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

"The Southern Cross"

The Hermanus Astronomy Centre Monthly Newsletter

July 2025

MONTHLY MEETINGS

Dr Amanda Sickafoose *requested we do not post to YouTube her May 20th address ("Small Body Ring Systems") as this material is as yet unpublished. However, she has approved that we watch the Zoom recording at a meeting strictly confined to HAC membership. The date set is* ***Tuesday July 8th***.

At our last meeting on Tuesday 17th July, **Lindsay Magnus**, director of the **Square Kilometre Array Observatory** (SKAO), addressed the formation of the world's youngest astronomy based intergovernmental organisation in South Africa and Australia and head-quartered at Jodrell Bank in the UK, giving us an update on the construction progress. We also heard about the potential radio frequency interference from satellite constellations like Starlink, sparking a lively debate.

The YouTube address and discussion link: https://youtu.be/Pa-6bSjKIHE .

Coming up in July on Tuesday 15th, **Dr Ros Skelton,** the newly appointed Managing Director of the SAAO, will lead us on a journey through South Africa's astronomical frontiers, exploring the cutting-edge discoveries and groundbreaking projects unfolding at the South African Astronomical Observatory**.** Learn how South African astronomers are playing a pivotal role in revolutionary global projects, including the recently commissioned **Rubin Observatory's** Legacy Survey of Space and Time (LSST).

SPECIAL INTEREST GROUP ACTIVITIES

Cosmology

On Tuesday 3rd June, we watched and discussed episode 29 of the History of the Universe series: *"Are The First Stars Really Still Out There?"*

https://www.youtube.com/watch?v=JLS90fyGZwg&list=PLROBLlvnR7BEF9b1NOvRf_zhboibmywJb&index=29&t=46s&pp=iAQB

https://www.youtube.com/watch?v=FpftRRm0jfA&list=PLROBLlvnR7BEF9b1NOvRf_zhboibmywJb&index=28&t=18s&pp=iAQB . And the discussion following: https://youtu.be/H8ykk6CZlnA .

The next meeting, scheduled for Tuesday July 1st, will be episode 30 of the same series, *"What did James Webb Really see at thy Beginning of Time?"*

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

Study Group

On Tuesday 24th June we watched *"Out of Africa Theory Update"*. Ostensibly "debunking" the migrational theory of the modern human species, this questioned Africa as the origin. This was followed by lively debate among participants.

The YouTube link: https://youtu.be/HQa6yvIMuKQ. The discussion recording link will be posted when available.

As explained to the attendees, this video was a bit too long so we decided to cut out the introduction and book promotions and go for the main topic. The unedited transcript is attached separately and some may find it worthwhile reading.

Our next meeting, scheduled for **Tuesday 24th** July, is yet to be prepared.

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 **July 2025**:

SUGGESTED EVENING OBSERVATION WINDOWS

(Lunar observations notwithstanding)

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

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

Skynotes Object of the month: **The Fighting Dragons.**

Moonwatch Within a few days either side of **July 2nd**, the **First Quarter**.

From Tim Cooper

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

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

MNASSA

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

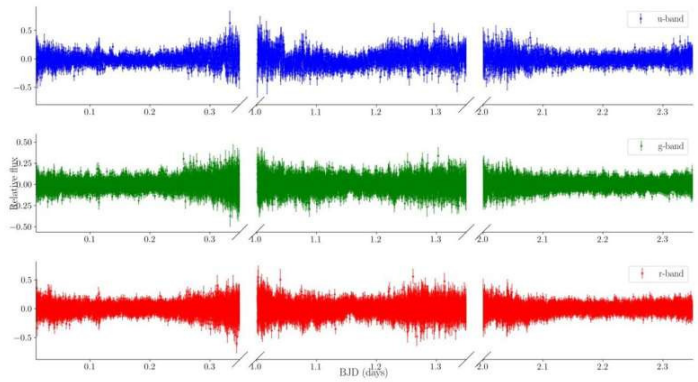
http://www.mnassa.org.za/

ASTRONOMY NEWS: June 2025 overleaf…

ASTRONOMY NEWS June 2025

(Compiled by Pieter Kotzé)

Asteroseismology study uncovers new pulsation modes in ultra-massive white dwarf

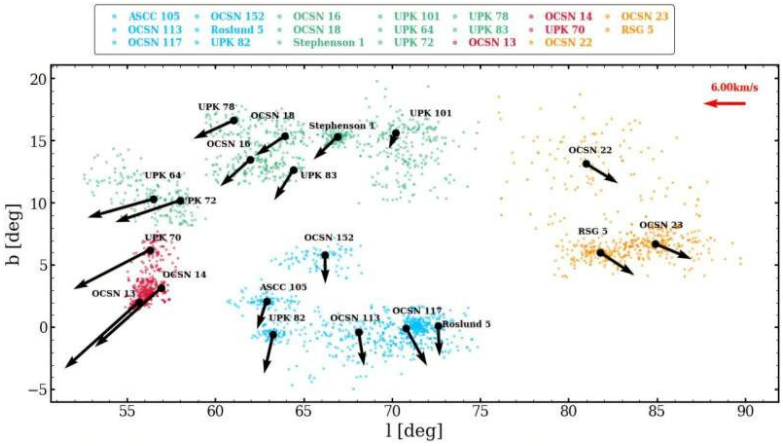


NTT ULTRACAM light curves of WD J0049–2525 from October 5, 6, and 7, 2023 (left to right). The top, middle, and bottom panels show the relative flux variations in the u (blue), g (green), and r (red) bands, respectively. Credit: arXiv (2025). DOI: 10.48550/arxiv.2505.17177

Based on time-series photometry from three different telescopes, an international team of astronomers has performed a detailed asteroseismology study of WD J0049–2525—the most massive pulsating white dwarf. The study resulted in the detection of new pulsation modes of this white dwarf. White dwarfs (WDs) are stellar cores left behind after a star has exhausted its nuclear fuel and represent the final evolutionary stage for the vast majority of stars. Observations show that most WDs have primary spectral classification DA as they exhibit hydrogen-dominated atmospheres. However, a small fraction of WDs showcases traces of heavier elements. In pulsating WDs, luminosity varies due to non-radial gravity wave pulsations within these objects. One subtype of pulsating WDs is known as DAVs, or ZZ Ceti stars, which have only hydrogen absorption lines in their spectra. With a mass of about 1.3 solar masses, WD J004917.14–252556.81, or WD J0049–2525 for short, is an ultra-massive ZZ Ceti star—the most massive pulsating WD so far detected.

https://phys.org/news/2025-06-asteroseismology-uncovers-pulsation-modes-ultra.html

Unveiling the birth of star cluster groups in the Milky Way



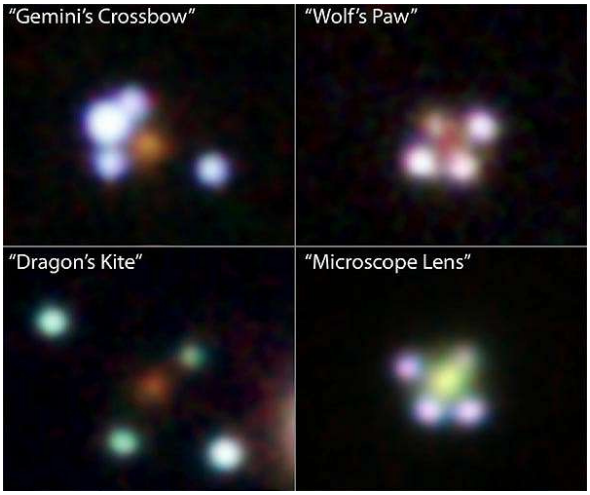
Four newly reported primordial open cluster groups (G1–G4). The blue, green, red, and orange dots represent OC groups G1, G2, G3, and G4, respectively. The black arrows denote the tangential velocity of the member OC, with arrow lengths scaled proportionally according to the red reference arrow located in the upper right corner. Credit: XAO

A study published in *Astronomy & Astrophysics* has identified four previously unknown primordial open cluster (OC) groups in the Milky Way. Open clusters, loose assemblies of stars born from the same giant molecular cloud (GMC), are typically considered to form in isolation. However, the newly discovered OC groups consist of multiple member clusters originating from the same GMC, formed through sequential star formation processes. Notably, two of these groups, labelled G1 and G2, appear to have formed via a hierarchical mechanism triggered by multiple supernova (SN) explosions. Using high-precision data from the Gaia satellite, researchers from the Xinjiang Astronomical Observatory (XAO) of the Chinese Academy of Sciences, in collaboration with the Shanghai Astronomical Observatory, Yunnan Observatories, and the University of Heidelberg, identified the OC groups by analyzing correlations in three-dimensional (3D) positions, velocities, and ages. G1 and G2 display distinct ring-like and arc-like morphologies, suggesting external compression events. Based on these findings, the researchers adopted a triggered star formation framework to construct spatial correlation maps between cluster age and distance from potential SN explosion sites around the birthplace of OC groups. A clear age-distance correlation emerged, supporting a scenario in which multiple SN explosions, occurring over a short timespan, sequentially triggered the formation of G1 and G2.To further validate this hypothesis, they performed trajectory traceback analyses of 607 pulsars, which are remnants of SN explosions. Several candidates were found to have birthplaces matching the predicted explosion region. This spatial agreement,

together with the observed cluster age gradients and SN remnant locations, supports a feedback-driven and hierarchical formation of OC groups.

https://phys.org/news/2025-05-unveiling-birth-star-cluster-groups.html

Cosmic Himalayas quasar cluster defies explanation

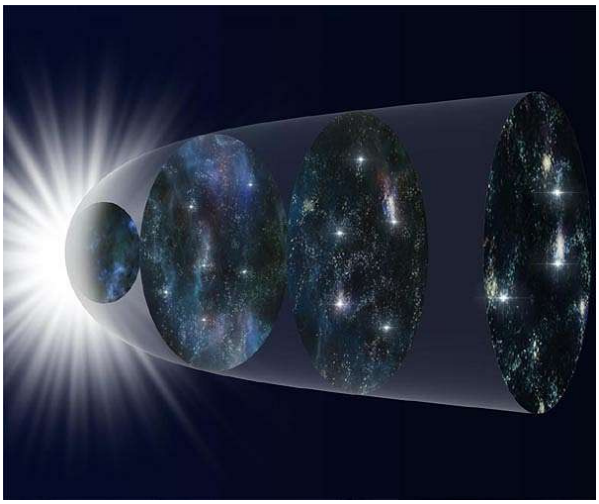


A newly discovered cluster of eleven quasars has shattered the previous record of five. Rather than being associated with a dense group of galaxies, these quasars sit on the boundary between two groups of galaxies. This structure, dubbed the "Cosmic Himalayas," cannot be explained by conventional theories, forcing astronomers to rethink the formation scenarios for quasars. Quasars are some of the brightest objects in the Universe. A quasar is powered by large amounts of matter falling into the supermassive black hole at the centre of a galaxy. Collisions and mergers between galaxies can cause quasar activity by feeding addition matter into the centre of a galaxy. Quasar activity peaked in the early Universe, but even then they were relatively rare. So an international research team led by Yongming Liang at the National Astronomical Observatory of Japan was surprised when they found a group of elven quasars in an area of space where you would normally expect to see maybe one, while analyzing data from the Sloan Digital Sky Survey. The previous record holder for quasar over-density had been five.

https://www.spacedaily.com/reports/Cosmic_Himalayas_quasar_cluster_defies_explanation_999.html

New measure of the universe's expansion suggests resolution of a conflict

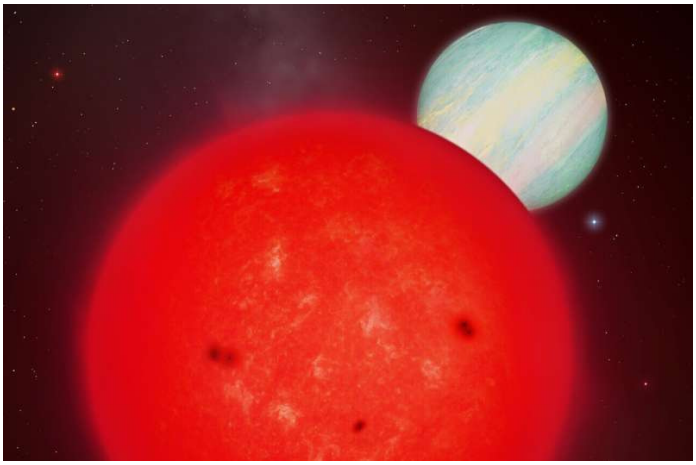
For the past decade, scientists have been trying to get to the bottom of what seemed like a major inconsistency in the universe. The universe expands over time, but how fast it's expanding seemed to differ depending on whether you looked early in the universe's history or the present day. If true, this would have presented a major problem to the gold-standard model that represents our best understanding of the universe.



But thanks to the new James Webb Space Telescope, scientists from the University of Chicago have been able to take new and better data-suggesting there may be no conflict after all."This new evidence is suggesting that our Standard Model of the universe is holding up," said UChicago Prof. Wendy Freedman, a leading figure in the debate over this rate of expansion, known as the Hubble Constant."It doesn't mean we won't find things in the future that are inconsistent with the model, but at the moment the Hubble Constant doesn't seem to be it," she said.

https://www.spacedaily.com/reports/New_measure_of_the_universes_expansion_suggests_resolution_of_a_conflict_999.html

Discovery of giant planet orbiting tiny star challenges theories on planet formation



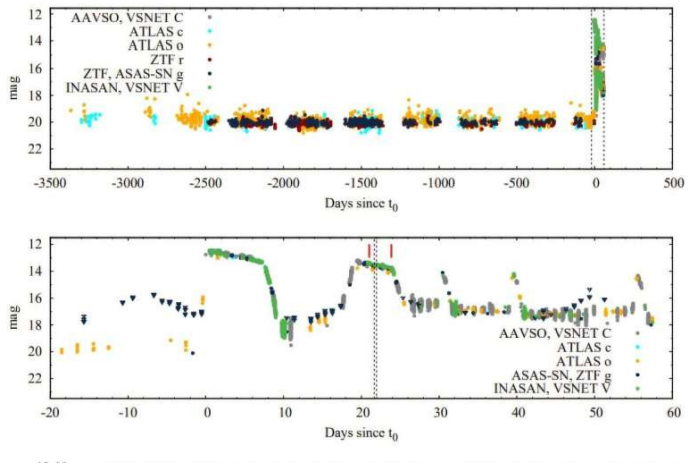
Artists Impression of the newly discovered giant planet—TOI-6894 b orbiting around a 0.2 solar mass host star. Credit: University of Warwick/Mark Garlick

Star TOI-6894 is just like many in our galaxy, a small red dwarf, and only ~20% of the mass of our sun. Like many small stars, it is not expected to provide suitable conditions for the formation and hosting of a large planet. However, an international team of astronomers have found the unmistakable signature of a giant planet, called TOI-6894b, orbiting this tiny star. The work is published in *Nature Astronomy*. This system has been discovered as part of a large-scale investigation of TESS (Transiting Exoplanet Survey Satellite) data, looking for giant planets around low-mass stars, led by Dr. Edward Bryant, who completed this work at the University of Warwick and at UCL's Mullard Space Science Laboratory. The planet (TOI-6894b) is a low-density gas giant with a radius a little larger than Saturn's but with only ~50% of Saturn's mass. The star (TOI-6894) is the lowest mass star to have a transiting giant planet discovered to date and is just 60% the size of the next smallest star to host such a planet.

https://phys.org/news/2025-06-discovery-giant-planet-orbiting-tiny.html

Astronomers detect new ultracompact binary system with unusually bright, infrequent outbursts

An international team of astronomers reports the discovery of a new ultracompact binary of the AM CVn type exhibiting infrequent outbursts.

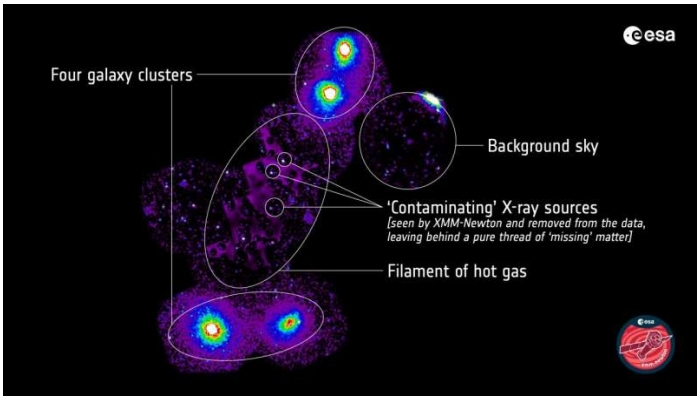


The lightcurve of J0722 combining V -band photometry from INASAN Terskol and Kislovodsk telescopes with V -band and unfiltered CV -band measurements collected by VSNET and AAVSO observers (including CV photometry from the two NMW cameras), ASAS-SN g, ATLAS o (orange) and c (cyan), and ZTF g and r data. Credit: arXiv (2025). DOI: 10.48550/arxiv.2505.20842

Cataclysmic variables (CVs) are binary star systems that include a white dwarf (WD) and a normal star companion from which the WD accretes matter. Observations show that the brightness of CVs increases irregularly by a large factor, then returns to a quiescent state. The so-called AM CVn stars (named after the star AM Canum Venaticorum) are a rare type of CV in which a WD accretes hydrogen-poor matter from a compact companion. These systems are helium-rich binaries, not showing traces of hydrogen in their spectra, with orbital periods ranging from five minutes to about an hour.According to the paper, TCP J07222683+6220548, or J0722, is located some 1,874 light years away. Its spectrum shows a blue continuum with prominent broad absorption lines of helium and lacks the Balmer hydrogen lines. Such spectrum is typical for an AM CVn system in an outburst.

https://phys.org/news/2025-06-astronomers-ultracompact-binary-unusually-bright.html

'The models were right': Astronomers find 'missing' matter linking four galaxy clusters



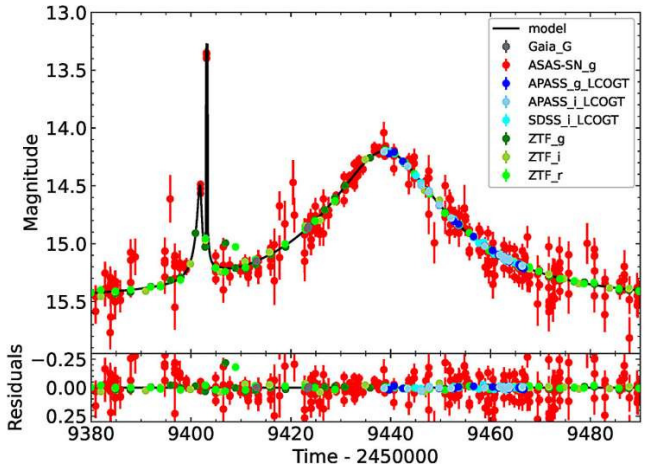
This image shows the new filament, which connects four galaxy clusters: two on one end, two on the other. These clusters are visible as bright spots at the bottom and top of the filament (four white dots encircled by colour). A mottled band of purple stretches between these bright dots, standing out brightly against the black surrounding sky; this is the filament of X-ray-emitting hot gas that had not been seen before, and contains a chunk of 'missing' matter. The purple band comprises data from Suzaku. The astronomers were able to identify and remove any possible 'contaminating' sources of X-rays from the filament using XMM-Newton, leaving behind a pure thread of 'missing' matter. These sources can be seen here as bright dots studded through—and removed from—the filament's emission. Credit: ESA/XMM-Newton and ISAS/JAXA

Astronomers have discovered a huge filament of hot gas bridging four galaxy clusters. At 10 times as massive as our galaxy, the thread could contain some of the universe's 'missing' matter, addressing a decades-long mystery. The astronomers used the European Space Agency's XMM-Newton and JAXA's Suzaku X-ray space telescopes to make the discovery. The work has been published in *Astronomy and Astrophysics*. Over one-third of the 'normal' matter in the local universe—the visible stuff making up stars, planets, galaxies, life—is missing. It hasn't yet been seen, but it's needed to make our models of the cosmos work properly. Said models suggest that this elusive matter might exist in long strings of gas, or filaments, bridging the densest pockets of space. While we've spotted filaments before, it's tricky to make out their properties; they're typically faint, making it difficult to isolate their light from that of any galaxies, black holes, and other objects lying nearby.

https://phys.org/news/2025-06-astronomers-linking-galaxy-clusters.html

https://phys.org/news/2025-06-astronomers-home-universe.html

Using a unique method, astronomers have discovered an exceptional new planet



Photometric data and fitted light curve of the event AT2021uey. Credit: Astronomy & Astrophysics (2025). DOI: 10.1051/0004-6361/202554236

Scientists from Vilnius University (VU) Faculty of Physics, together with colleagues from Poland and other countries, have identified an exoplanet—a gas giant located far from the galactic centre. This is only the third such discovery in the entire history of observations. The discovery is even more exceptional due to the method used—the phenomenon known as microlensing. The results of the observations have been published in *Astronomy & Astrophysics*."This kind of work requires a lot of expertise, patience, and, frankly, a bit of luck. You have to wait for a long time for the source star and the lensing object to align and then check an enormous amount of data. Ninety percent of observed stars pulsate for various other reasons, and only a minority of cases show the microlensing effect," says Dr. Marius Maskoliūnas, the head of the Lithuanian research team.

https://phys.org/news/2025-06-unique-method-astronomers-exceptional-planet.html

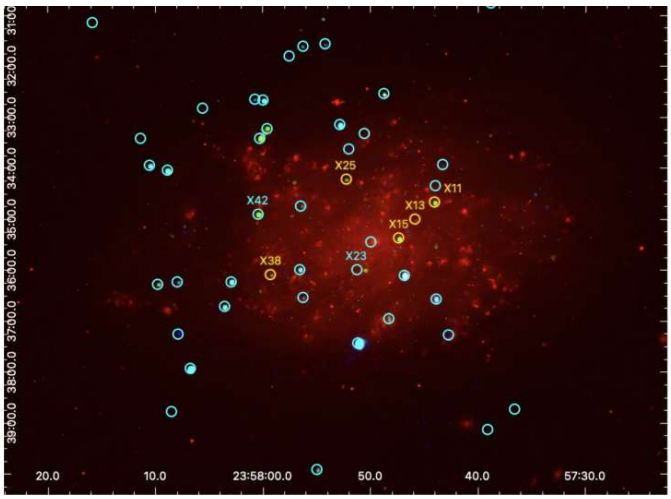
Largest Oort Cloud comet ever observed reveals its secrets under ALMA's powerful gaze

An artist rendition of comet C/2014 UN271, the largest known comet in the Oort Cloud. Credit: NSF/AUI/NSF NRAO/M.Weiss

A team of astronomers has made a groundbreaking discovery by detecting molecular activity in comet C/2014 UN271 (Bernardinelli-Bernstein)—the largest and second most distantly active comet ever observed from the Oort Cloud. Using the powerful Atacama Large Millimeter/submillimeter Array (ALMA) in Chile, researchers observed this giant comet while it was more than halfway to Neptune, at an astonishing distance of 16.6 times the distance between the sun and Earth. The find is reported in *The Astrophysical Journal Letters*. C/2014 UN271 is a true behemoth, measuring nearly 140 km across—more than 10 times the size of most known comets. Until now, little was known about how such cold, distant objects behave. The new observations revealed complex and evolving jets of carbon monoxide gas erupting from the comet's nucleus, providing the first direct evidence of what drives its activity so far from the sun.

https://phys.org/news/2025-06-largest-oort-cloud-comet-reveals.html

Four new X-ray supernova remnants detected in the galaxy NGC 7793



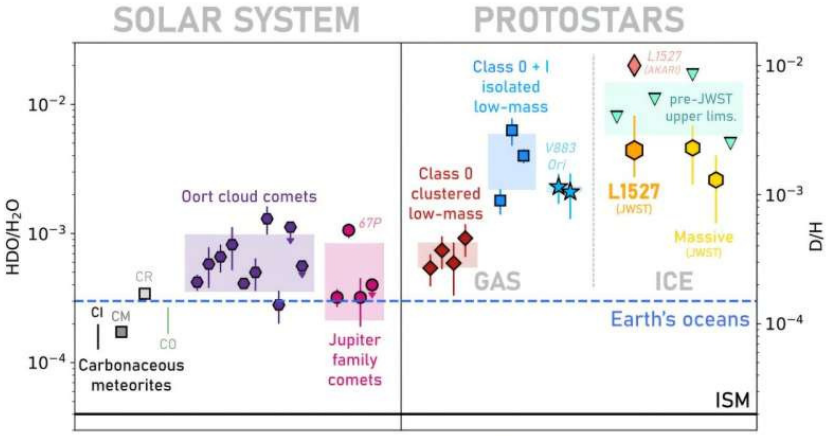
Composite X-ray optical image of NGC 7793 consisting of: Hα + [N II] (red), soft X-ray (0.5 - 1.2 keV; green), and medium + hard X-ray (1.2 - 7.0 keV; blue) of the OBSID 3954. All circles indicate the X-ray detected sources. The orange circles show the X-ray sources that coincide with optical SNRs. Credit: arXiv (2025). DOI: 10.48550/arxiv.2506.09120

Using NASA's Chandra spacecraft and ESA's XMM-Newton satellite, astronomers have investigated the galaxy NGC 7793, searching for supernova remnants (SNRs). As a result, they discovered four new X-ray SNRs in this galaxy. The findings were published June 10 on the *arXiv* pre-print server. SNRs are diffuse, expanding nebulae of gas and dust resulting from a supernova explosion. They usually last several hundred thousand years before dispersing into the interstellar medium (ISM). Detecting X-ray SNRs in other galaxies is crucial for understanding their feedback in different evolutionary phases and gaining insights into their local ISM. However, SNRs beyond the Local Group are rarely found, mainly due to the limited sensitivity of current X-ray instruments.NGC 7793 is a flocculent spiral galaxy at a distance of some 12 million light years. The galaxy is an excellent place to search for new X-ray supernova remnants as it hosts a large number of optical SNRs. That is why a team of astronomers led by Maria Kopsacheili of the Institute of Space Sciences (ICE-CSIC) in Barcelona, Spain, decided to look for X-ray SNRs in this galaxy using Chandra and XMM-Newton.

https://phys.org/news/2025-06-ray-supernova-remnants-galaxy-ngc.html

Semi-heavy water ice detected around young sunlike star for first time

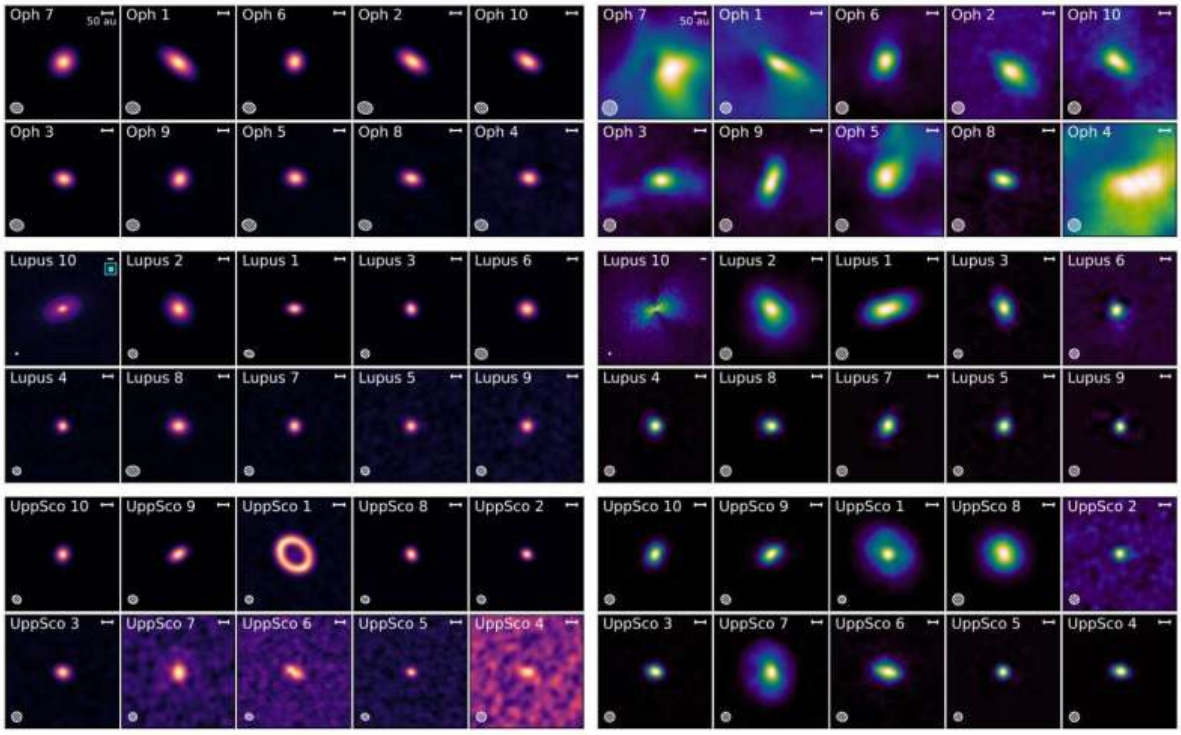
A team led by astronomers at Leiden University in the Netherlands and the National Radio Astronomy Observatory in Virginia (U.S.) have, for the first time, robustly detected semi-heavy water ice around a young sunlike star. The results strengthen the case that some of the water in our solar system formed before our sun and the planets. Their findings are published in *The Astrophysical Journal Letters*. One way that astronomers trace the origin of water is through measuring its deuteration ratio. That is the fraction of water that contains one deuterium atom instead of one of the hydrogens. So instead of H_2O, it's HDO, which is also called semi-heavy water. A high fraction of semi-heavy water is a sign that the water formed in a very cold place, such as the primitive dark clouds of dust, ice, and gas from which stars are born.



Comparison of HDO/H_2O ratios measured in various primitive solar system objects and toward protostars in both ices and the gas phase. The ice HDO/H_2O ratio of L1527 measured in this work using JWST data is indicated with the large orange hexagon. Credit: arXiv: DOI: 10.48550/arxiv.2505.14686

https://phys.org/news/2025-06-semi-heavy-ice-young-sunlike.html

By measuring gases around young stars, astronomers unlock major clues to planet formation



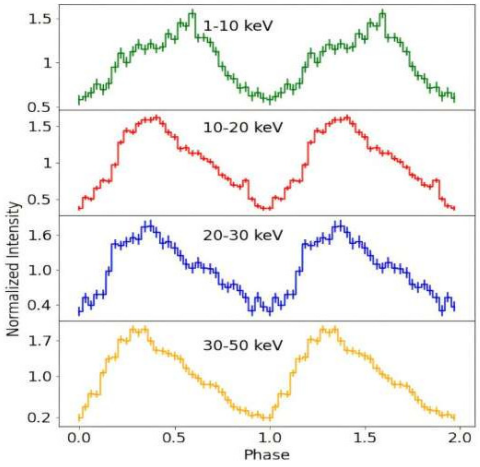
1.*3 mm (Left panels) and 12CO (2-1) moment zero images (Right panels) of the AGE-PRO sample. Credit: arXiv (2025). DOI: 10.48550/arxiv.2506.10719*

An international team of scientists led by astronomers from the University of Wisconsin–Madison has produced the most accurate measurement of the gases swirling around young stars and how their mass changes over time. The discovery joins many pieces of a puzzle that may reveal which kinds of planets form—rocky Earth-types, gas giants like Jupiter, or balls of ice in the Neptune mold—as star

systems mature. The researchers used an array of 66 massive radio telescopes, the Atacama Large Millimeter/submillimeter Array, perched at 4 900 metres in the Chilean Andes Mountains, to study the disks of gas spinning in the gravity of each of 30 young stars. "In order to know what type of planets and how many planets you can have in a system, the fundamental requirement is understanding the mass in the disk around the young star. We call those disks protoplanetary disks," says Ke "Coco" Zhang, professor of astronomy at UW–Madison and leader of the ALMA Survey of Gas Evolution of Protoplanetary Disks. The stars the researchers focused on ranged from less than 1 million years old to more than 5 million years old. That may sound ancient, but those are still diaper days for a star.

https://phys.org/news/2025-06-gases-young-stars-astronomers-major.html

Multiple X-ray quasi-periodic oscillations detected in X-ray binary IGR J19294+1816



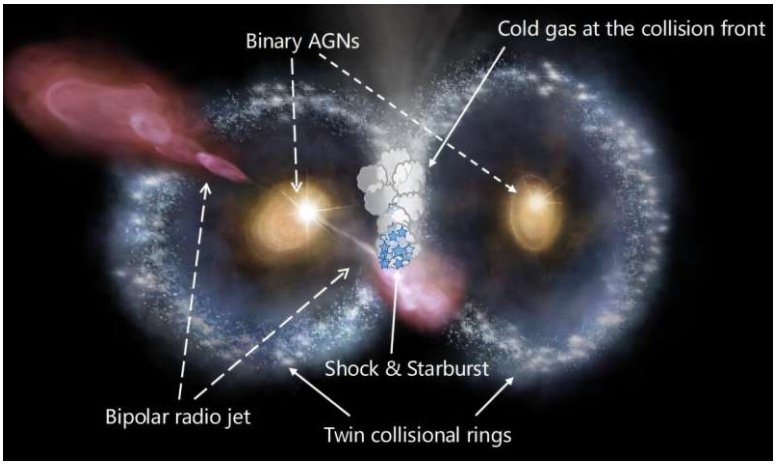
Pulse profiles of IGR J19294+1816 obtained from Insight-HXMT data in different energy bands. Credit: arXiv (2025). DOI: 10.48550/arxiv.2506.05771

Using the Hard X-ray Modulation Telescope (HXMT), astronomers have observed an X-ray binary system designated IGR J19294+1816. As a result, they discovered multiple X-ray quasi-periodic oscillations in this source. In general, X-ray binaries are systems composed of a normal star or a white dwarf transferring mass onto a compact neutron star or a black hole. Taking into account the mass of the companion star in XRBs, astronomers divide them into low-mass X-ray binaries (LMXBs) and high-mass X-ray binaries (HMXBs).The largest subgroup of HMXBs is known as Be/X-ray binaries (BeXRBs). They are composed of Be stars and, usually, neutron stars, including pulsars. Most of these binaries exhibit weak persistent X-ray emission interrupted by outbursts lasting several weeks.IGR J19294+1816 is a BeXRB at a distance of some 36,000 light years, discovered during an outburst in 2009. It showcases pulsations with a period of 12.4 seconds and long-term flux variability with an orbital period of approximately 117.2 days.

https://phys.org/news/2025-06-multiple-ray-quasi-periodic-oscillations.html

The Cosmic Owl: Astronomers discover a peculiar galaxy merger

An international team of astronomers reports the detection of a peculiar merger of two similar ring galaxies that morphologically resemble an owl's face. The discovery of this galaxy merger, dubbed the "Cosmic Owl," is presented in a research paper published June 11 on the *arXiv* preprint server. Galaxy mergers play a crucial role in the evolution of galaxies. These events redistribute the gas around galaxies, impact the stellar kinematics, transform galaxy morphology, and eventually lead to effective stellar mass assembly.



The schematic artistic view of the Cosmic Owl, consisting of twin collisional ring galaxies with binary AGN. Credit: arXiv (2025). DOI: 10.48550/arxiv.2506.10058

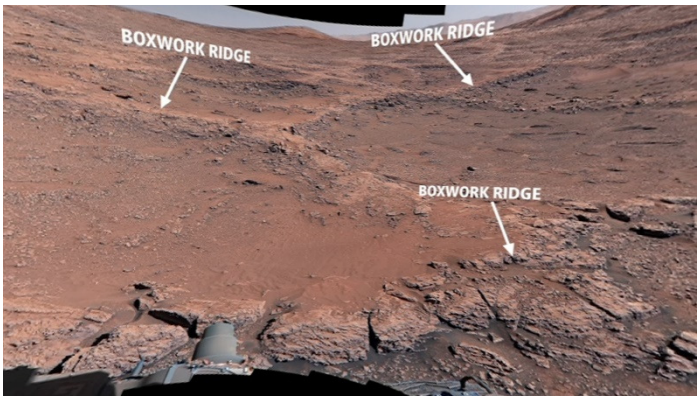
Some galaxy mergers lead to the formation of collisional ring galaxies (CRGs), which are relatively rare as only a few hundred of them have been detected in the local

universe. Rings in such galaxies are created when one galaxy passes directly through the disk of another in a nearly head-on collision, causing gas and stars to be shocked outward into a circular or near-circular pattern.

https://phys.org/news/2025-06-cosmic-owl-astronomers-peculiar-galaxy.html

Mars rover captures first close-up photos of giant 'spider webs' on the Red Planet

NASA's Curiosity rover has snapped its first images of web-like "boxwork" features on the surface of Mars. The zigzagging rocks could provide clues about the Red Planet's watery past and whether it once harboured extraterrestrial life.



New images from NASA's Curiosity rover show a series of "boxwork" ridges, which looks like large spider webs when viewed from above. (Image credit: NASA/JPL-Caltech/MSSS)

NASA's Curiosity Mars rover has taken the first ever close-up images of gigantic Martian "spider webs" on the Red Planet. The zigzagging ridges, which were left behind by ancient groundwater, could reveal more about Mars' watery past and provide clues about whether the planet once harboured extraterrestrial life, researchers say. The web-like features, known as "boxwork," are made up of criss-crossing ridges of mineral-rich rocks that infrequently litter the surface of Mars. The patterns can span up to 20 km across and look as if they have been spun by giant arachnids when viewed from space. Yet, until now, these structures have never been studied up close. Smaller boxwork formations are found on the walls of caves on Earth and form via a similar mechanism to stalagmites and stalactites. Scientists have suggested the same mechanism created these structures on Mars, only on a much larger scale.

https://www.livescience.com/space/mars/mars-rover-captures-first-close-up-photos-of-giant-spider-webs-on-the-red-planet

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