# "The Southern Cross"



# The Hermanus Astronomy Centre Newsletter

# **MARCH 2024**

Please note that all our regular meetings are scheduled for **TUESDAYS**, commencing at **18.00** (**6 pm**) unless otherwise advised. The day and date may change from time to time according to the current Hermanus load shedding status and/or according to venue availability for a physical meeting; such changes will be notified via e-mail and on our website.

# MONTHLY MEETINGS

Monthly Meetings are held on the **Third Tuesday** of each month except December.

Our last meeting, our **Annual General Meeting**, was held on **February 20<sup>th</sup>**. Many thanks to all the attendees, both physical at the Catholic Church Hall and virtual on Zoom.

The next Monthly Meeting is on **Tuesday March 19<sup>th</sup>** and will take place at **Onrus Manor.** A Zoom invite will be available on request to those who cannot make it in person. We shall be commencing at **18.00 (6 pm)**.

Narusha Isaacs-Klein will provide an overview of the *Square Kilometre Array* (SKA) and delve into



An antenna of the Sauare Kilometre Arrav

South Africa's rich astronomical history, emphasizing its contributions to the field. Narusha is deeply involved in empowering the youth in her community, fostering a passion for higher education. Her dedication extends to both astrophysics and education, where she strives to make a positive impact. Her commitment to research and community empowerment reflects her mission to advance knowledge and inspire future astronomers.

She'll also highlight the upcoming International Astronomical Union (IAU) conference in Cape Town in 2024.

# SPECIAL INTEREST GROUP ACTIVITIES

# **Cosmology**

These meetings are scheduled for the **First Tuesday** of each month except January. We commence at **18.00** (6 pm).

On **Tuesday February 6<sup>th</sup>**, in episode 16 of "THE ENTIRE HISTORY OF THE UNIVERSE", we watched "*Where are all the Hidden Dimensions?*"

Herewith the YouTube video link:

https://www.youtube.com/watch?v=SedW4SdXNHU&list=PLROBLlvnR7BEF9b1NOvRf\_zhboibmywJb&index=14

and the YouTube discussion link:

https://www.youtube.com/watch?v=E-IQ\_xbsnk0

The transcript of this episode is also attached to this e-mail.

The next episode of the "THE ENTIRE HISTORY OF THE UNIVERSE" series is episode 17 "*What Actually are Space and Time?*" - scheduled for **Tuesday March 5**<sup>th</sup>.

The series now continues for another 16 episodes to # 33.

For further information, please contact Derek Duckitt: <u>derek.duckitt@gmail.com</u>.

# Astrophotography

This SIG is no longer scheduled but can be arranged as requested by group members.

For further information, contact Deon Krige: <u>krige.deon44@outlook.com</u> and please keep an eye on our website calendar and our e-mail notices and invites.

# Study Group

Scheduled for the Last Tuesday of each month.

Our February meeting was cancelled; the next is scheduled for **26<sup>th</sup> March**, the topic yet to be decided.

For further information regarding Study Group, please contact Peter Harvey petermh@hermanus.co.za

# **Observing**

This section includes recommended dates for **Stargazing**, **Moonwatch**, **Meteors**, **Solar observation** and whatever else deserves a close look.

For quick reference:

Optimal dates for MARCH 2024:

SUGGESTED EVENING OBSERVATION WINDOW

(Lunar observations notwithstanding)

Date	Moon		Dusk end
2 <sup>nd</sup> March	Rises	22h48 (60%)	20h44
13 <sup>th</sup> March	Sets	20h57 (13%)	20h28

Moonwatch – a few days either side of the First Quarter (Sunday March 17<sup>th</sup>)

No centre Stargazing or Moonwatch activities are planned at the moment. They do tend to be arranged at short notice for weather considerations. Please watch our activities calendar on the website – <u>https://www.hermanusastronomy.co.za/</u>

**Eclipses** – None observable from southern Africa. A total Solar Eclipse will be visible from Mexico, USA and Canada on 8<sup>th</sup> April 2024.

Astronomy Magazine https://www.google.com/imgres?imgurl=https%3A%2F%2Fwww.astronomy.com%2Fwpcontent%2Fuploads%2Fsites%2F2%2F2023%2F04%2FASYPL0323\_02.jpg%3Fw%3D600%26resize%3D 600%252C388&tbnid=ggwgaE3CpE5K6M&vet=12ahUKEwjSzMaNscaEAxUymicCHQH6CyEQMygDeg QIARB3..i&imgrefurl=https%3A%2F%2Fwww.astronomy.com%2Fobserving%2Fhow-when-and-whereto-see-the-2024-total-solareclipse%2F&docid=D8Wxf7OchWaJQM&w=600&h=388&q=solar%20eclipse%202024&client=firefox-bd&ved=2ahUKEwjSzMaNscaEAxUymicCHQH6CyEQMygDegQIARB

I shall circulate a link to watch on the internet closer to the time.

According to the **Royal Museum of Greenwich**, UK residents could see a *partial* solar eclipse on 8<sup>th</sup> April 2024.

 The Sun The Sun and Auroral Activity: Daily solar activity and predictions for auroral activity can be found at the following website:

 https://www.spaceweatherlive.com/en/solar-activity.html

Meteors -The gamma Normids will commence on Sunday March 25th but will peak on March<br/>14th. A not very intense shower.

For the dedicated meteor enthusiast, please see page 5 in the March *Skynotes* and in the 2024 Sky Guide p. 86.

#### Future Trips

No outings are planned at present.

# ASTRONOMY NEWS: FEBRUARY 2024

#### (Compiled By Pieter Kotzé)

#### IXPE investigates micro-quasar jets, finds unexpected magnetic field structure

Recently, a team of scientists utilized the X-ray capabilities of NASA's Imaging X-ray Polarimetry Explorer (IXPE) observatory to investigate how cosmic rays within black hole jets are created. More specifically, the team investigated Stephenson and Sanduleak 433 (SS 433), a microquasar comprised of a black hole pulling in material from a nearby star.

SS 433 is the first microquasar ever discovered and is located in the centre of supernova remnant W50, also known as the "Manatee Nebula," which is located within the constellation Aquila, approximately 18 000 light-years away from Earth. SS 433 contains extremely powerful jets that move at velocities greater than 77 249 km per second — roughly 26% the speed of light. In fact, the jets are responsible for the manatee-shape of W50.



Labelled composite image of supernova remnant W50 showing the location of SS 433's black hole and jet. (Credit: (IXPE) NASA/MSFC/IXPE; (Chandra) NASA/CXC/SAO; (XMM) ESA/XMM-Newton; (Infrared) NASA/JPL/Caltech/WISE; (Radio) NRAO/AUI/NSF/VLA/B. Saxton; (Infrared/Radio Image) M. Goss et al.; (Image Processing) NASA/CXC/SAO/N. Wolk/K. Arcand)

As mentioned, to investigate the jets of SS 433, the scientists, led by IXPE principal investigator Philip Kaaret of NASA's Marshall Space Flight Center in Alabama, utilized IXPE and its suite of telescopes. IXPE's three telescopes measured the polarization — a special property of X-ray light

that allows scientists to understand the organization and alignment of electromagnetic waves at X-ray frequencies — of the jets to better understand the physical processes that were occurring in and around SS 433, as well as how particles were being accelerated within the jets. The results from IXPE showed that the magnetic field around SS 433 is surprisingly intact and organized. For decades, scientists have theorized that when the jets interact with the surrounding interstellar medium, a type of shock would be created, thus creating disordered and messy magnetic fields.

https://www.nasaspaceflight.com/2024/01/ixpe-ss433/

#### New Findings from Ryugu Samples Reveal Cometary Organic Matter



In a recent development that adds another layer to our understanding of the solar system's complexity, researchers have uncovered intriguing evidence from the asteroid Ryugu. This near-Earth asteroid, which came into the spotlight following the successful Hayabusa2 mission by the Japan Aerospace Exploration Agency (JAXA), continues to offer rich insights, particularly about the presence and transportation of organic materials in space.

A carbonaceous material found in the melt splash. The carbonaceous material shows spongy texture and contains small iron sulphide inclusions. This is similar to the primitive organic matters found in cometary dust. Megumi Matsumoto et al.

https://www.spacedaily.com/reports/New\_Findings\_from\_Ryugu\_Samples\_Reveal\_Cometary\_Organic\_Matter\_999.ht ml

#### 2" 0.3-2.0 keV 0

Study explores spectacular ionization cones of the galaxy NGC 5252

Chandra ACIS-S image showing the nuclear region of NGC 5252 in soft X-ray band (0.3–2.0 keV). The image is overlaid with the contours of [OIII] emission from the continuum subtracted HST image. Credit: arXiv (2024). DOI: 10.48550/arxiv.2401.09172

The nearby lenticular galaxy NGC 5252 hosts extremely extended cones of ionized material. Recent observations conducted by an international team of astronomers have inspected these remarkable structures. providing important insights into their properties. Results of the observational campaign were published January 17 on the

pre-print server *arXiv*. Ionization cones are cones of ionized material extending from <u>active galactic nuclei</u> (AGN). They reach sizes of tens of thousands of <u>light years</u> and are observed mainly in type II Seyfert galaxies. Studies of these structures could help us better understand the interactions between AGN and their host galaxies. One of the largest ionization cones in the local universe is located in NGC 5252—a type 1.9 Seyfert galaxy at a distance of about 329 million light years away. Previous observations of the ionization cones in NGC 5252 have found that they extend over 130 000 light years across and are composed of several arcs confined in a bi-cone encircling the galaxy's nucleus. <u>https://phys.org/news/2024-01-explores-spectacular-ionization-cones-galaxy.html#google\_vignette</u>

#### 'Old smokers': Strange new type of star discovered in Milky Way



#### Astronomers have nicknamed the stars "old smokers"

Nearing the end of their life, they sit quietly for long periods of time, barely noticeable, before suddenly puffing out a cloud of smoke. A mysterious new type of star nicknamed "old smoker" has been discovered hiding in the heart of our Milky Way galaxy, astronomers revealed. The "peculiar" puffing behaviour of these stars has never been seen before in such red giants, astrophysicist Philip Lucas told AFP. The international team of scientists behind the discovery had not been looking for such old stars during their 10-year survey, which took in hundreds of millions of stars across the sky. Instead, they were using the VISTA telescope in the Chilean Andes to search for newborn stars-

called proto-stars—which are prone to frequent, exuberant eruptions. <u>https://phys.org/news/2024-01-smokers-strange-star-milky.html</u>

https://www.sciencealert.com/astronomers-see-a-new-type-of-hidden-star-for-the-first-time

#### New Wolf in the pack: Astronomers discover an ultra-short-period super-Earth



TESS phase-folded light curve of Wolf 327 b after subtracting the photometric variations from the time series (top panel). The best-fit transit model is shown in black, the circles are TESS binned observations. Bottom panel: residuals of the fit. Credit: Murgas et al., 2024.

Using NASA's Transiting Exoplanet Survey Satellite (TESS), an international team of astronomers has discovered a new ultra-short-period exoplanet. The newfound alien world, designated Wolf 327 b, is slightly larger and about 2.5 times more massive than the Earth. The finding was reported in a paper published

January 22 on the pre-print server *arXiv*. To date, TESS has identified over 7 000 candidate exoplanets (TESS Objects of Interest, or TOI), of which 415 have been confirmed so far. Since its launch in April 2018, the spacecraft has been conducting a survey of about 200 000 of the brightest stars near the sun with the aim of searching for transiting exoplanets—ranging from small, rocky worlds to gaseous giants. https://phys.org/news/2024-01-wolf-astronomers-ultra-short-period.html#google\_vignette

#### Study: Stars travel more slowly at Milky Way's edge



A study by MIT physicists suggest the Milky Way's gravitational core may be lighter in mass, and contain less dark matter, than previously thought

By clocking the speed of stars throughout the Milky Way galaxy, MIT physicists have found that stars further out in the galactic disk are traveling more slowly than expected compared to stars that are closer to the galaxy's center. The findings raise a surprising possibility: The Milky Way's gravitational core may be lighter in mass, and contain less dark matter, than previously thought. The new results are based on the team's analysis of data taken by the Gaia and APOGEE instruments. Gaia is an orbiting space telescope that tracks the precise location, distance,

and motion of more than 1 billion stars throughout the Milky Way galaxy, while APOGEE is a groundbased survey. The physicists analyzed Gaia's measurements of more than 33 000 stars, including some of the farthest stars in the galaxy, and determined each star's "circular velocity," or how fast a star is circling in the galactic disk, given the star's distance from the galaxy's centre.

The scientists plotted each star's velocity against its distance to generate a rotation curve - a standard graph in astronomy that represents how fast matter rotates at a given distance from the centre of a galaxy. The shape of this curve can give scientists an idea of how much visible and dark matter is distributed throughout a galaxy.

https://www.spacedaily.com/reports/Study\_Stars\_travel\_more\_slowly\_at\_Milky\_Ways\_edge\_999.html

# ALMA spots the shadow of a molecular outflow from a quasar when the universe was less than 1 billion years old



A group of ALMA 12-m antennas observing the night sky. Observations in this study were made using the 12-m antennas. Credit: Photo: ESO/Y. Beletsky

Theoretical predictions have been confirmed with the discovery of an outflow of molecular gas from a quasar when the universe was less than a billion years old. A team of researchers led by Assistant Professor Dragan Salak at Hokkaido University, Assistant Professor Takuya Hashimoto at the University of Tsukuba, and Professor Akio Inoue at Waseda University, has discovered the first evidence of suppression of star formation driven by an outflow of molecular

gas in a quasar-host galaxy in the early universe. Their findings, based on observations they made using the Atacama Large Millimeter/submillimeter Array (ALMA), in Chile, were published in The Astrophysical Journal. Molecular gas is vital to the formation of stars. As the primary fuel of star formation, the ubiquity and high concentrations of molecular gas within a galaxy would lead to a vast number of stars being formed. By ejecting this gas into intergalactic space faster than it could be consumed by star formation, molecular outflows effectively suppress the formation of stars galaxies that host in quasars. https://phys.org/news/2024-01-alma-shadow-molecular-outflow-quasar.html

#### A new kink in proton spectrum to enhance our knowledge of cosmic ray origin



A view of the GRAPES-3 experiment in Ooty, India depicted with a simulated cosmic ray shower. Results of cosmic ray proton spectrum measurement by GRAPES-3 along with space and ground-based experiments are shown. Credit: TIFR

The GRAPES-3 experiment in Ooty, India, operated by the Tata Institute of Fundamental Research has discovered a new feature in the cosmic-ray proton spectrum at about 166 tera-electron-volt (TeV) energy while measuring the spectrum spanning from 50 TeV

to a little over 1 peta-electron-volt (PeV). The observed feature suggests a potential re-evaluation of our understanding of cosmic-ray sources, acceleration mechanisms, and their propagation within our galaxy.<u>https://phys.org/news/2024-02-kink-proton-spectrum-knowledge-cosmic.html</u>



#### Event Horizon Telescope spies jets erupting from nearby supermassive black hole

Zooming into Perseus A with the Event Horizon Telescope reveals details of the powerful jet it is launching.(Image credit: Georgios Filippos Paraschos (MPIfR))

Astronomers have observed a supermassive black hole in Earth's cosmic backyard as it blasts out jets of matter at near-light speeds. These outflows tell the tale of a battle for supremacy between magnetism and gravity. The discovery could help scientists better understand how black holes feed on matter and eject powerful jets that extend far beyond their host galaxies. The team of

astronomers made the observations of the heart of the <u>radio galaxy</u> 3C 84, also known as Perseus A, a region powered by a <u>feeding supermassive black hole</u>, using the <u>Event Horizon Telescope</u> (EHT). The EHT, a global array of linked-up radio dishes, produced the <u>first images of a black hole</u> ever seen by humanity.

#### Team of astronomers discovers galaxy that shouldn't exist



A colour-composite image of PEARLSDG made with JWST NIRCAM data. Individual stars are visible as small points of light in the image. Its somewhat dull colour and lack of many bright stars is consistent with its old age and lack of ongoing star formation. Credit: NASA, ESA, CSA, Jake Summers (ASU), Jordan C. J. D'Silva (UWA), Anton M. Koekemoer (STScI), Aaron Robotham (UWA) and Rogier Windhorst (ASU)

A team of astronomers, led by Arizona State

University Assistant Research Scientist Tim Carleton, has discovered a dwarf galaxy that appeared in James Webb Space Telescope imaging that wasn't the primary observation target. Galaxies are bound together by gravity and made up of stars and planets, with vast clouds of dust and gas as well as dark matter. Dwarf galaxies are the most abundant galaxies in the universe, and are by definition small with low luminosity. They have fewer than 100 million stars, while the Milky Way, for example, has nearly 200 billion stars. Recent <u>dwarf galaxy</u> observations of the abundance of "ultra-diffuse galaxies" beyond the reach of previous large spectroscopic surveys suggest that our understanding of the dwarf galaxy population may be incomplete.

#### https://phys.org/news/2024-02-team-astronomers-galaxy-shouldnt.html

#### Cosmic dark matter web detected in Coma cluster



Dark matter in the Coma Cluster region. The distribution of dark matter calculated based on this research (dark green cloud) is overlaid on an image of the Coma Cluster and more distant background galaxies taken by the Subaru Telescope. Strands of dark matter can be seen extending millions of light years. Credit: HyeongHan et al.

The Subaru Telescope has spotted the terminal ends of dark matter filaments in the Coma cluster stretching across millions of light years. This is the first time that strands of the cosmic web spanning the entire universe have been directly detected. This

provides new evidence to test theories about the evolution of the universe. <u>Dark</u> matter, which accounts for most of the mass in the universe, is believed to exist as a web of long thin strands. https://phys.org/news/2024-02-cosmic-dark-web-coma-cluster.html



#### Astronomers discover new supernova remnant

Composite RGB image of G321.3–3.9 as seen in the eROSITA all-sky surveys eRASS:4 and the MWA radio image taken at 200 MHz. Credit: Mantovanini et al., 2024.

Astronomers from Curtin University in Australia and elsewhere report the detection of a new supernova remnant (SNR) located some 3 300 light years away. The newfound SNR, designated G321.3-3.9, has an elliptical shape and is estimated

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to be a few thousand years old. The finding was detailed in a paper <u>published</u> Jan. 30 on the pre-print server *arXiv*.SNRs are diffuse, expanding structures resulting from a supernova explosion. They contain ejected material expanding from the explosion and other interstellar material that has been swept up by the passage of the shockwave from the exploded star.

#### https://phys.org/news/2024-02-astronomers-supernova-remnant.html

#### Chinese astronomers find radio pulsar in a supernova remnant



Dual-wavelength image of SNR CTB 87: NVSS 1.4 GHz radio continuum image in red, and Chandra X-ray (0.5–7 keV) image in blue. The white cross indicates the location of the X-ray point-like source. Credit: Liu et al., 2024.

Using the Five-hundred-meter Aperture Spherical radio Telescope (FAST), astronomers from the Nanjing University in China and elsewhere, have detected a radio pulsar in a supernova remnant known as CTB 87. The finding is reported in a <u>paper</u> published February 1 on the *arXiv* pre-print server. Pulsars are highly magnetized, rotating <u>neutron stars</u> 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 <u>gamma-ray</u> telescopes. CTB 87 is a plerionic supernova remnant (SNR) with an

X-ray luminosity nearly 100-times weaker than the Crab Nebula in the 0.15–3 keV band. It hosts a <u>pulsar</u> <u>wind nebula</u> (PWN) with trailing morphology in X-rays. However, although PWNe are nebulae powered by the wind of a pulsar, no such object in this SNR has been found to date.

https://phys.org/news/2024-02-chinese-astronomers-radio-pulsar-supernova.html

#### **Researchers discover cosmic dust storms from Type 1a supernova**



#### Schematic sketches of SN 2018evt at the different phases. Credit: arXiv (2023). DOI: 10.48550/arxiv.2310.14874

Cosmic dust—like dust on Earth—comprises groupings of molecules that have condensed and stuck together in a grain. But the exact nature of dust creation in the universe has long been a mystery. Now, however, an international team of astronomers from China, the United States, Chile, the United Kingdom, Spain, etc., has made a significant discovery by identifying a previously unknown source of dust in the universe: a Type 1a supernova interacting with gas from its surroundings. The study was <u>published</u> in *Nature Astronomy* on Feb. 9, and was led by Prof. Wang Lingzhi from the South America Center for Astronomy of the Chinese Academy of Sciences. Supernovae have been known to play a role in dust formation, and to date, dust formation has only been seen in core-collapse supernovae—the explosion of

massive stars. Since core-collapse supernovae do not occur in elliptical galaxies, the nature of dust creation in such galaxies has remained elusive. <u>https://phys.org/news/2024-02-cosmic-storms-1a-supernova.html</u>

#### New Study Uncovers Asymmetry in Solar Gamma-Ray Emissions During Solar Maximum



In a groundbreaking study published in \*The Astrophysical Journal\*, researchers have unveiled unexpected findings regarding the Sun's gamma-ray emissions, particularly during periods of heightened solar activity known as the solar maximum. This research, spearheaded by Bruno Arsioli from the Institute of Astrophysics and Space Sciences (IA) and the Faculty of Sciences of the University of Lisbon (CienciasULisboa), in collaboration with Elena Orlando from the University of Trieste, INFN, and Stanford University, provides new insights into the high-energy processes occurring in our star's atmosphere. Gamma rays, the highest energy form of electromagnetic radiation, are produced by various processes in the Sun, including in its halo and during solar flares. These

rays carry a billion times more energy than ultraviolet light and are a key to understanding violent events on the Sun's surface. The study's findings challenge the previously held belief that gamma rays emitted from the Sun would show a uniform distribution across the solar disk.

'Beyond what's possible': New JWST observations unearth mysterious ancient galaxy



JWST-7329: a rare massive galaxy that formed very early in the Universe. This JWST NIRCAM image shows a red disc galaxy but with images alone it is hard to distinguish from other objects. Spectral analysis of its light with JWST revealed its anomalous nature. It formed around 13 billion years ago even though it contains ~4x more mass in stars than our Milky Way does today. Credit: James Webb Space Telescope

Our understanding of how galaxies form and the nature of dark matter could be completely upended after new observations of a stellar population bigger than the Milky Way from more than 11 billion years ago that should not exist. A paper <u>published</u> today in *Nature* details findings using new data from the James Webb Space Telescope (JWST). The results find that a

massive galaxy in the <u>early universe</u>—observed 11.5 billion years ago (a cosmic redshift of 3.2)—has an extremely old population of stars formed much earlier—1.5 billion years earlier in time (a redshift of around



11). The observation upends current modelling as not enough dark matter has built up in sufficient concentrations to seed their formation. <u>https://phys.org/news/2024-02-jwst-unearth-mysterious-</u> ancient-galaxy.html

#### eROSITA relaxes cosmological tensions

This plot shows the constraints put on the total matter density in the universe and the S8 parameter. Constraints from eROSITA galaxy clusters are in orange, constraints from the Cosmic Microwave Background (Planck) in blue, from weak

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#### lensing (DES+KiDS) in grey, and from cluster number counts (SPT) in black.

In a groundbreaking advancement in cosmological research, the German eROSITA consortium, spearheaded by the Max Planck Institute for Extraterrestrial Physics (MPE), has unveiled findings that refine our understanding of the universe's structure and composition. By analyzing the evolution of galaxy clusters over time, eROSITA has provided precise measurements of the universe's total matter and its distribution, offering a fresh perspective on long-standing cosmological debates. Central to this achievement is eROSITA's resolution of the so-called "S8 tension" - a discrepancy in measurements of the universe's clumpiness between studies of the cosmic microwave background (CMB) and weak gravitational lensing. Dr. Esra Bulbul of MPE, leading the eROSITA clusters and cosmology team, highlighted the significance of these results, stating, "The cosmological parameters that we measure from galaxy clusters are consistent with state-of-the-art CMB, showing that the same cosmological model holds from soon after the Big Bang to today." This reconciliation between different measurement techniques underscores eROSITA's role in enhancing the precision of cosmological tools.

https://www.spacedaily.com/reports/eROSITA\_relaxes\_cosmological\_tensions\_999.html

#### Scientists Unveil Free-Floating Planetary Giants in the Orion Nebula

In a remarkable advancement in the field of astronomy, researchers have unveiled findings that challenge our traditional understanding of planetary systems. A team of astronomers has discovered Jupiter-mass binary objects, termed JuMBOs, that are drawn into each other's orbit, devoid of a central star to anchor their path. This intriguing phenomenon was observed in the Orion Nebula, shedding light on the dynamic interactions between massive, free-floating planetary bodies.



Free-floating binary Jupiter-mass objects are common even when present stellar and planetary theory cannot account for its existence. Artistic depiction of one of these systems, not to scale Credit: Gemini Observatory/Jon Lomberg

The discovery was made possible through observations conducted with the Karl G. Jansky Very Large Array (VLA) at the U.S. National Science Foundation National Radio Astronomy Observatory and enhanced by NASA's James Webb Space Telescope.

https://www.spacedaily.com/reports/Scientists Unveil Free Floating Planetary Giants in the Orion Neb ula 999.html

Unprecedented observation of magnetar glitches provides new insights into fast radio bursts In a breakthrough observation, two of NASA's X-ray telescopes, the Neutron Star Interior Composition Explorer (NICER) aboard the International Space Station and the Nuclear Spectroscopic Telescope Array (NuSTAR) in low Earth orbit, have offered unprecedented insights into the enigmatic fast radio bursts (FRBs) originating from deep space. This observation, focusing on a specific FRB from a known magnetar within our Milky Way galaxy, marks a significant leap in our quest to understand these mysterious cosmic events. Fast radio bursts, though fleeting, unleash energy comparable to what our Sun produces over a year, distinguished by their laserlike beam formation. Their ephemeral nature has historically made it challenging to trace their origins. However, the scenario began to change when a magnetar within our galaxy, SGR 1935+2154, was identified as the source of an FRB, providing a tangible lead for astronomers.



In an ejection that would have caused its rotation to slow, a magnetar is depicted losing material into space in this artist's concept. The magnetar's strong, twisted magnetic field lines (shown in green) can influence the flow of electrically charged material from the object, which is a type of neutron star.

https://www.spacedaily.com/reports/Unprecedented observation of magnetar glitches provides new i nsights into fast radio bursts 999.html

#### Brightest quasar ever seen is powered by black hole that eats a 'sun a day'

The quasar, as bright as 500 trillion suns, has evaded astronomers for over 40 years because of its incredible luminosity.



An illustration of the recording-breaker quasar J059-4351, the bright core of a distant galaxy that is powered by a greedy supermassive black hole. (Image credit: ESO/M. Kornmesser)

A newly discovered quasar is a real record-breaker. Not only is it the brightest quasar ever seen, but it's also the brightest astronomical object in general ever seen. It's also powered by the hungriest and fastest-growing black hole ever seen — one that consumes the equivalent of over one sun's mass a day. The <u>quasar</u>, J0529-4351, is located so far from Earth that its light has taken 12

billion years to reach us, meaning it is seen as it was when the 13.8 billion-year-old universe was just under 2 billion years old. The <u>supermassive black hole</u> at the heart of the quasar is estimated to be between 17 billion and 19 billion times the mass of the sun; each year, it eats, or "accretes" the gas and dust equivalent to 370 solar masses. This makes J0529-4351 so luminous that if it were placed next to the sun, it would be 500 trillion times brighter than our brilliant star. "We have discovered the fastest-growing black hole known to date. It has a mass of 17 billion suns and eats just over a sun per day," team leader and Australian National University astronomer Christian Wolf <u>said in a statement</u>. "This makes it the most luminous object in the known universe." J0529-4351 was spotted in data over 4 decades ago but was so bright that astronomers failed to identify it as a quasar.

https://www.space.com/brightest-quasar-ever-powered-black-hole-solar-mass-accretion-disk



Orbital phase

# Smallest star ever observed is part of an exotic binary system

Phase-folded RV curve and double-band light curves for J0526. Top, RV curve derived from Keck/LRIS and GTC/OSIRIS observations. The dotted-dashed line is the best-fitting sinusoidal model. Middle and bottom, g- and r-band phasefolded light curves provided by LJT and ZTF. The purple solid lines represent the best-fitting light-curve models obtained from the ellc package. The unequal maxima are due to the relativistic Doppler beaming effect. Orbital phase  $\phi = 0$  represents the epoch of superior conjunction when the visible star is closest to the observer. Credit: Nature Astronomy (2024). DOI: 10.1038/s41550-023-02188-2

A large international team of astronomers has discovered the smallest known star to date, and found that it is paired with another, somewhat larger star. Their paper is <u>published</u> in the journal *Nature Astronomy*. Recent research has shown that hot subdwarfs are the smallest-known kinds of stars—they burn helium at their cores and are typically found in galactic stellar groups. Such research has overturned prior theories suggesting that <u>red dwarfs</u> are the smallest type of star. In this new study, the researchers discovered the smallest hot subdwarf yet, a star that is part of a binary system known as J0526 and is located approximately 2,760 light years from Earth. The two stars are named J0526A, the larger unseen white dwarf; and J0526B, the hot subdwarf. The smaller star is approximately seven times the size of Earth, which means it is smaller than Saturn. It also has a surface temperature of approximately 2,226°C. It orbits the larger star approximately every 20 minutes, the shortest known binary <u>orbit.https://phys.org/news/2024-02-smallest-star-exotic-binary.html</u>

#### 3 tiny new moons found around Uranus and Neptune — and one is exceptionally tiny



The discovery image of the new Uranian moon S/2023 U1 using the Magellan telescope on November 4, 2023. Uranus is just off the field of view in the upper left, as seen by the increased scattered light. S/2023 U1 is the faint point of light in the centre of the image. (Image credit: Scott Sheppard)

Astronomers have discovered two tiny moons orbiting Neptune and one circling Uranus, bringing the number of their known moons to 16 and 28 respectively. Uranus' new moon, the first detected around the ice giant in over two decades and possibly the smallest of its ilk, is just 5

miles (8 km) wide; it takes 680 days to complete one orbit around Uranus. In comparison, one Mars' moon named Deimos, considered to be among the tiniest known moons in our solar system, is 8 miles (13 km) wide. <u>https://www.space.com/new-moons-discovered-uranus-neptune</u>

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