-years away in the Large Magellanic Cloud (LMC), a satellite dwarf galaxy companion of the Milky Way. Astronomers have known of the existence of this star for some time, and it has earned the nickname the "behemoth star" because it is an incredible 2,000 times the size of the sun.

The VLTI was able to see this distant star in such detail that it also revealed its surrounding cocoon of gas and dust. These outflows of material indicate that WOH G64 is dying, in the final stages of its life leading up to a massive supernova explosion.



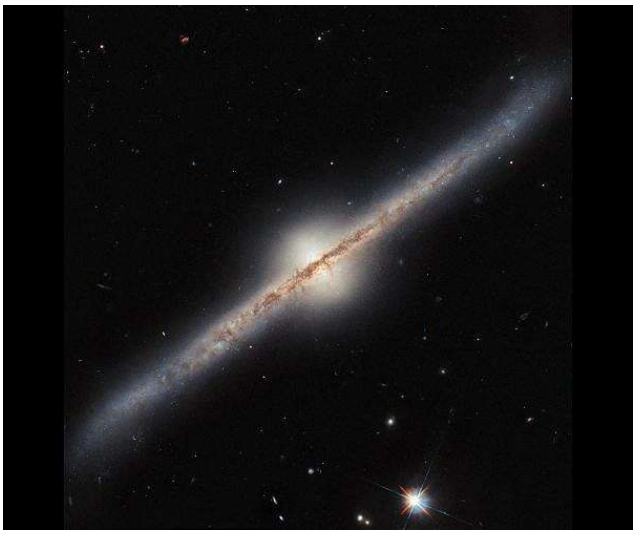
(left) an image of WOH G64 taken by the VLT (right) an artist's impression of the dying star located in the Large Magellanic Cloud (Image credit: ESO/K. Ohnaka et al., L. Calçada)

"For the first time, we have succeeded in taking a zoomed-in image of a dying star in a galaxy outside our own Milky Way," team leader Keiichi Ohnaka, an astrophysicist from Universidad Andrés Bello, said in a statement. "We discovered an egg-shaped cocoon closely surrounding the star.

"We are excited because this may be related to the drastic ejection of material from the dying star before a supernova explosion."

https://www.space.com/star-outside-milky-way-wohg64

Hubble reveals edge-on spiral galaxy with unique structure



The NASA/ESA Hubble Space Telescope has captured a striking view of UGC 10043, a spiral galaxy located approximately 150 million light-years away in the Serpens constellation. This galaxy is seen edge-on, revealing a sharp silhouette of its disc rather than the familiar spiral arm pattern.

From this vantage point, UGC 10043's disc appears as a distinct line with thick, dark dust lanes that obscure the light of the stars. If viewed from above, these dust formations would likely highlight the galaxy's spiral arms. Despite the obscuring effect of the dust, bright star-forming regions shine through, adding intricate detail to the image.At the galaxy's centre lies a luminous, egg-shaped bulge that rises prominently above and below the disc. This feature, typical of spiral galaxies, consists of stars orbiting the galactic core along paths extending beyond the plane of the disc. However, UGC 10043's bulge is unusually large compared to its disc.

https://www.spacedaily.com/reports/Hubble_reveals_edge_on_spiral_galaxy_with_unique_structure_999.html

COMMITTEE MEMBERS

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Pieter Kotzé	(Events co-ordinator, "Southern Cross" Astronomy News)	082 581 3233

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