"The Southern Cross"

The Hermanus Astronomy Centre Newsletter

JUNE 2023

MONTHLY MEETING

Our **May** meeting was held on **Monday 15th**.

Tim Cooper presented

"Meteors"

Meteors can be considered the debris left over from formation of the solar system. Tim traced the origins of meteors in Giant Molecular Clouds to the formation of meteor streams from parent comets and asteroids. His concise listing of the various terms involving "Meteors", as defined by the IAU in 2017, served to dispel many misunderstandings among the less initiated public.

Amongst the many surprises of his address, Tim described the organic compounds within comets, suggesting they could be "smelly" at close quarters!

He discussed the incidence of meteor streams, initiatives to discover new streams, each one the smoking gun of a potentially hazardous comet or asteroid, and visual observations which can be carried out from your backyard. In this presentation, he encouraged more observers to get involved with this important field of astronomy.

Tim is the current Director of the Comet, Asteroid and Meteor Section of ASSA, a voting member of the International Meteor Organisation and recipient of the Overbeek Medal in 2018 for his scientific work. He is also known for his work on recovery of meteorites from Botswana and the of naming the asteroid 22722 (Timothy Cooper) in recognition of his long term coordination of meteor observation and reporting of bright bolides.

For a seriously recommended watch or rewatch, herewith the You Tube link:
https://www.youtube.com/watch?v=PY1sjTfZhkE .

2023 Monthly Meeting dates for your diaries: June 19, July 17, August 14, September 18, October 16, November 20. (Monthly Meetings are scheduled for the third Monday of every month, subject to load shedding). No meeting is normally planned for December unless otherwise advised.

SPECIAL INTEREST GROUP ACTIVITIES

Cosmology

(the first Monday of each month)

This is a series of 17 videos entitled "COSMOLOGY, THE HISTORY OF THE UNIVERSE".

At the meeting on **4th May**, we watched episode 8 - *Why Is The Universe Out Of Balance?*

The next Cosmology meeting is scheduled for **Tuesday 13th June,** episode 9 – *Where did Dark Matter and Dark Energy Come From?*

For further information, please contact Derek Duckitt: derek.duckitt@gmail.com

Astrophotography

This SIG is scheduled for the second Monday of each month as requested by group members.

For further information, please contact Deon Krige: krige.deon44@outlook.com .

Study Group

(The last Monday of each month)

Our last meeting, scheduled for 29th May, was cancelled. This special interest group as under revision in both content and timing. Members will be receiving requests for input.

For further information, please contact Peter Harvey: petermh@hermanus.co.za

Stargazing

No Hermanus Astronomy Centre events are currently planned but we shall let you know when a suitable evening is scheduled.

Future Trips

No outings are planned at present.

Website

A Face Book analysis of visitors:

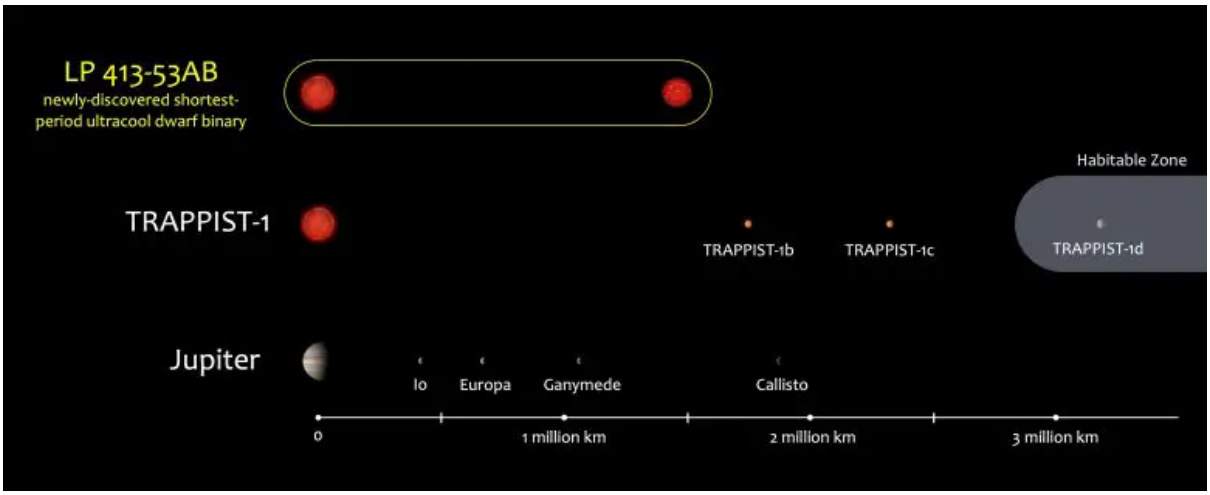
Please check our website calendar for HAC scheduled events: https://www.hermanusastronomy.co.za

(compiled by Pieter Kotzé)

Astronomy News: May 2023 (Compiled By Pieter Kotzé)

"Amazing" – Astrophysicists Have Identified the Shortest-Period, Low-Mass Stellar Binary System Ever Observed

Astrophysicists from Northwestern University and the University of California San Diego have identified the tightest binary system ever observed among ultracool dwarfs. The two stars are in such proximity that they complete a revolution around each other in less than one Earth day, meaning that each star's "year" lasts a mere 20.5 hours. The newly found system, LP 413-53AB, consists of a pair of ultracool dwarfs, which are very low-mass stars that emit light primarily in the infrared, thus making them invisible to the human eye. Despite this, they are one of the most abundant types of stars in the universe. Previously, astronomers had only detected three short-period ultracool dwarf binary systems, all of which are relatively young — up to 40 million years old. LP 413-53AB is estimated to be billions of years old — similar age to our sun — but has an orbital period that is at least three times shorter than the all ultracool dwarf binaries discovered so far.



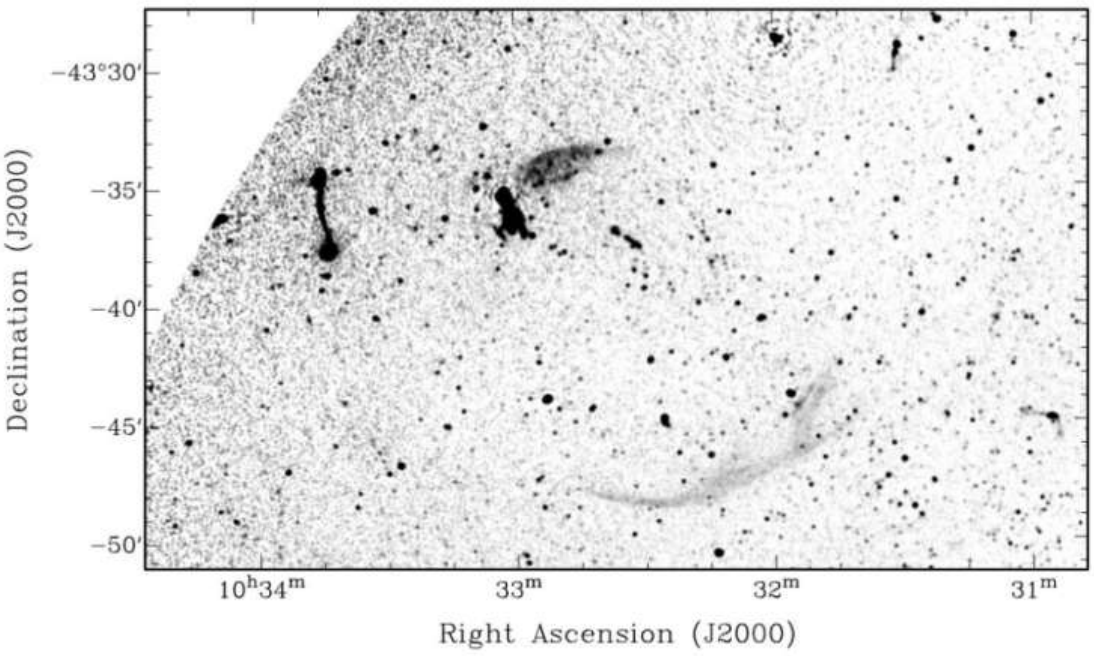
This illustration compares the closeness of the two dwarf stars in the recently discovered binary system to other systems. Credit: Adam Burgasser/University of California San Diego

Early observations caught the system when the stars were roughly aligned and their spectral lines overlapped. But as the stars moved in their orbit, the spectral lines shifted in opposite directions, splitting into pairs in later spectral data. Astronomers realized there were actually two stars locked into an incredibly tight binary.

https://scitechdaily.com/amazing-astrophysicists-have-identified-the-shortest-period-low-mass-stellar-binary-system-ever-observed/

Double radio relic and odd radio circle discovered with MeerKAT

During observations of the merging galaxy cluster PSZ2 G277.93+12.34 with the MeerKAT radio telescope, an international team of astronomers have serendipitously detected a double radio relic and an odd radio circle. The discovery was detailed in a paper published April 24 on the *arXiv* pre-print repository.



MeerKAT 1.3 GHz radio continuum image of a newly discovered double relic associated with the galaxy cluster PSZ2 G277.93+12.34. Credit: Koribalski et al, 2023

At a distance of about 2.5 billion light years away from the Earth, PSZ2 G277.93+12.34 is a galaxy cluster with a mass of some 360 trillion solar masses. The cluster is poorly studied, hence its members are currently not well defined. However, previous observations have found that a galaxy known as WISEA J103230.00–433815.4 is most likely the brightest cluster galaxy of PSZ2 G277.93+12.34.

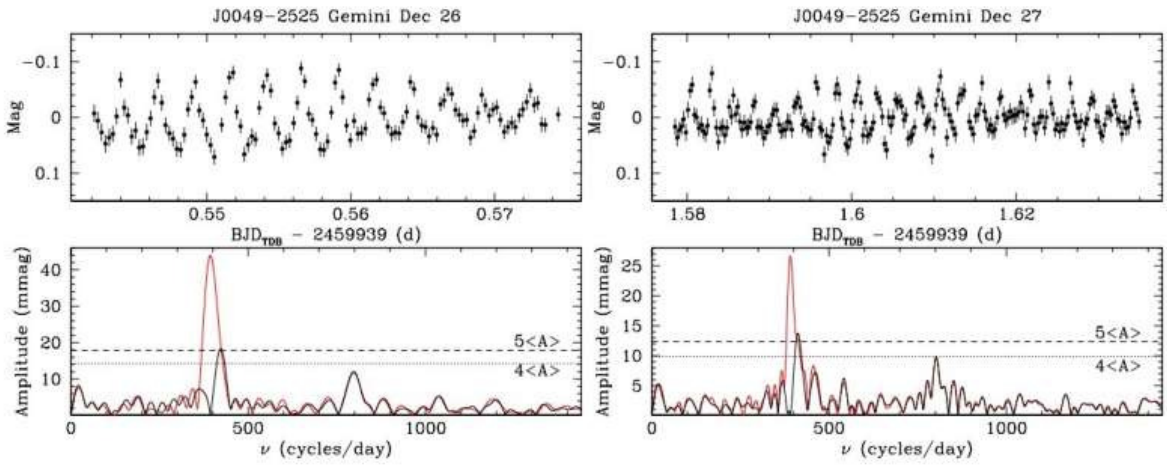
A team of astronomers led by Bärbel S. Koribalski of the Western Sydney University in Australia, has recently investigated PSZ2 G277.93+12.34 with MeerKAT in order to shed more light on the nature of this cluster. Their study was complemented by radio continuum images from the Australian SKA Pathfinder (ASKAP) and X-ray data from the Spectrum-Roentgen-Gamma (SRG) space telescope.

By analyzing MeerKAT 1.3 GHz radio continuum images of the PSZ2 G277.93+12.34, the researchers detected two large radio relics, located northeast and southwest of the cluster center, forming a double radio relic with an angular separation of approximately 16 arcminutes (about 8.5 million light years). The southern relic is relatively thin, has a linear extent of about 5.35 million light years, and a surface brightness of some 16 μJy/beam. When it comes to the northern relic, it is twice as wide as the southern one, has a linear extent of at least 2.15 million light years, and its surface brightness was found to be 55 μJy/beam.

https://phys.org/news/2023-05-radio-relic-odd-circle-meerkat.html

Study finds J0049−2525 is the most massive pulsating white dwarf

Astronomers have conducted photometric observations of a white dwarf known as J004917.14−252556.81. Results of the observational campaign detected photometric variability of this object, making J004917.14−252556.81 the most massive pulsating white dwarf known to date. The finding is reported in a paper published April 18 in *Monthly Notices of the Royal Astronomical Society*.



Gemini time-series photometry of J0049−2525 obtained over two consecutive nights. Credit: Kilic et al, 2023

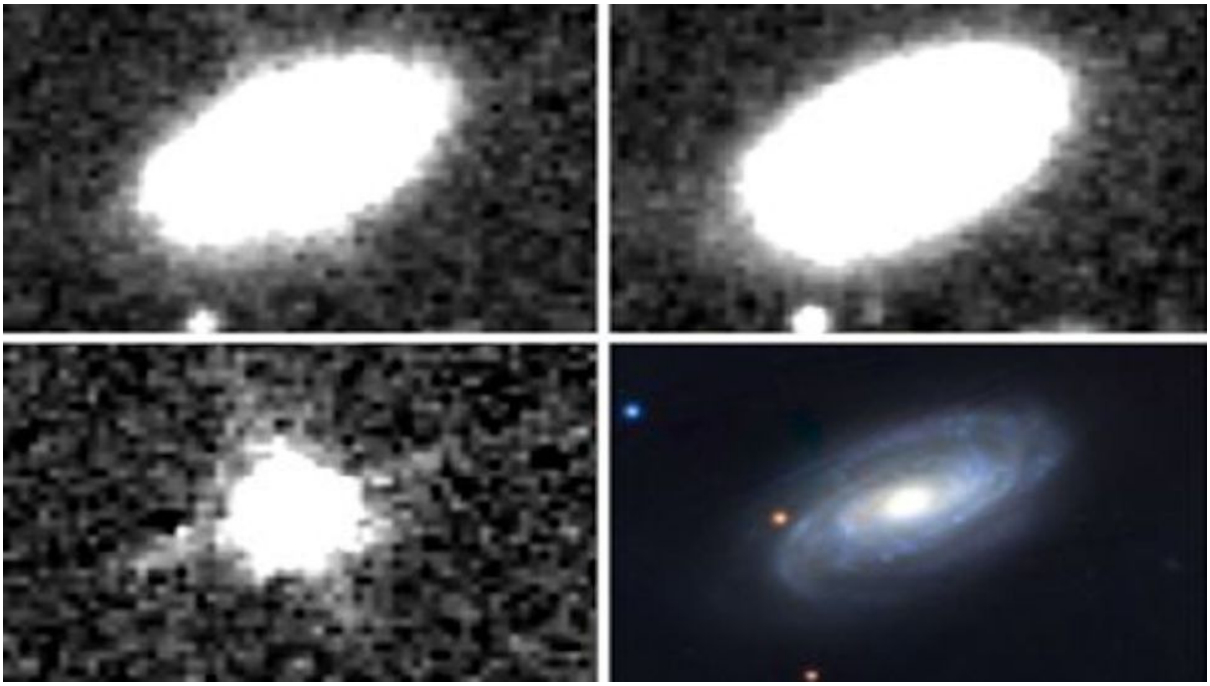
White dwarfs (WDs) are stellar cores left behind after a star has exhausted its nuclear fuel. Although their atmospheres are mainly composed of hydrogen or helium, between 25% and 50% of all known white dwarfs show traces of metals in their spectra. In general, the majority of WDs have primary spectral classification DA—they showcase hydrogen-dominated atmospheres. Located some 325 light years away, J004917.14−252556.81 (or J0049−2525 for short) is a DA white dwarf with an effective temperature of 13,020 K and an estimated mass of approximately 1.3 solar masses. Previous studies have suggested that J0049−2525 may be a pulsating WD of the ZZ Ceti type, however, due to the lack of time-series photometric data, it was difficult to confirm this hypothesis.

https://phys.org/news/2023-05-j00492525-massive-pulsating-white-dwarf.html

Scientists discover closest star-shredding black hole to Earth ever seen

Astronomers comparing maps of the universe uncovered the nearest example of a black hole devouring a star ever detected. A long time ago, in a galaxy not so far away, a supermassive black hole ripped a star to shreds in the center of the galaxy NGC 7392. The flash of light from the black hole's dinner finally reached Earth in 2014 — and astronomers just discovered it in their data.

This newly detected outburst from the center of NGC 7392 is the closest-yet example of a tidal disruption event (TDE), where a star is pulled apart by the massive gravitational pull of a black hole.



Four images of a bright smudge of light that turned out to be a black hole eating a star in a distant galaxy (Image credit: Panagiotou et al.)

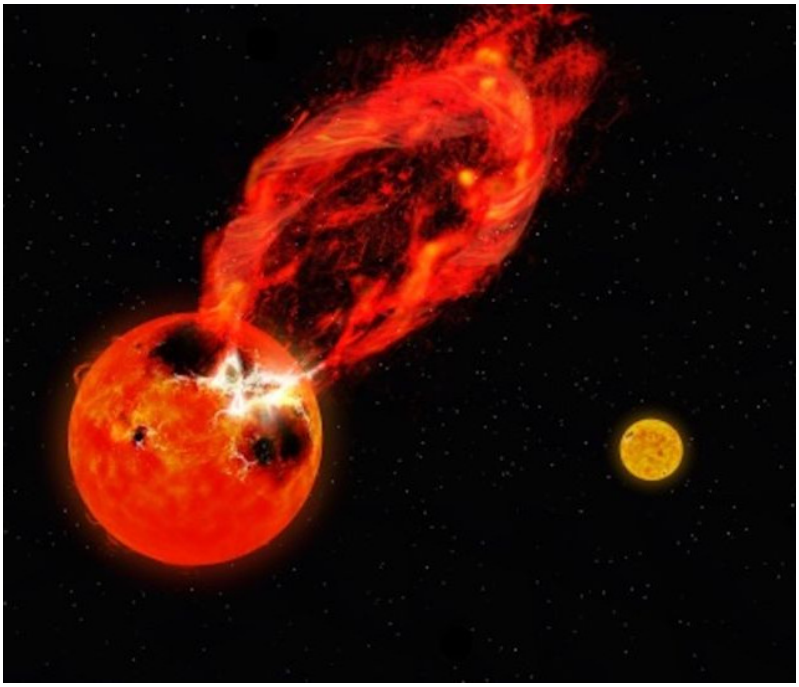
The hungry black hole was spotted roughly 137 million light-years from Earth — or about 35 million times as far as Proxima Centauri, the closest star to the sun. As distant as that sounds, astronomers have only observed around 100 of these events so far, and this one is four times closer than the previous title-holder of "closest TDE to Earth." Scientists discovered the TDE in infrared, a different wavelength than most conventional TDE detections, which usually come in X-rays, ultraviolet, and optical light. This finding suggests that astronomers should be searching for TDEs in infrared light, too.

https://www.space.com/black-hole-shredding-star-closest-to-earth-ever-seen

Gargantuan 'superflare' from distant star may have launched one of the strongest solar storms ever seen

Scientists studying a star system in Orion witnessed one of the most powerful stellar eruptions ever seen — and it could be devastating to nearby planets. Scientists scoping out a star system in the constellation Orion have witnessed one of the most gargantuan and powerful stellar flares ever seen. Dubbed a "superflare," the enormous blast of stellar radiation is 10 times more massive than anything ever witnessed erupting from the sun, according to new research published in The Astrophysical Journal. While the mechanism behind these monster flares still isn't well understood, the new research suggests that superflares originate from stars that are highly magnetically active. These superflares may be accompanied by enormous eruptions of charged particles that could devastate life on any planets in their firing line, the study authors wrote. (Fortunately for us, Earth is not one of those planets.)

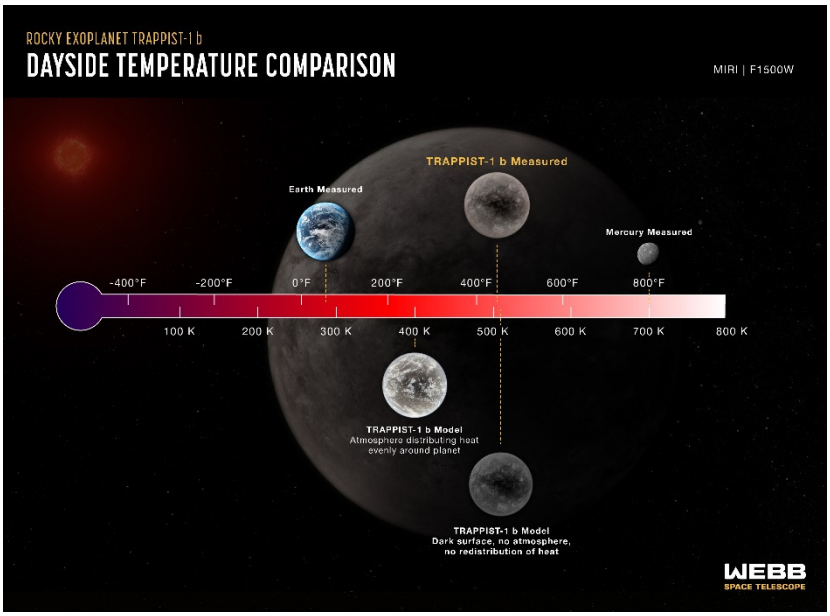
In their new research, the astronomers targeted a star system called V1355 Orionis, which is about 400 light-years from Earth and features two stars orbiting each other.



A distant red star erupting with a fiery flare that extends far off the star's surface (Image credit: NAOJ)

https://www.space.com/star-superflare-strongest-solar-storms-ever-seen

Webb Measures the Temperature of a TRAPPIST-1 Exoplanet

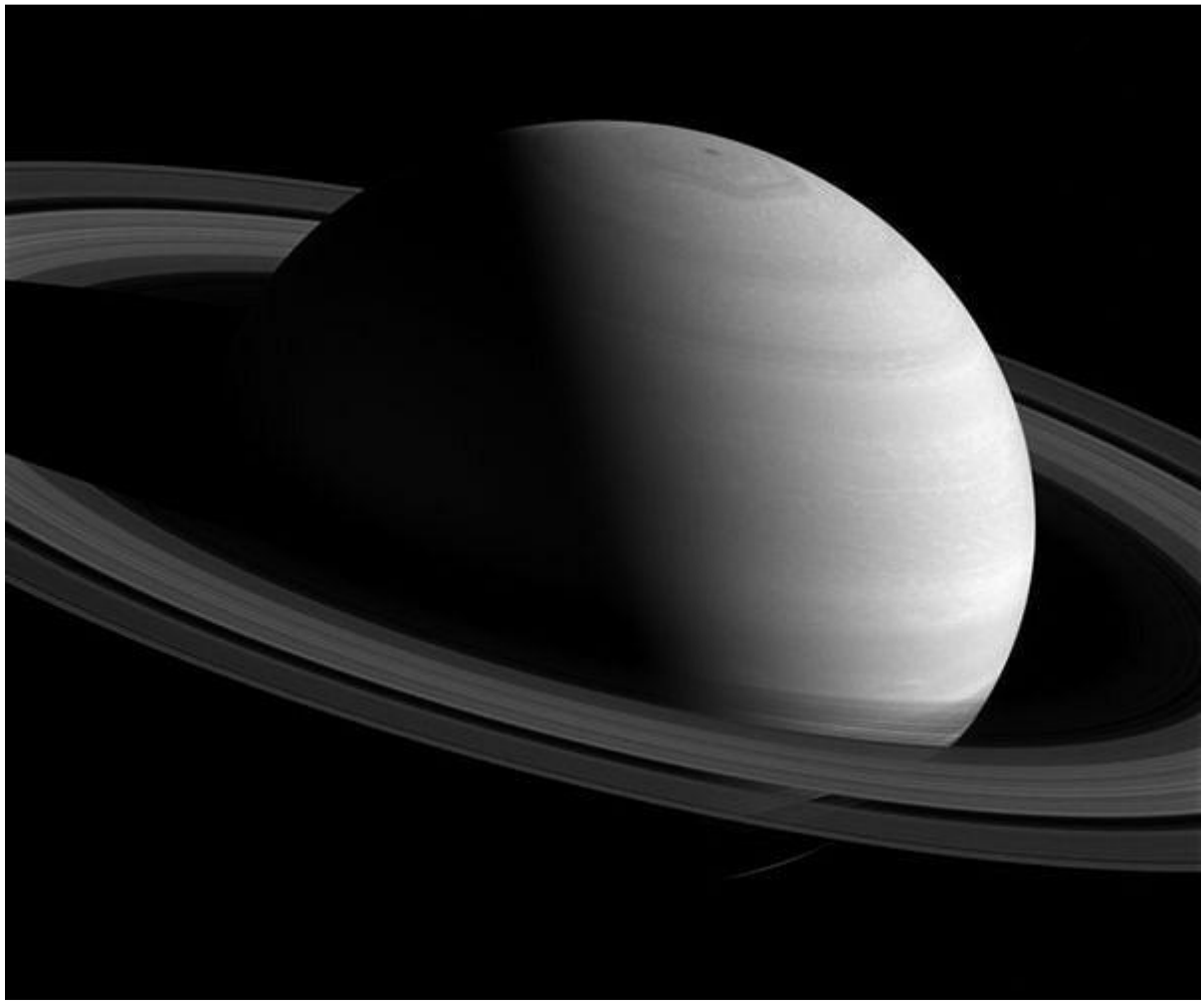


This graphic compares the dayside temperature of TRAPPIST-1 b as measured using Webb's Mid-Infrared Instrument (MIRI) to computer models of what the temperature would be under various conditions.

TRAPPIST-1 b, the innermost of seven known planets in the TRAPPIST-1 system, orbits its star at a distance of 0.011 AU, completing one circuit in just 1.51 Earth-days. TRAPPIST-1 b is slightly larger than Earth, but has around the same density, which indicates that it must have a rocky composition. Webb's measurement of mid-infrared light given off by TRAPPIST-1 b suggests that the planet does not have any substantial atmosphere. The star, TRAPPIST-1, is an ultracool red dwarf (M dwarf) with a temperature of only 2,566 kelvins and a mass just 0.09 times the mass of the Sun. An international team of researchers has used NASA's James Webb Space Telescope to measure the temperature of the rocky exoplanet TRAPPIST-1 b. The measurement is based on the planet's thermal emission: heat energy given off in the form of infrared light detected by Webb's Mid-Infrared Instrument (MIRI). The result indicates that the planet's dayside has a temperature of about 500 kelvins (roughly 450 degrees Fahrenheit) and suggests that it has no significant atmosphere.

https://exoplanets.nasa.gov/news/1756/webb-measures-the-temperature-of-a-trappist-1-exoplanet/

New study puts a definitive age on Saturn's rings



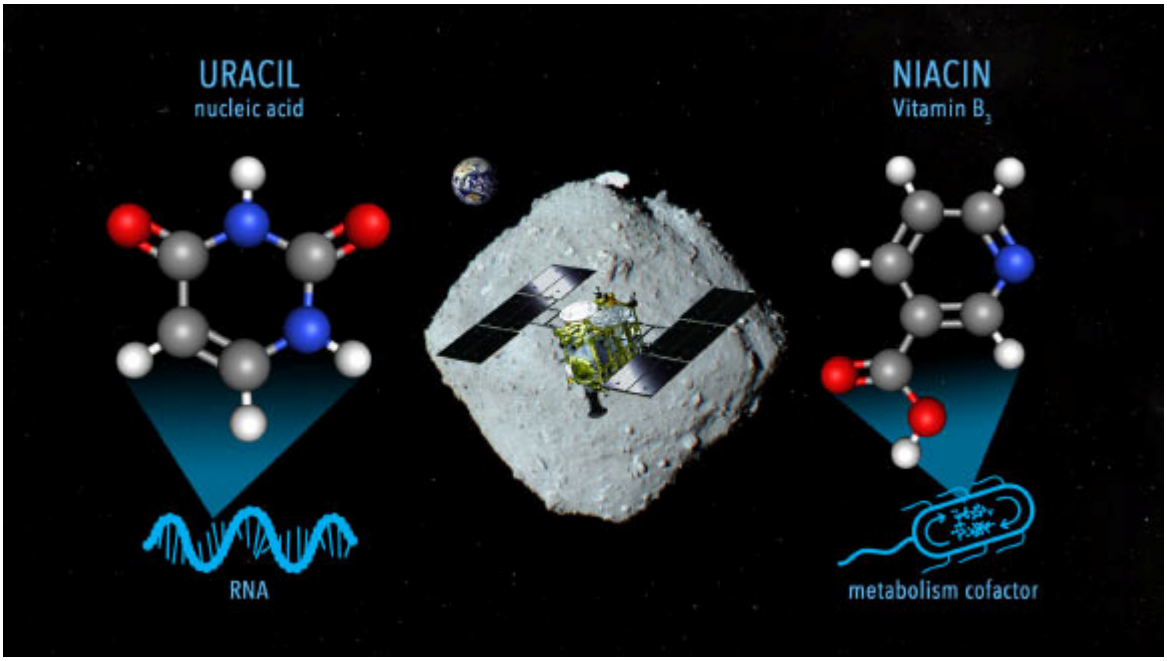
Cassini looks down on Saturn's rings from 16 degrees above.

A new study led by physicist Sascha Kempf at the University of Colorado Boulder has delivered the strongest evidence yet that Saturn's rings are remarkably young-potentially answering a question that has boggled scientists for well over a century.The research, to be published May 12 in the journal Science Advances, pegs the age of Saturn's rings at no more than 400 million years old. That makes the rings much younger than Saturn itself, which is about 4.5 billion years old.The researchers arrived at that closure by studying what might seem like an unusual subject: dust.

https://www.spacedaily.com/reports/New_study_puts_a_definitive_age_on_Saturns_rings_theyre_really_young_999.html

Scientists Find Vitamin B3 and Uracil in Samples from Asteroid Ryugu

An international team of researchers has detected nicotinic acid (also known as vitamin B_3 or niacin) and uracil, one of the four nucleobases in ribonucleic acid, in aqueous extracts from samples of the C-type near-Earth asteroid (162173) Ryugu. The findings strongly suggest that such molecules of prebiotic interest commonly formed in carbonaceous asteroids including Ryugu and were delivered to the early Earth.



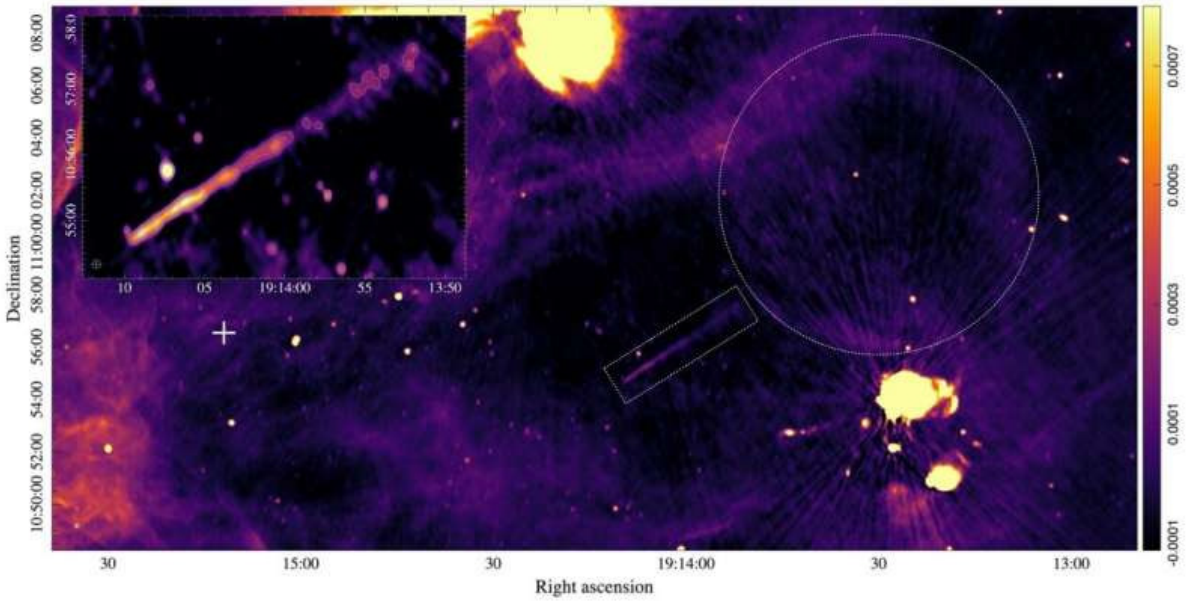
Oba *et al*. report the detection of uracil, one of the four nucleobases in ribonucleic acid, in aqueous extracts from Ryugu samples. Image credit: NASA's Goddard Space Flight Center / JAXA / Dan Gallagher.

Ryugu was discovered in May 1999 by astronomers with the Lincoln Near-Earth Asteroid Research. Also known as 1999 JU3, this asteroid measures approximately 900 m (0.56 miles) in diameter and orbits the Sun at a distance of 0.96-1.41 astronomical units once every 474 days. JAXA's Hayabusa-2, a sample-return mission to Ryugu, was launched on December 3, 2014 and arrived at the asteroid on June 27, 2018.

https://www.sci.news/space/vitamin-b3-uracil-ryugu-11766.html

MeerKAT radio telescope catches a 'Mini Mouse' in the sky

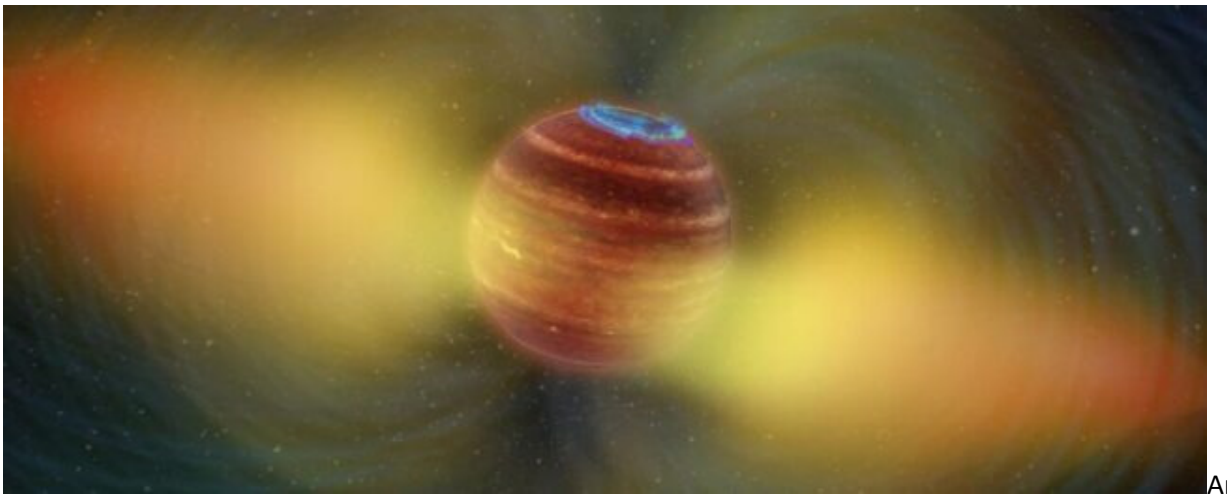
Using the MeerKAT radio telescope, European astronomers have serendipitously discovered a new radio nebula during observations of the black hole binary GRS 1915+105. The newfound object, dubbed "the Mini Mouse," is a young radio pulsar escaping its birth site and therefore creating a radio nebula with a cometary-like morphology. The finding was reported in a paper published May 10 on the *arXiv* preprint server. 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.



A portion of the field centered on GRS 1915+105 as seen by the MeerKAT radio telescope at 1.28 GHz. Credit: Motta et al., 2023.

https://phys.org/news/2023-05-meerkat-radio-telescope-mini-mouse.html

Radiation Belt Identified Outside The Solar System For First Time Ever



Artist's impression of radiation belts around tiny star LSR J1835+3259.(Chuck Carter, Melodie Kao, Heising-Simons Foundation)

All the planets in our Solar System with global magnetic fields have radiation belts, donut-shaped regions confined by magnetic fields where particles are trapped and accelerated, glowing in radio light. This all suggests that there should also be radiation belts wherever there is a stable, global magnetic field. For the first time, astronomers have imaged a radiation belt wrapped around an extrasolar object. That object is a very low-mass red dwarf star named LSR J1835+3259 that's just over the diameter of Jupiter, has about 77 times the mass of Jupiter, and sits some 20 light-years away. It's a result that astronomers hope will help search for potentially habitable worlds in the future as techniques and instruments are refined. That's because Earth's

magnetic field is thought to be essential for life to flourish. It deflects harmful solar radiation from reaching the surface, protecting the atmosphere and the vulnerable organisms that inhabit the surface.

https://www.sciencealert.com/radiation-belt-identified-outside-the-solar-system-for-first-time-ever

James Webb Space Telescope finds footprints of 'celestial monsters'

Thousands upon thousands of stars illuminate this breathtaking image of star cluster Liller 1, imaged with Hubble's Wide Field Camera 3. This stellar system, located 30,000 light-years from Earth, formed stars over 11 billion years. — NASA

Recent data harvested from the James Webb Space Telescope (JWST) strongly suggests that millions of supermassive stars, potentially up to 10,000 times the mass of the sun, formed during the early stages of the universe, are hiding among the clusters of stars.

These colossal stars, referred to as "celestial monsters" by researchers, emerged a mere 440 million years after the Big Bang.

This discovery can potentially provide valuable insights into the origins of heavy elements in our universe.

https://www.geo.tv/latest/488609-james-webb-space-telescope-finds-footprints-of-celestial-monsters

Supernova Discovered in Nearby Spiral Galaxy M101

This new supernova is the closest to Earth in a decade. It's visible in the night sky right now.

A nearby star has exploded and humanity's telescopes are turning to monitor it. The supernova, dubbed SN 2023ixf, was discovered by Japanese astronomer Koichi Itagaki three days ago and subsequently located on automated images from the Zwicky Transient Facility two days earlier. SN 2023ixf occurred in the photogenic Pinwheel Galaxy M101, which, being only about 21 million light years away, makes it the closest supernova seen in the past five years, the second closest in the past 10 years, and the second supernova found in M101 in the past 15 years. Rapid follow up observations already indicate that SN 2023ixf is a Type II supernova, an explosion that occurs after a massive star runs out of nuclear fuel and collapses. The featured image shows home spiral galaxy on 20 May with the supernova highlightedvisible to telescopes for months. Studying such a close and young Type II supernova may yield new clues about massive stars and how they explode.

What we are seeing in this new supernova is a star that is — or was — many times larger and more massive than our own sun. If such a star were to replace the sun in the solar system, it might extend beyond the orbit of Mars. Stars produce their energy by fusing hydrogen into helium deep within their cores. When a star accumulates sufficient helium in its core, its energy output increases significantly, and it swells into a red giant or supergiant, like Betelgeuse in the constellation of Orion.

https://science.nasa.gov/supernova-discovered-nearby-spiral-galaxy-m101

https://www.space.com/supernova-closest-earth-m101-galaxy

COMMITTEE MEMBERS

Derek Duckitt	(Chairman, website editor, "Southern Cross" editor, Cosmology SIG co-ordinator)	082 414 4024 derek.duckitt@gmail.com
Pierre de Villiers	(Vice-chairman, GPAED project leader)	082 854 2277
Elaine Sykes	(Treasurer)	083 286 2683
Peter Harvey	(Secretary, "Skynotes", "Southern Cross", Study Group SIG coordinator)	081 212 9481 petermh@hermanus.co.za
Mick Fynn	(Educational outreach)	082 443 0848
Pieter Kotzé	(Events co-ordinator, "Southern Cross" Astronomy News)	082 581 3233

Non-committee members with portfolios:

Deon Krige	(GPAED project, Astro-photography SIG coordinator)	
Johan Retief	(Membership)	028 315 1132