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"The Southern Cross"

The Hermanus Astronomy Centre Monthly Newsletter

August 2025

MONTHLY MEETINGS

On Tuesday July 15th, Dr Skelton, the recently appointed MD of NRF-SAAO, outlined the history of the South African Astronomical Observatory. Founded in 1820 at the Royal Observatory, the facility was later combined with the Republic Observatory in Johannesburg to become the SAAO. The organisation set up an observatory in a remote and pollution-free location near Sutherland in the Karoo region of the Northern Cape, providing research, training and observational facilities to the national and international astronomical communities. The facility shares with society, including outreach to younger people. Ros continued with details of the various telescopes involved and the work they do, some remotely controlled and available to astronomers worldwide.

For those who would like to revisit this presentation, the YouTube link is https://youtu.be/2aSP5hC903Y .

SPECIAL INTEREST GROUP ACTIVITIES

Cosmology

On Tuesday July 1st, we watched and discussed episode 30 of the History of the Universe series, *"What did James Webb Really see at the Beginning of Time?"*

The video link:

https://www.youtube.com/watch?v=2pux7v9qJ58&list=PLROBLlvnR7BEF9b1NOvRf_zhboibmywJb&index=30&pp=iAQB

The discussion link:

https://youtu.be/doBVcpaXo2E

The next meeting, scheduled for Tuesday August 5th, will be episode 31, *"Why shouldn't the Universe Exist?"*

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

Study Group

On Tuesday 29th July we watched *"The World's Most Deadly Lakes"*.

The YouTube link: https://youtu.be/fJHkHeHFuhg?si=DVmGFlKXUeLFU4WQ

The discussion recording link: https://youtu.be/MDkyOOAaNuc

Our next meeting, scheduled for **Tuesday 26th** August, *"Early Humans weren't so Different to Us."*

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 June.

Optimal dates for **August 2025**:

SUGGESTED EVENING OBSERVATION WINDOWS

(Lunar observations notwithstanding)

Date		*Moon*	*Dusk end*
August 15	*Rise*	**22h47 (81%)**	**19h20**
to August 27	*Set*	**20h53 (10%)**	**19h27**

Skynotes Moon: **The late Heavy Bombardment.**

Skynotes Object of the month: **The Helix Nebula.**

Moonwatch The **First Quarter** is August 1st.

From Tim Cooper

The latest circular of the Comet Asteroid and Meteor Section will be circulated when available.

MNASSA

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

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

Breaking News

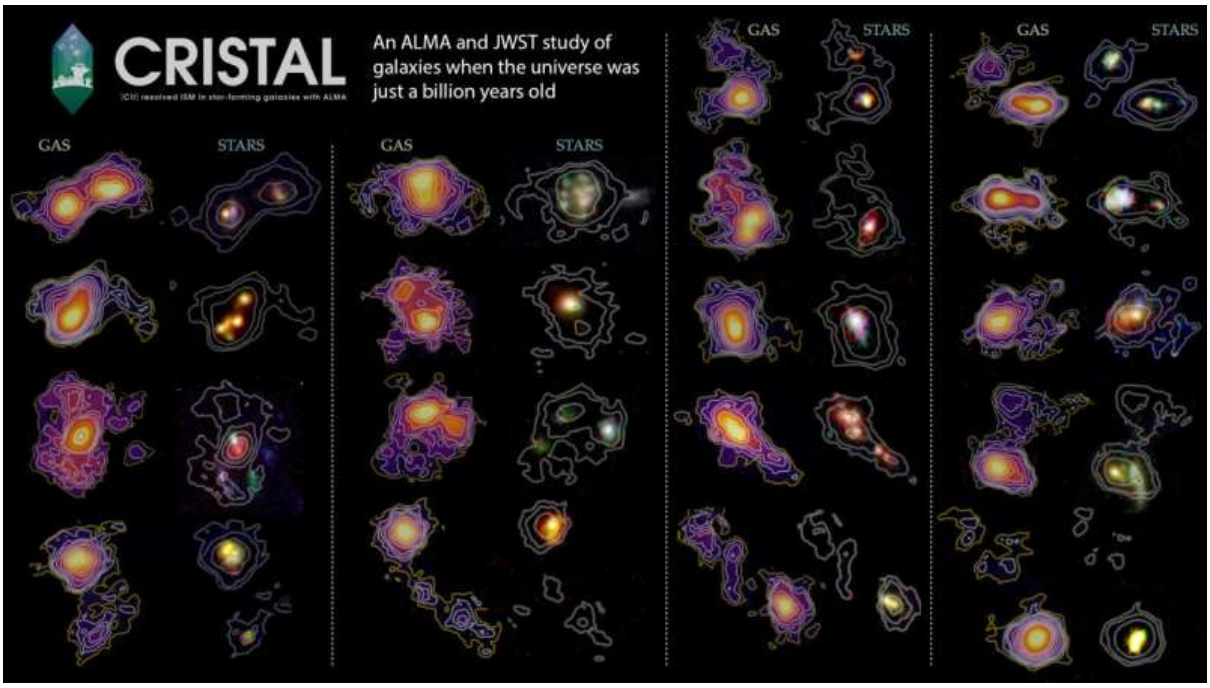
South African-born Professor Michele Dougherty has been appointed Astronomer Royal, succeeding Lord Martin Rees. And first female ever.

https://www.google.com/url?sa=t&source=web&rct=j&opi=89978449&url=https://www.theguardian.com/science/2025/jul/30/planetary-scientist-michele-dougherty-first-female-astronomer-royal&ved=2ahUKEwitwu_go-mOAxVDUUEAHUnYKP8QvOMEKAB6BAgeEAE&usg=AOvVaw3QGNEI0k_9Xcdq-1gckkoK

ASTRONOMY NEWS: July 2025 overleaf…

(Compiled by Pieter Kotzé)

ALMA reveals hidden structures in the first galaxies of the universe



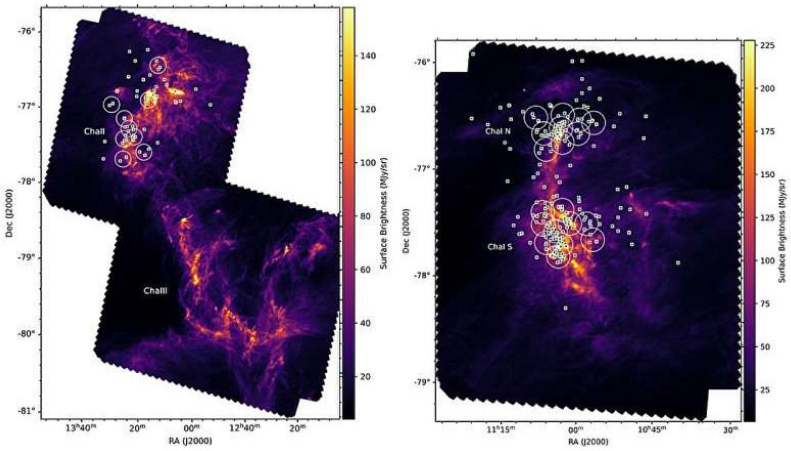
A family portrait of galaxies from the CRISTAL survey. Red shows cold gas traced by ALMA's [CII] observations. Blue and green represent starlight captured by the Hubble and James Webb Space Telescopes. Credit: ALMA (ESO/NAOJ/NRAO) / HST / JWST / R. Herrera-Camus

Astronomers have used the Atacama Large Millimeter/submillimeter Array (ALMA) to peer into the early universe and uncover the building blocks of galaxies during their formative years. The CRISTAL survey—short for [CII] Resolved ISM in STar-forming galaxies with ALMA—reveals cold gas, dust, and clumpy star formation in galaxies observed as they appeared just 1 billion years after the Big Bang."Thanks to ALMA's unique sensitivity and resolution, we can resolve the internal structure of these early galaxies in ways never possible before," said Rodrigo Herrera-Camus, principal investigator of the CRISTAL survey, professor at Universidad de Concepción, and Director of the Millennium Nucleus for Galaxy Formation (MINGAL) in Chile. "CRISTAL is showing us how the first galactic disks formed, how stars emerged in giant clumps, and how gas shaped the galaxies we see today."CRISTAL, an ALMA Large Program, observed 39 typical star-forming galaxies selected to represent the main population of galaxies in the early universe. Using [CII] line emission, a specific type of light emitted by ionized carbon atoms in cold interstellar gas, as a tracer of cold gas and dust, and combining it with near-infrared images from the James Webb and Hubble Space Telescopes, researchers created a detailed map of the interstellar medium in each system.

https://phys.org/news/2025-07-alma-reveals-hidden-galaxies-universe.html

Astronomers detect five young stars in the Chamaeleon cloud complex

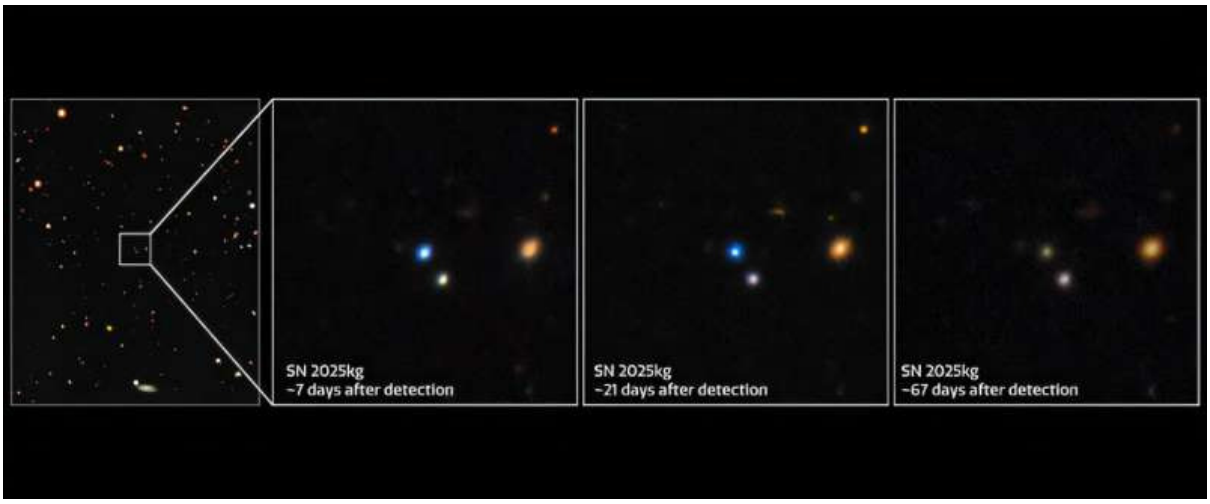
Using the Australia Telescope Compact Array (ATCA), astronomers have performed large-scale radio observations of a star-forming region known as the Chamaeleon cloud complex. The observational campaign, which detected five young stars in Chamaeleon, may shed more light on the properties of this complex. The findings were detailed in a paper published June 19 on the *arXiv* pre-print server.



Herschel 250 μm maps of the Cha II/III regions (left) and the Cha I sub-regions (right) with the observed ATCA fields overlaid as circles (with a diameter of 9 arcmin corresponding to the field of view of ATCA at 5.5 GHz). Squares indicate the positions of known young stars in each field. Credit: arXiv (2025). DOI: 10.48550/arxiv.2506.15927

Star-forming regions are perceived by astronomers as essential for better understanding the processes of star formation and stellar evolution. Observations of such regions are crucial to expand the list of known stars, protostars, young stellar objects (YSOs) and clumps, which could then be studied comprehensively to get more insights into the initial stages of the stellar life cycle. The Chamaeleon cloud complex is a prominent star-forming region in the southern hemisphere, at a distance of some 620 light years. It harbours three main dark clouds, designated Cha I, Cha II and Cha III.https://phys.org/news/2025-06-astronomers-young-stars-chamaeleon-cloud.html

The surprising link between fast X-ray transients and the explosive death of massive stars



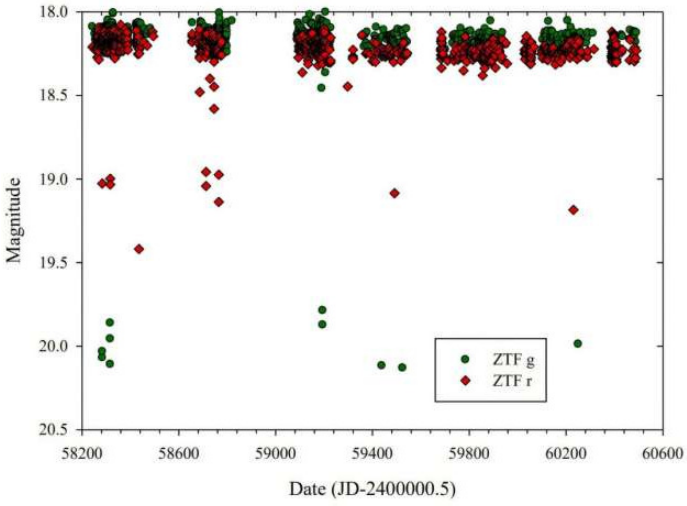
Credit: Association of Universities for Research in Astronomy

Using a combination of telescopes, astronomers have characterized the closest supernova linked to a fast X-ray transient. The observations reveal that these bright blasts of X-rays may be the result of a "failed" explosive death of a massive star. The telescopes included the International Gemini Observatory, operated by NSF NOIRLab, and the SOAR telescope at Cerro Tololo Inter-American Observatory in Chile, a Program of NSF NOIRLab.

Since their first detection, powerful bursts of X-rays from distant galaxies, known as fast X-ray transients (FXTs), have mystified astronomers. FXTs have historically been elusive events, occurring at vast distances away from Earth and only lasting seconds to hours. Einstein Probe (EP), launched in 2024, is dedicated to observing transient events in the X-ray and is changing the game for astronomers looking to understand the origin of these exotic events. In January 2025, the EP alerted astronomers to the nearest FXT known at the time, named EP 250108a. Its proximity to Earth (2.8 billion light-years away) provided an unprecedented opportunity for detailed observations of the event's evolving behaviour.

https://phys.org/news/2025-07-link-fast-ray-transients-explosive.html

Grigoriev 1: New eclipsing variable star discovered in the Pegasus constellation



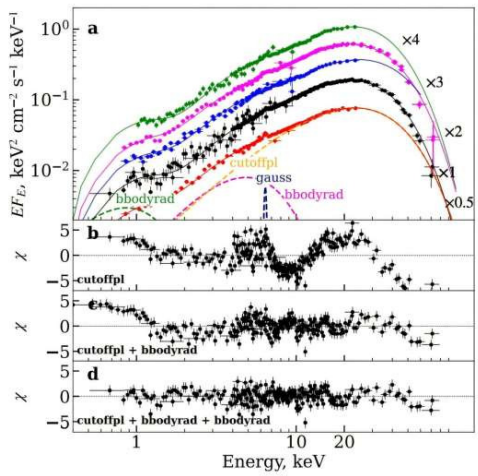
Light curve of the variable star Grigoriev 1 from the Zwicky Transient Facility (ZTF) project. Green circles—observations in g filter, red diamonds—in r filter. Credit: arXiv (2025). DOI: 10.48550/arxiv.2507.01005

Astronomers from the Center of Astronomical and Space Education in Moscow report the discovery of a new star, which turned out to be an eclipsing variable binary. The finding of the new star, which received designation Grigoriev 1, was reported in a research paper published July 1 on the *arXiv* pre-print server. Studies of variable stars could offer important hints into aspects of stellar structure and evolution. Such stars could also help us better understand the distance scale of the universe. The Center of Astronomical and Space Education in Moscow has its own project dedicated to the search for variable stars and supernovae. The program, which started in 2021, has resulted in the detection of 120 variables, and the newest discovery was announced in a recent paper. The new variable star was found in the constellation Pegasus and named Grigoriev 1 after one of the discoverers—V. S. Grigoriev.

https://phys.org/news/2025-07-grigoriev-eclipsing-variable-star-pegasus.html

Quasi-periodic oscillations detected in X-ray binary SXP31.0

Astronomers from the University of Turku in Finland and elsewhere have performed a broadband spectral and timing study of an X-ray binary designated XTE J0111.2−7317, which resulted in the detection of quasi-periodic oscillations in this system. X-ray binaries (XRBs) consist of a normal star or a white dwarf transferring mass onto a compact neutron star or a black hole. During this accretion process, they emit energy, mostly in the form of X-rays. Based on the mass of the companion star, these systems can be divided into low-mass X-ray binaries (LMXBs) and high-mass X-ray binaries (HMXBs).The largest subgroup of HMXBs are Be/X-ray binaries (Be/XRBs)—composed of Be stars and, usually, neutron stars, including pulsars. Observations show that most of these systems exhibit weak persistent X-ray emission that is interrupted by outbursts, which can last several weeks.

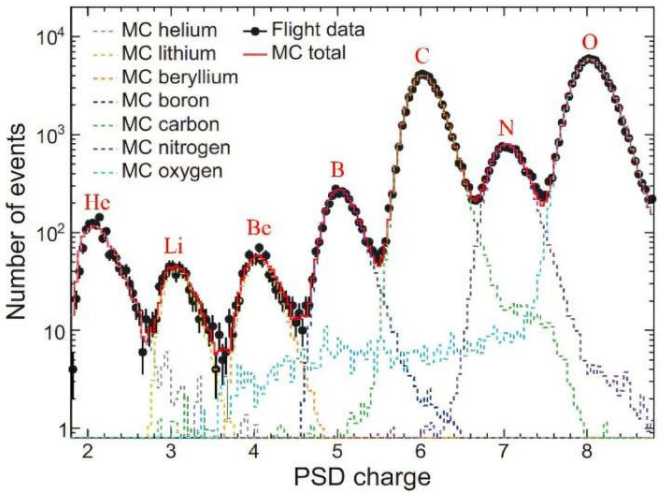


Unfolded energy spectra of SXP31.0. Credit: arXiv (2025). DOI: 10.48550/arxiv.2506.19601

Previous observations of SXP31.0 have found that it experienced outbursts with luminosities reaching 100 undecillion erg/s, therefore approaching the Eddington for a neutron star. This makes it a promising candidate for studying accretion at high rates. To date, only a handful of super-Eddington pulsars have been detected, and their properties remain poorly understood. The study found that during the outburst, SXP31.0 exceeded the Eddington limit of 180 undecillion erg/s for a canonical 1.4-solar mass neutron star. This places it among the most luminous outbursts ever observed in BeXRB systems.

https://phys.org/news/2025-07-quasi-periodic-oscillations-ray-binary.html

Dark Matter Particle Explorer obtains high-precision cosmic-ray boron spectrum

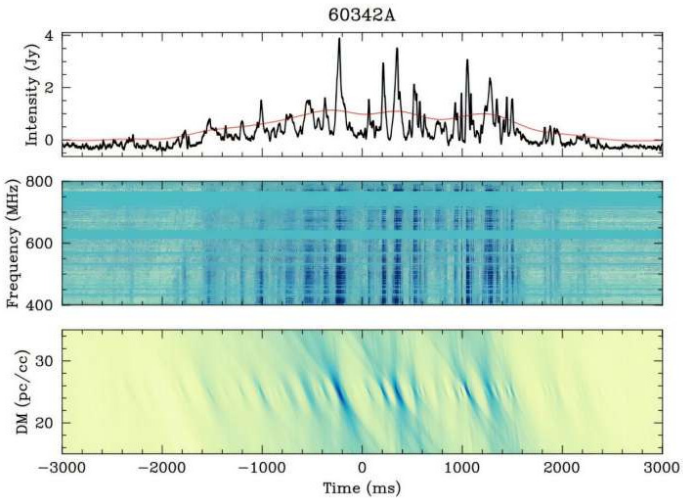


The charge spectrum from DAMPE's PSD for particle identification of cosmic rays. Credit: Physical Review Letters (2025). DOI: 10.1103/PhysRevLett.134.191001

The Dark Matter Particle Explorer (DAMPE, also known as "Wukong") Collaboration has obtained a high-precision cosmic-ray boron spectrum in the energy range of 10 GeV/n–8 TeV/n, and discovered a spectral "hardening" phenomenon around 182 GeV/n for the first time. DAMPE is a satellite mission equipped with the thickest calorimeter made of bismuth germanium oxide, providing an energy coverage range more than twice that of previous space experiments. The Plastic Scintillator Detector (PSD), developed by the Institute of Modern Physics (IMP) of the Chinese Academy of Sciences (CAS), is a core detector for identifying cosmic-ray nuclei due to its excellent charge measurement capabilities. Using DAMPE data, researchers discovered a significant "hardening" feature in the boron spectrum around 182 GeV/n, with a confidence level of eight sigma. The study revealed that the secondary boron spectrum hardens roughly twice as much as that of primary cosmic rays (protons and helium nuclei), while remaining consistent with hardening in boron-to-carbon and boron-to-oxygen flux ratios.These results align well with the theoretical prediction that cosmic-ray boron is produced through fragmentation reactions involving primary cosmic rays (e.g., carbon and oxygen) and interstellar matter.

https://phys.org/news/2025-07-dark-particle-explorer-high-precision.html

Astronomers discover an unusual long-period radio transient

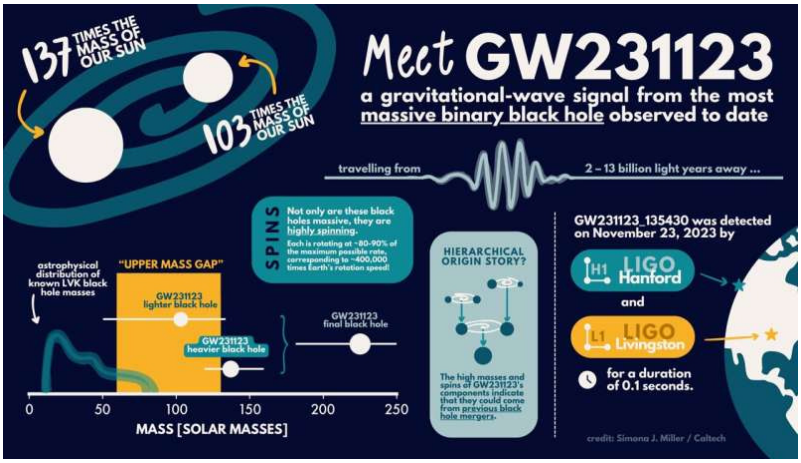


CHIME J1634+44: Sample of a detection made with the CHIME/Pulsar instrument. Credit: Dong et al., 2025.

An international team of astronomers report the discovery of a long-period radio transient, which is unusually circularly polarized and showcases an accelerating spin period. The finding of the new transient, designated CHIME J1634+44, was detailed in a paper published July 7 on the pre-print server *arXiv*. The term long-period radio transients (LPTs) refers to a new class of periodic radio emitters, with ultra long rotation periods (ranging from minutes to hours) and strong magnetic fields. Although some observations have suggested that these transients may originate from rotating neutron stars with extremely strong magnetic fields (magnetars) or magnetic white dwarfs, their true nature is still elusive.The observations found that CHIME J1634+44 emits fully circularly polarized radio bursts and has an accelerating spin period as it showcases a significantly negative period derivative of about -9.03 x 10^{-12} seconds/second. The astronomers note that this makes CHIME J1634+44 the first known LPT that is circularly polarized and exhibits a significant spin-up.

https://phys.org/news/2025-07-astronomers-unusual-period-radio-transient.html

LIGO-Virgo-KAGRA detect most massive black hole merger to date



Infographic on the binary binary black hole merger that produced the GW231123 signal. Credit: Simona J. Miller/Caltech

The LIGO-Virgo-KAGRA (LVK) Collaboration has detected the merger of the most massive black holes ever observed with gravitational waves using the LIGO observatories. The powerful merger produced a final black hole approximately 225 times the mass of our sun. The signal, designated GW231123, was detected during the fourth observing run of the LVK network on November 23, 2023.LIGO, the Laser Interferometer Gravitational-wave Observatory, made history in 2015 when it made the first-ever direct detection of gravitational waves, ripples in space-time. In that case, the waves emanated from a black hole merger that resulted in a final black hole 62 times the mass of our sun. The signal was detected jointly by the twin detectors of LIGO, one located in Livingston, Louisiana, and the other in Hanford, Washington.

https://phys.org/news/2025-07-ligo-virgo-kagra-massive-black.html

Astronomers find giant hidden molecular cloud fuelling star birth in Milky Way

The location of the area of focus for this research in the Milky Way galaxy is shown above, along with a previously unknown maser. Credit: Image credits as noted, collage created by NSF/AUI/NSF NRAO/P. Vosteen

An international team of astronomers has discovered a massive cloud of gas and dust located in a little-known region of our Milky Way galaxy. The Giant Molecular Cloud (GMC) is about 60 parsecs—or 200 light years—long. In a new study published in *The Astrophysical Journal*, researchers using the U.S. National Science Foundation Green Bank Telescope (NSF GBT) have peered into a molecular cloud known as M4.7-0.8, nicknamed the Midpoint cloud. Their observations have revealed a dynamic region bustling with activity, including potential sites of new star formation." One of the big discoveries of the paper was the GMC itself. No one had any idea this cloud existed until we looked at this location in the sky and found the dense gas. Through measurements of the size, mass, and density, we confirmed this was a giant molecular cloud," shares Natalie Butterfield, an NSF National Radio Astronomy Observatory (NSF NRAO) scientist and lead author of this paper.

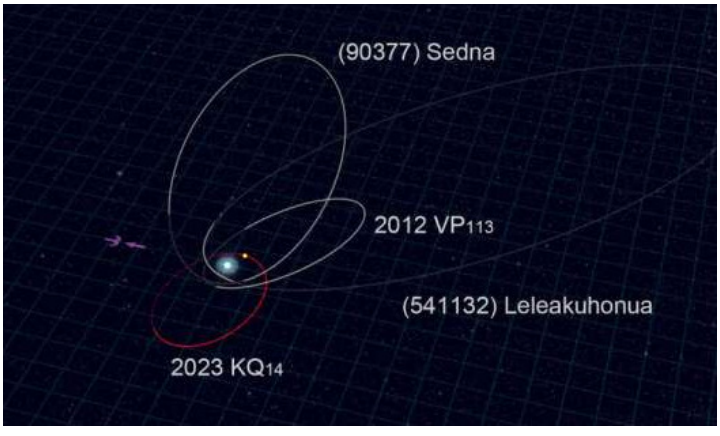
https://phys.org/news/2025-07-astronomers-giant-hidden-molecular-cloud.html

Cosmic baby steps: For the first time, astronomers witness the dawn of a new solar system

This is HOPS-315, a baby star where astronomers have observed evidence for the earliest stages of planet formation. The image was taken with the Atacama Large Millimeter/submillimeter Array (ALMA), in which ESO is a partner. Together with data from the James Webb Space Telescope (JWST), these observations show that hot minerals are beginning to solidify. In orange we see the distribution of carbon monoxide, blowing away from the star in a butterfly-shaped wind. In blue we see a narrow jet of silicon monoxide, also beaming away from the star. These gaseous winds and jets are common around baby stars like HOPS-315. Together the ALMA and JWST observations indicate that in addition to these features, there is also a disk of gaseous silicon monoxide around the star that is condensing into solid silicates––the first stages of planetary formation. Credit: ALMA(ESO/NAOJ/NRAO) / M. McClure et al.

For the first time, international researchers have pinpointed the moment when planets began to form around a star beyond the sun. Using the ALMA telescope, in which the European Southern Observatory (ESO) is a partner, and the James Webb Space Telescope, they have observed the creation of the first specks of planet-forming material—hot minerals just beginning to solidify. This finding marks the first time a planetary system has been identified at such an early stage in its formation and opens a window to the past of our own solar system."For the first time, we have identified the earliest moment when planet formation is initiated around a star other than our sun," says Melissa McClure, a professor at Leiden University in the Netherlands and lead author of the new study, published in *Nature*.This newborn planetary system is emerging around HOPS-315, a "proto" (baby) star that sits some 1,300 light-years away from us and is an analogue of the nascent sun. Around such baby stars, astronomers often see disks of gas and dust known as "protoplanetary disks," which are the birthplaces of new planets.https://phys.org/news/2025-07-cosmic-baby-astronomers-witness-dawn.html

Subaru telescope discovers 'fossil' in outer solar system



The orbit of 2023 KQ_{14} (in red) compared to the orbits of the other three sednoids (in white). 2023 $KQ_{14}$was discovered near its perihelion at a distance of 71 astronomical units (71 times the average distance between the Sun and Earth). The yellow point indicates its current position. Credit: NAOJ

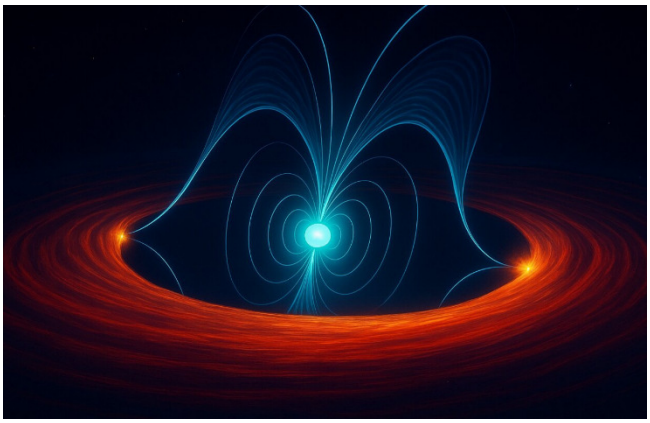
The Subaru Telescope has made an exciting discovery: a small body beyond Pluto, with implications for the formation, evolution, and current structure of the outer solar system. The object was found as part of the survey project FOSSIL (Formation of the Outer Solar System: An Icy Legacy), which takes advantage of the Subaru Telescope's wide field of view. The object was discovered through observations taken in March, May, and August 2023 using the Subaru Telescope. The details have been published in the journal *Nature Astronomy*. The object is currently designated 2023 KQ_{14}; a more classical name will be assigned later by the International Astronomical Union. After that, follow-up observations in July 2024 with the Canada-France-Hawaii Telescope and a search for

unrecognized sightings of the object in old data from other observatories allowed astronomers to track the object's orbit over 19 years. Due to its peculiar distant orbit, 2023 KQ_{14} has been classified as a "sednoid," making it only the fourth known example of this rare type of object.

https://phys.org/news/2025-07-subaru-telescope-fossil-outer-solar.html

NASA X-ray spacecraft reveals secrets of a powerful, spinning neutron star

"Transitional millisecond pulsars are cosmic laboratories that help us understand how neutron stars evolve in binary systems."Astronomers have discovered that radiation emitted by a rapidly spinning neutron star, or "pulsar," is dominated by the impact of its powerful particle winds — and not by the material it strips from a companion star. The pulsar in question is PSR J1023+0038 (J1023), which sits in a binary system located 4,500 light-years away from Earth. This binary consists of a "dead star," or neutron star that spins around 600 times a second, as well as a low-mass star upon which the neutron star "feeds."

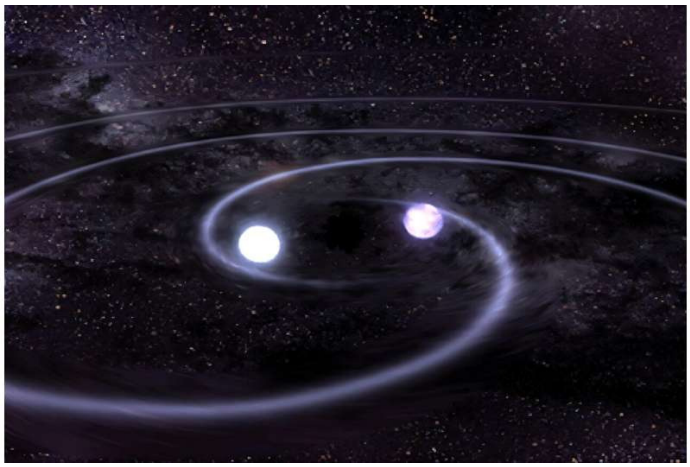


An illustration of the pulsar system PSR J1023+0038 showing the central pulsar and an accretion disk around it. (Image credit: Marco Maria Messa, University of Milan/INAF-OAB; Maria Cristina Baglio, INAF-OAB)

The rapid spin of J1023 classifies it as a millisecond pulsar, but because it transitions clearly between an active state — during which it feeds and blasts out beams of radiation from its poles — and an inactive state, it is part of a rare subclass called "transitional millisecond pulsar." One of just three known transitional millisecond pulsars, J1023 is an invaluable target for astronomers.

https://www.space.com/astronomy/nasa-x-ray-spacecraft-reveals-secrets-of-a-powerful-spinning-neutron-star

Astronomers discover mysterious radio pulsing white dwarf, one of only 10 found to date



Artist impression of a binary white dwarf system similar to J1634+44. Credit: Dana Berry

A team of astronomers have made a fascinating discovery that forces us to rethink our understanding of how dead stars behave. Using the powerful Low Frequency Array (LOFAR) radio telescope in the Netherlands, the team have found a white dwarf star that's doing something completely unexpected, sending out bright radio pulses in a strange, rhythmic pattern.

The star system, officially called ILT J163430+445010 (or J1634+44 for short), is located over 3 500 light years from Earth. What makes it extraordinary isn't just that it's sending radio signals, it's how those signals behave. Every 14 minutes, this dead star emits radio pulses that have a bizarre twist. Some waves spin in circles while others vibrate in straight lines. This rapid switching between different types of polarization has never been seen before in any white dwarf.

https://phys.org/news/2025-07-astronomers-mysterious-radio-pulsing-white.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)