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

"The Southern Cross"

The Hermanus Astronomy Centre Monthly Newsletter

June 2025

MONTHLY MEETINGS

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

Our last meeting was held on **Tuesday 20th May**.

Dr Amanda Sickafoose, a long-standing member and friend of the HAC, presented an as yet unpublished overview of some of the research she and her team are currently engaged in. To name but one; DART (Double Asteroid Redirect Test) was a mission by NASA to launch a spacecraft to hit an asteroid that was orbiting another asteroid, the whole idea being that if there were an asteroid coming to hit the earth, could we stop it?

As mentioned above, this work is unpublished and the author has requested we do not copy it to the public domain (like YouTube). We are planning a private Zoom meeting, with Amanda's approval, restricted to the HAC membership, specifically for those who would like a review and for those who were unable to attend.

Further information on this plan will be advised on e-mail in due course.

On **Tuesday 17th June**, **Lindsey Magnis** of the **Square Kilometre Array (SKA)**. The topic will be posted as soon as available.

SPECIAL INTEREST GROUP ACTIVITIES

Cosmology

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

On Tuesday 6th May we watched and discussed episode 28: *"How Early could Life have Appeared in the Universe?*

Another excellent presentation and well worth a revisit:

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 3rd June**, will be episode 29 *"Are The First Stars Really Still Out There?"*

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

Study Group

This meeting is scheduled for the **Last Tuesday** of each month except December.

On **Tuesday 27th May** we watched **Eric H Cline's** YouTube presentation *"After 1177 BC"*.

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** June, 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 May.

Optimal dates for **June 2025**:

SUGGESTED EVENING OBSERVATION WINDOWS
(Lunar observations notwithstanding)

Date		*Moon*	*Dusk end*
June 16	*Rise*	**22h43 (71%)**	**19h10**
to June 27	*Set*	**19h54 (5%)**	**19h12**

Skynotes Moon: **Mare Nectaris**

Skynotes Object of the month: **Centaurus A** (The Hamburger Galaxy).

Moonwatch Within a few days either side of **June 3rd**, 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 June. 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

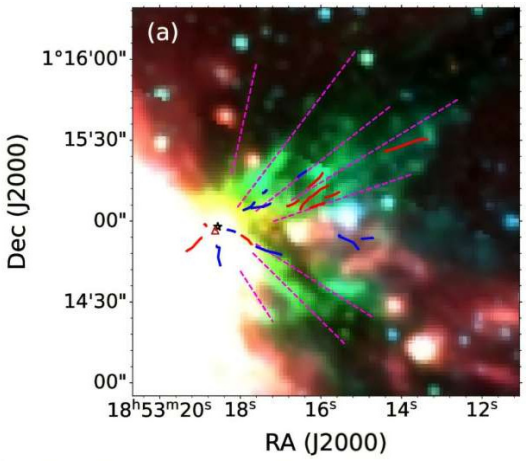
The Monthly Notes of the Astronomical Society of Southern Africa are available on

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

ASTRONOMY NEWS: May 2025 overleaf…

(Compiled by Pieter Kotzé)

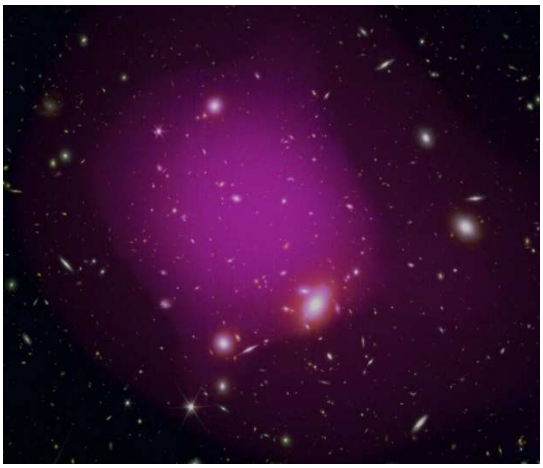
Astronomers discover explosive outflow in star-forming complex using ALMA data



Color-composite image of G34 from IRAC 3.6 μm (blue), 4.5 μm (green), and 8.0 μm bands. Credit: arXiv (2025). DOI: 10.48550/arxiv.2504.15748

By analyzing the data from the Atacama Large Millimeter/submillimeter Array (ALMA), astronomers have investigated a star-forming region known as G34.26+0.15. As a result, they discovered an explosive outflow in this complex. G34.26+0.15 (G34 for short) is a high-mass star-forming region at a distance of some 10,760 light years from the Earth. It is part of a large-scale star-forming filament, including the Infrared Dark Cloud IRDC G34.43+0.24.Previous observations of G34.26+0.15 have found that it contains four radio components, two of which are hypercompact (HC) regions of ionized atomic hydrogen (HII regions), and the others are a cometary ultracompact (UC) and a shell-like HII regions designated as A, B, C, and D. Recently, a team of astronomers led by Namitha Issac of the Shanghai Astronomical Observatory in China investigated archival ALMA data regarding G34.26+0.15, in order to shed more light on its properties. Their study, which was complemented by data from the Very Large Array (VLA) and the James Clerk Maxwell Telescope (JCMT), resulted in the detection of an outflow from this source.https://phys.org/news/2025-04-astronomers-explosive-outflow-star-complex.html

Astronomers observe largest ever sample of galaxies up to more than 12 billion light years away

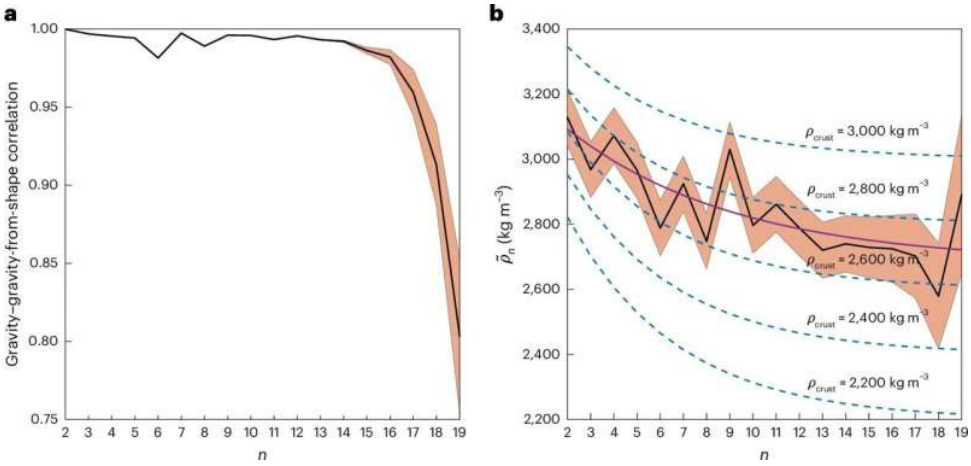


Group 15, a nearby group viewed 1.5 billion light-years away, shows the mature form of galaxy associations in the present-day universe—observed as they were 12.3 billion years into cosmic time. Credit: ESA/Webb, NASA & CSA, G. Gozaliasl, A. Koekemoer, M. Franco, K. Virolainen.

The largest sample of galaxy groups ever detected has been presented by a team of international astronomers using data from the James Webb Space Telescope (JWST) in an area of the sky called COSMOS Web. The study marks a major milestone in extragalactic astronomy, providing unprecedented insights into the formation and evolution of galaxies and the large-scale structure of the universe. Peering back in time to when the universe was younger than Earth is now, the images span the period from about 12 billion years ago until 1 billion years ago. The new catalog of images, soon to be published in the journal *Astronomy and Astrophysics*, includes nearly 1,700 galaxy groups. The research group's impressive image of a galaxy cluster more than 6 billion light years away will be showcased as the European Space Agency's (ESA) picture of the month from April 29."We're able to actually observe some of the first galaxies formed in the universe," says Ghassem Gozaliasl of Aalto University, and head of the galaxy groups detection team who led the study. "We detected 1,678 galaxy groups or proto-clusters—the largest and deepest sample of galaxy groups ever detected—with the James Webb Space Telescope. With this sample, we can study the evolution of galaxies in groups over the past 12 billion years of cosmic time."

https://phys.org/news/2025-04-astronomers-largest-sample-galaxies-billion.html

Vesta's missing core shatters long-held beliefs about the asteroid

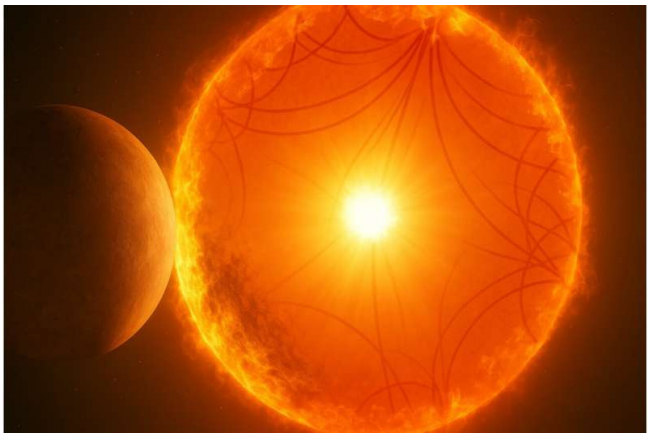


The correlation between gravity and gravity from shape, and effective density. Credit: Nature Astronomy (2025). DOI: 10.1038/s41550-025-02533-7

For decades, scientists believed Vesta, one of the largest objects in our solar system's asteroid belt, wasn't just an asteroid and eventually concluded it was more like a planet with a crust, mantle and core. Now, Michigan State University has contributed to research that flips this notion on its head. A team led by the NASA Jet Propulsion Lab, or JPL, authored a paper published in *Nature Astronomy*, that reveals Vesta doesn't have a core. These findings startled researchers who, until that point, assumed Vesta was a protoplanet that never grew to a full planet."The lack of a core was very surprising," said MSU Earth and Environmental Sciences Assistant Professor Seth Jacobson, a co-author on the paper. "It's a really different way of thinking about Vesta."What is Vesta's true identity? The research team has two hypotheses that need further exploration. The first possibility is Vesta went through incomplete differentiation, meaning it started the melting process needed to give the asteroid distinct layers, like a core, mantle and crust, but never finished. The second is a theory Jacobson floated at an astronomy conference years ago—Vesta is a broken chunk off a growing planet in our solar system. https://phys.org/news/2025-04-vesta-core-shatters-held-beliefs.html

Astronomers tune into the music of a nearby star to unlock a surprising discovery

Astronomers using W. M. Keck Observatory on Maunakea, Hawai‘i Island have listened to the music of a nearby star, uncovering surprises that shake our understanding of how stars work. The study used Keck Observatory's latest cutting-edge instrument, the Keck Planet Finder (KPF), to detect oscillations rippling through a star. The findings, published today in *The Astrophysical Journal*, open a new window into the interiors of stars that were once thought too quiet to probe.



Credit: Gabriel Perez Diaz/Instituto de Astrofísica de Canarias/W. M. Keck Observatory

Keck Observatory's KPF instrument precisely measures the motion of the stellar surface toward and away from the observer. Over four consecutive nights, the team used KPF to collect over 2,000 ultra-precise velocity measurements of the star—enabling them to catch the star's vibrations in action. This is the first asteroseismic inference of the age and radius for a cool star using KPF. Using the oscillations detected in HD 219134, the team determined its age to be 10.2 billion years, more than twice the age of our sun. This makes it one of the oldest main-sequence stars with an age determined using asteroseismology.

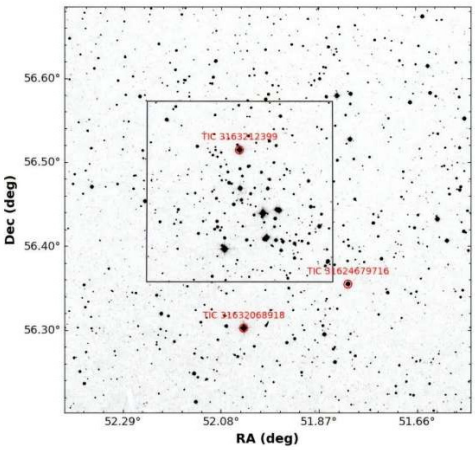
https://phys.org/news/2025-05-astronomers-tune-music-nearby-star.html

Astronomers solve long-standing mystery of massive star formation using interstellar ammonia

Ammonia gas infalling into accretion disk feeding Cepheus A HW2. Credit: NSF/AUI/NSF NRAO/B. Saxton

Using the National Radio Astronomy Observatory's Very Large Array, astronomers have revealed for the first time the huge flow of gas near a massive star in the making that allows its rapid growth. By observing the young star HW2 in Cepheus A, located 2,300 light years from Earth, researchers have resolved the structure and dynamics of an accretion disk feeding material to this massive star. This finding sheds light on a central question in astrophysics: how do massive stars, which often end their lives as supernovae, accumulate their immense mass? The research has been accepted for publication in *Astronomy & Astrophysics* and is available on the *arXiv* preprint server. Cepheus A is the second closest site of massive star formation to Earth, making it an ideal laboratory for studying these challenging processes. The research team used ammonia (NH_3), a molecule commonly found in interstellar gas clouds and widely used industrially on Earth, as a tracer to map the gas dynamics around the star. https://phys.org/news/2025-05-astronomers-mystery-massive-star-formation.html

Open cluster King 6: Astronomers find three new variable stars



Identification chart for the cluster King 6, taken from SDSS. Rectangular box outlines observed region, while the red circles highlight position of variable stars. Credit: arXiv (2025). DOI: 10.48550/arxiv.2504.18088

Using the 104-cm Sampurnanand optical telescope, Indian astronomers have performed photometric observations of an open cluster named King 6, which resulted in the detection of three new variable stars in the field of this cluster. Open clusters (OCs), formed from the same giant molecular cloud, are groups of stars loosely gravitationally bound to each other. So far, more than 1,000 of them have been discovered in the Milky Way, and scientists are still looking for more, hoping to find a variety of these stellar groupings. Expanding the list of known galactic open clusters and studying them in detail could be crucial for improving our understanding of the formation and evolution of our galaxy. King 6 is a Galactic open cluster at a distance of about 2,357 light years. Very little is known about this cluster as previous observations have only found that it has a color excess of 0.55, mass function slope at a level of 1.29 and its age was estimated to be some 200 million years. https://phys.org/news/2025-05-cluster-king-astronomers-variable-stars.html

Another first: Webb identifies frozen water in young star system

For the first time, researchers confirmed the presence of crystalline water ice in a dusty debris disk that orbits a sun-like star, using NASA's James Webb Space Telescope. All the frozen water detected by Webb is paired with fine dust particles throughout the disk. The majority of the water ice observed is found where it's coldest and farthest from the star. The closer to the star the researchers looked, the less water ice they found. Credit: NASA, ESA, CSA, Ralf Crawford (STScI)

Is frozen water scattered in systems around other stars? Astronomers have long expected it is, partially based on previous detections of its gaseous form, water vapour, and its presence in our own solar system. Now there is definitive evidence: Researchers confirmed the presence of crystalline water ice in a dusty debris disk that orbits a sun-like star 155 light-years away using detailed data known as spectra from NASA's James Webb Space Telescope. (The term water ice specifies its makeup, since many other frozen molecules are also observed in space, such as carbon dioxide ice, or "dry ice.") In 2008, data from NASA's retired Spitzer Space Telescope hinted at the possibility of frozen water in this system. "Webb unambiguously detected not just water ice, but crystalline water ice, which is also found in locations like Saturn's rings and icy bodies in our solar system's Kuiper Belt," said Chen Xie, the lead author of the new paper and an assistant research scientist at Johns Hopkins University in Baltimore, Maryland. https://phys.org/news/2025-05-webb-frozen-young-star.html

NASA Observes First Visible-light Auroras at Mars

NASA's Perseverance Mars rover made history by detecting them for the first time from the surface of another planet, and MAVEN confirmed the detection. On March 15, 2024, near the peak of the current solar cycle, the Sun produced a solar flare and an accompanying coronal mass ejection (CME), a massive explosion of gas and magnetic energy that carries with it large amounts of solar energetic particles. This solar activity led to stunning auroras across the solar system, including at Mars, where NASA's Perseverance Mars rover made history by detecting them for the first time from the surface of another planet. Due to the Red Planet's lack of a global magnetic field, Mars has different types of auroras than those we have on Earth. One of these is solar energetic particle (SEP) auroras, which NASA's MAVEN (Mars Atmosphere and Volatile EvolutioN) mission discovered in 2014. These occur when super-energetic particles from the Sun hit the Martian atmosphere, causing a reaction that makes the atmosphere glow across the whole night sky. While MAVEN had observed SEP auroras in ultraviolet light from orbit, this phenomenon had never been observed in visible light from the ground.

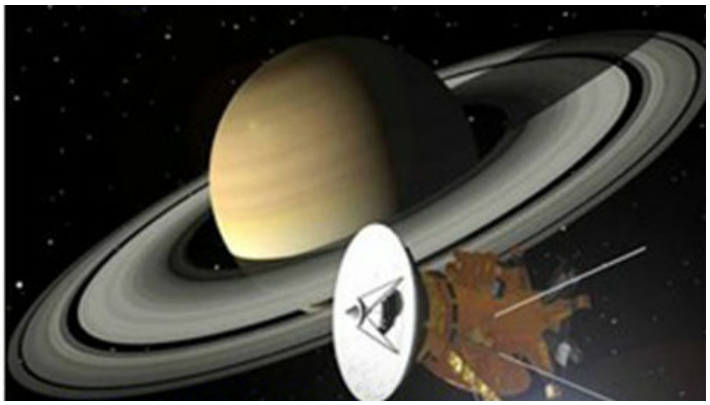
https://www.spacedaily.com/reports/NASA_Observes_First_Visible_light_Auroras_at_Mars_999.html

Webb Uncovers New Mysteries in Jupiter's Aurora

The James Webb Space Telescope, a collaboration between NASA, ESA, and CSA, has provided fresh insights into the intense auroras that dance around Jupiter, the largest planet in our Solar System. These auroras, hundreds of times brighter than those on Earth, have been studied with Webb's highly sensitive instruments, revealing previously unseen details. Jupiter's auroras form when high-energy particles enter the planet's atmosphere near its magnetic poles and collide with gas atoms. Unlike Earth's auroras, which are driven mainly by solar storms, Jupiter's immense magnetic field draws in charged particles not only from the solar wind but also from its volcanic moon Io. Io's volcanic eruptions eject particles that can escape the moon's gravity and enter Jupiter's magnetosphere, adding to the auroral spectacle. As these particles are accelerated to extreme speeds, they collide with Jupiter's atmosphere, generating the powerful light displays observed. Webb's Near-InfraRed Camera (NIRCam) captured this dynamic activity on Christmas Day 2023. Their findings reveal that the trihydrogen ion (H3+) emissions are far more variable than previously thought, providing new clues about the heating and cooling processes in Jupiter's upper atmosphere.
https://www.spacedaily.com/reports/Webb_Uncovers_New_Mysteries_in_Jupiters_Aurora_999.html

https://phys.org/news/2025-05-webb-reveals-mysteries-jupiter-aurora.html

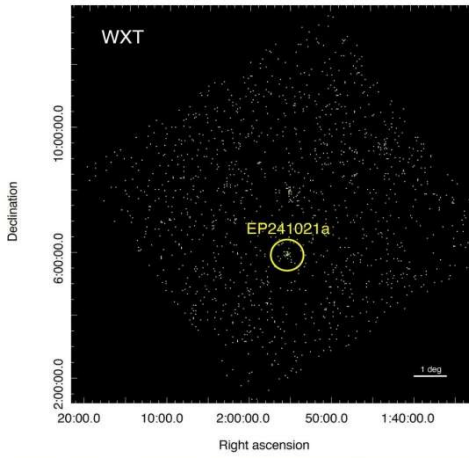
Webb Observations Reveal Active Methane Cycle and Atmospheric Dynamics on Titan



A team of researchers has used data from the James Webb Space Telescope (JWST) and the Keck II telescope to observe cloud convection on Titan, Saturn's largest moon, in its northern hemisphere for the first time. This is significant, as most of Titan's lakes and seas are found in this region, likely replenished by occasional methane and ethane rain. The findings provide new insights into the complex atmospheric processes on this distant world. Titan, the only known moon in the Solar System with a dense atmosphere and liquid bodies on its surface, features a weather system driven by methane rather than water. Methane evaporates from Titan's frigid surface, rises into the atmosphere, condenses into clouds, and occasionally falls back as a chilly, oily rain. This cycle is similar to Earth's hydrological cycle but involves methane and ethane, compounds that are gases at Earth-like temperatures. The team observed Titan in November 2022 and July 2023 using both the JWST and the ground-based W.M. Keck Observatory. These observations revealed clouds at mid and high northern latitudes, where Titan is currently experiencing summer. Notably, the clouds appeared to rise to higher altitudes over time, suggesting active convection. This is the first time such atmospheric behavior has been detected in Titan's northern hemisphere, where most of its methane-rich lakes and seas are located, potentially serving as a significant methane source.

https://www.spacedaily.com/reports/Webb_Observations_Reveal_Active_Methane_Cycle_and_Atmospheric_Dynamics_on_Titan_999.html

Einstein Probe detects a peculiar X-ray transient

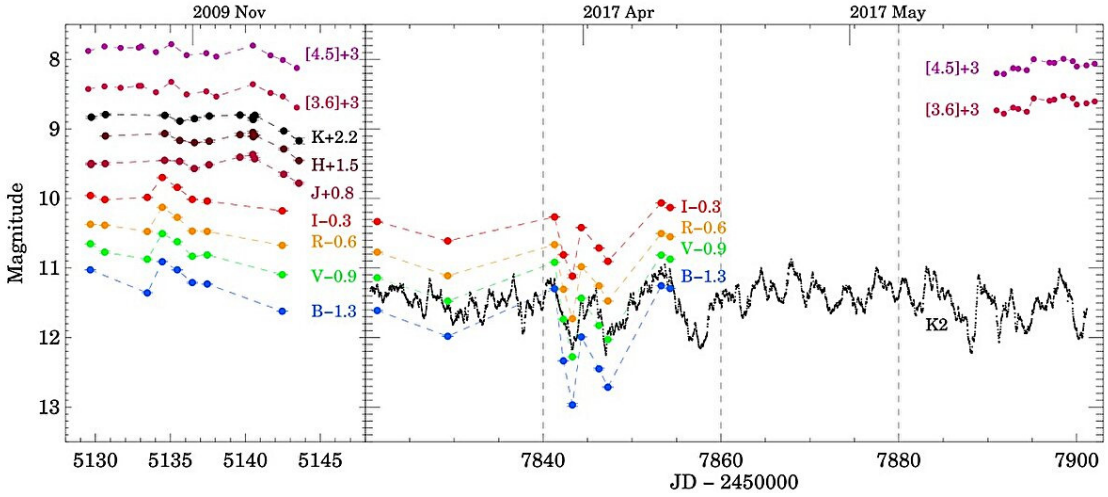


The image of EP241021a detected in one of the WXT CMOS detectors. Credit: arXiv (2025). DOI: 10.48550/arxiv.2505.07665

An international team of astronomers using the Einstein Probe reports the discovery of a new peculiar fast-evolving X-transient. The newfound transient exhibits an unprecedented long-lasting X-ray emission. The finding was detailed in a paper published May 12 on the *arXiv* preprint server. Intense bursts of soft X-ray emission lasting tens to thousands of seconds with a wide range of luminosities are known as fast-evolving X-ray transients (FEXTs). The nature of FEXTs is still puzzling. However, astronomers trying to explain their origin take into account several scenarios; for instance, stellar flares, supernova shock breakouts, or long gamma-ray bursts (GRBs).One of the crucial space telescopes for the search and investigation of FEXTs is the Einstein Probe (EP), also known as the Tianguan telescope. Launched into space in early 2024, EP is capable of determining the temporal evolution properties of the afterglow X-ray emission in FEXTs, including the duration, the shape of light curve, and spectral evolution, which is essential to understanding the origin of these transients.

https://phys.org/news/2025-05-einstein-probe-peculiar-ray-transient.html

Multiwavelength observations investigate the variability of young star DR Tauri



Optical and mid-infrared light curves of DR Tauri. The small black dots are the Kepler K2 data with 30 minute cadence, the large filled circles are multiband optical photometry from Konkoly Observatory, and the pink and purple circles represent the Spitzer observations. Credit: arXiv (2025). DOI: 10.48550/arxiv.2505.07684

Using various ground-based and space telescopes, an international team of astronomers has observed a highly variable young star known as DR Tauri. Results of the observational campaign, published May 12 on the *arXiv* preprint server, provide crucial information regarding the short- and long-term variability of this star.Classical T Tauri stars (CTTSs) are newly-formed, low-mass stars surrounded by protoplanetary disks. They are characterized by the presence of strong emission lines and large variations in brightness, which may be both periodic and random. DR Tauri is a CTTS located in the Taurus star-forming region, some 610 light years away. The star has a spectral type of K5 to M0, a radius of 1.46 solar radii, and its effective temperature is estimated to be 4,100 K.DR Tauri has been monitored for decades, and previous observations have found that it showcases irregular light variations on multiple timescales. For instance, it displays quasi-periodic signals in the range of 2–10 days, or its strong emission lines, such as the hydrogen Balmer lines, show significant variations.

https://phys.org/news/2025-05-multiwavelength-variability-young-star-dr.html

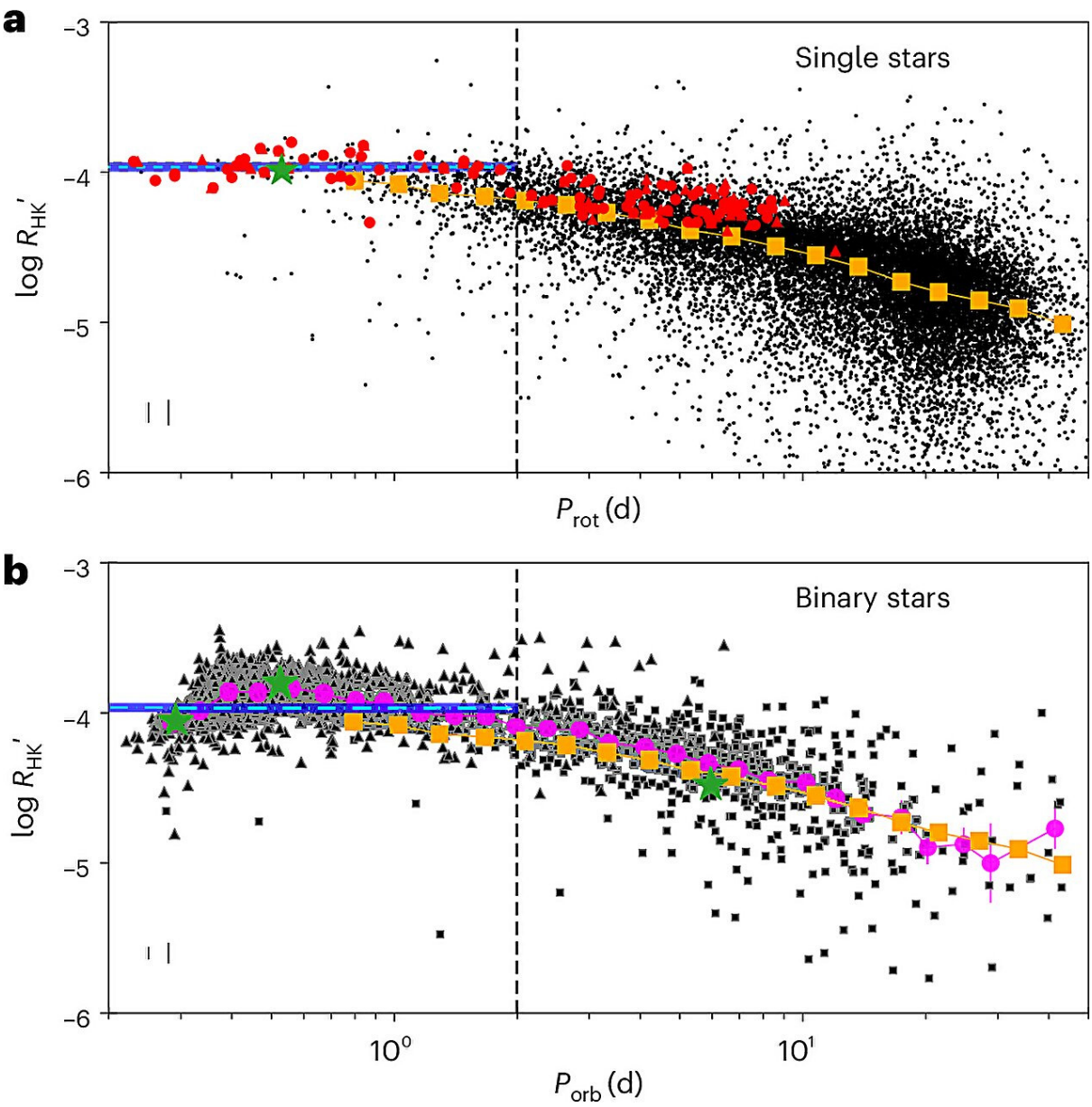
Pairs of stars that orbit each other exhibit unexpected magnetic activity

A new study published in *Nature Astronomy*, led by Dr. Jie Yu, from the Australian National University, reveals that stars in close binary systems—pairs of stars orbiting each other at close range—can exhibit unexpectedly high levels of magnetic activity. This activity, responsible for flares, sunspots, and other energetic outbursts, is usually powered by the star's rotation. For single stars, surface magnetic activity increases with stellar rotation rate, but only up to a known limit, beyond which activity saturates.

Comparison of magnetic activity between single and binary stars. Credit: Nature Astronomy (2025). DOI: 10.1038/s41550-025-02562-2

Using data from China's LAMOST telescope and Europe's Gaia space observatory, Dr. Yu's team found that close binary stars break this rule. Instead of levelling off, many of these stars show even stronger magnetic activity. And in the most extreme cases—where stars spin especially fast (orbital period < 0.5 days)—the activity curiously begins to decline, a phenomenon known as supersaturation. The findings suggest that tidal forces between closely orbiting stars can amplify or reshape their magnetic behaviour. Understanding these effects offers new insight into stellar evolution and the magnetic environments that surround stars—an important factor in determining the habitability of exoplanets.

https://phys.org/news/2025-05-pairs-stars-orbit-unexpected-magnetic.html


a
Single stars
log R'_{HK}
−3
−4
−5
−6
P_{rot} (d)
b
Binary stars
log R'_{HK}
−3
−4
−5
−6
10^0
10^1
P_{orb} (d)

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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)