

“The Southern Cross”



HERMANUS ASTRONOMY CENTRE NEWSLETTER

SEPTEMBER 2022

Unless otherwise advised, all our meetings are virtual using Zoom; login from 18.15 to commence 18.30.

Monthly Meeting

(The third Monday of each month)

15th August – Stefan Lotz of SANSA presented [“Artificial Intelligence in Space Weather Predictions, The Rise of the Machine”](#)

We hear a lot about Artificial Intelligence (AI) these days. Stefan explained that artificial intelligence is anything where a computer helps you to make a complex prediction. He walked us through some of the basics of the research on the subject being done here at SANSA in Hermanus, discussing the ever-increasing use of AI in the observation, analysis and prediction of space weather originating from our local star, the Sun. The development of machine learning has made such rapid advances in recent years that it has become very difficult to keep up. He emphasized our increasing reliance on technology, leaving us vulnerable to interference from space weather, such as problems with navigation systems degradation, reduced power grid currents, etc.

To view the full presentation, click on the link below:

<https://www.youtube.com/watch?v=4Us4gOxaE9A>

Next: 19th September – Chris Engelbrecht is the presenter.

Topic: "Astroseismology: Listening to the heartbeat of the stars"

Chris Engelbrecht will speak on his research work on time-domain monitoring of stars and the techniques used to learn about the interior structure and evolution of stars by analysing variations in their light emissions.

Chris obtained his PhD in Astronomy from UCT in 1994. He worked as a junior astronomer at the SAAO in Cape Town, before joining the department of Physics at UNISA and then the Department of Physics at UJ. He moved to the Overstrand in 2019. Chris has presented

hundreds of talks on astronomy and other topics, and he maintains a broad spectrum of activity in research and teaching.

2022 meeting dates: For your diaries - The monthly meetings of 2022 are scheduled as follows: 19 September, 17 October and 21 November.

SPECIAL INTEREST GROUP ACTIVITIES

Cosmology

(the first Monday of each month)

1st August - The History of the Universe – part 1: [What was the Big Bang?](#)

This is a series of 17 videos titled “Cosmology, The History of the Universe”, to be spread over a period of time to be discussed.

Next: 5th September – unless otherwise advised, we shall continue with The History of the Universe – part 2: [What Was The Universe Like IMMEDIATELY After The Big Bang?](#)

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

Astrophotography

(The second Monday of each month)

8th August: no meeting held.

Next: 12th September This meeting will only take place in accordance with group members’ wishes. For further information, please contact Deon Krige: krige.deon44@outlook.com

Study Group

(The last Monday of each month)

29th August:

Next 26th September: the topic will be advised in due course.

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

Stargazing

Stargazing, one activity actually benefitting from loadshedding! No HAC Stargazing is currently planned but we shall let you know as soon as a suitable evening is scheduled. Please check our website calendar for HAC scheduled events: <https://www.hermanusastronomy.co.za>

Other activities

Educational outreach: Mick Fynn, assisted by others including HAC members, has been leading weekly tours of the solar system model on the Cliff Path commencing every Thursday at 11.00 at the **Tourism Centre** (Old Railway Station). Tourism staff are keen to market and publicise this new addition to Hermanus attractions.

Future Trips

No outings are being planned at present.

GEARING'S POINT ASTRONOMY EDUCATION DISPLAY (GPAED)

From Pierre De Villiers:

“During August the foundations and pre-cast mounting slabs were cast, a sample tablet of the Sun was received from Dowd Engravers and approved with modifications. It was also shown to HAC members at a “first light” unveiling at Gearings Point on 16th August (see photo), where the committee explained all aspects of the project on the ground.

The chemical etching and colour printing of the tablets as well as the installation of the mounting slabs will commence in September and be installed on their receipt.

Installation completion will probably only be in October.”



OUTREACH (from Mick Fynn)

The tourism office has requested me to oversee and facilitate a day's training for 18 trainee tour guides starting at 08h00 Wednesday 31st. I'll take them through the normal Thursday tour until 10h00 when we'll proceed to SANSA for their 11h00 tour and work our way back to the tourism office via Ficks Pool, Hermanuspietersfontein history board, Swallow Park and sun dial, the eco tour on the cliff path from Wasbakkies to Gearings point sun dial and tablets in future, the three museums and back along the pedestrianised Mitchell Street to House one and railway station! There is a tour guide organising some transport etc but hopefully the astronomy will play a pivotal role in their future tours!

September 2022

Explosive volcanic eruption produced rare mineral on Mars



NASA's Curiosity Mars Rover drilled this hole to collect sample material from a rock target called "Buckskin" on July 30, 2015. The diameter of the hole is slightly smaller than a U.S. dime. Rock powder from the drill site was subsequently delivered to a laboratory inside the rover and found to contain the rare mineral tridymite. (Image courtesy of NASA/JPL-Caltech/MSSS)

Planetary scientists from Rice University, NASA's Johnson Space Center and the California Institute of Technology have an answer to a mystery that's puzzled the Mars research community since NASA's Curiosity rover discovered a mineral called tridymite in Gale Crater in 2016.

Tridymite is a high-temperature, low-pressure form of quartz that is extremely rare on Earth. The discovery of tridymite in a mudstone in Gale Crater is one of the most surprising observations that the Curiosity rover has made in 10 years of exploring Mars. Tridymite is usually associated with quartz-forming, explosive, evolved volcanic systems on Earth, but it was found it in the bottom of an ancient lake on Mars, where most of the volcanoes are very primitive.

https://www.marsdaily.com/reports/Study_Explosive_volcanic_eruption_produced_rare_mineral_on_Mars_999.html

Heaviest neutron star to date is a 'black widow' eating its mate

A dense, collapsed star spinning 707 times per second—making it one of the fastest spinning neutron stars in the Milky Way galaxy—has shredded and consumed nearly the entire mass of its stellar companion and, in the process, grown into the heaviest neutron star observed to date. Weighing this record-setting neutron star, which tops the charts at 2.35 times the mass of the sun, helps astronomers understand the weird quantum state of matter inside these dense objects, which—if they get much heavier than that—collapse entirely and disappear as a black hole. The measurement of the neutron star's mass was possible thanks to the extreme sensitivity of the 10-meter Keck I telescope on Maunakea in Hawai'i, which was just able to record a spectrum of visible light from the hotly glowing companion star, now reduced to the size of a large gaseous planet. The stars are about 3,000 light years from Earth in the direction of the constellation Sextans.

<https://phys.org/news/2022-07-heaviest-neutron-star-date-black.html>

'Castaway' gamma-ray bursts come from distant early galaxies

New findings indicate that intense and mysterious bursts of radiation originate from neutron star mergers that occurred in the early universe.

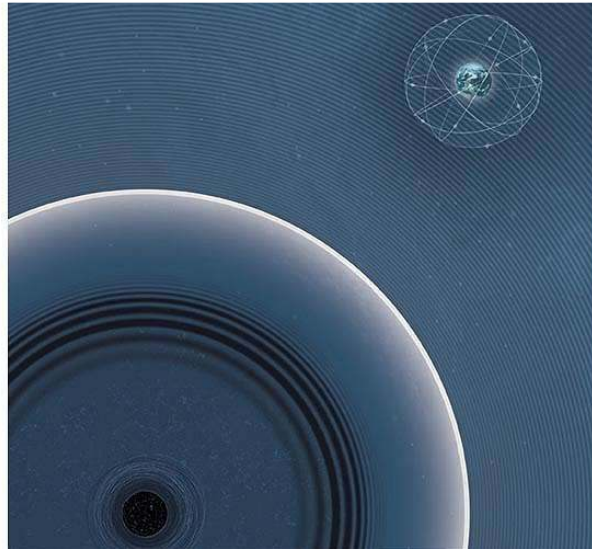


An illustration shows a neutron star merger in the early universe blasting out gamma rays. (Image credit: NOIRLab/NSF/AURA/J. da Silva/Spaceengine)

Isolated mysterious blasts of intense energy that previously couldn't be traced back to galactic sources could originate from incredibly dim galaxies located as far away as 10 billion light-years. An international team of astronomers used some of the most powerful ground and space-based telescopes — including the Gemini North telescope in Hawai'i and the Gemini South telescope in Chile — to trace the origins of these "castaway" short gamma-ray bursts to incredibly distant galaxies. The findings imply that gamma-ray bursts that are launched when incredibly dense collapsed stars — neutron stars — collide with each other and merge may have been more common in the past than previously believed.

<https://www.space.com/gamma-ray-bursts-distant-galaxies>

Sneaky discovery sheds light on star death, black holes and gravity waves



stock illustration only

There is always something new and exciting happening in the field of black hole research. Albert Einstein first published his book explaining the theory of general relativity - which postulated black holes - in 1922. One hundred years later, astronomers captured actual images of the black hole at the center of the Milky Way. In a recent paper, a team of astronomers describes another exciting new discovery: the first "dormant" black hole observed outside of the galaxy. Dormant black holes are black holes that do not emit any detectable light. Thus, they are notoriously difficult to find. This new discovery is exciting because it provides insight into the formation and evolution of black holes. This information is vital for understanding gravitational waves as well as other astronomical events.

https://www.spacedaily.com/reports/Sneaky_discovery_sheds_light_on_star_death_black_holes_and_gravity_waves_999.html

New 3D cosmic map reveals 1 million previously hidden galaxies



A section of the Small Magellanic Cloud as seen by the VISTA telescope with distant galaxies circled in green. (Image credit: ESO/VISTA Magellanic Clouds Survey)

Astronomers have created the largest ever 3D map of 1 million distant galaxies otherwise obscured by the Milky Way's dwarf galaxy neighbors, the Magellanic Clouds.

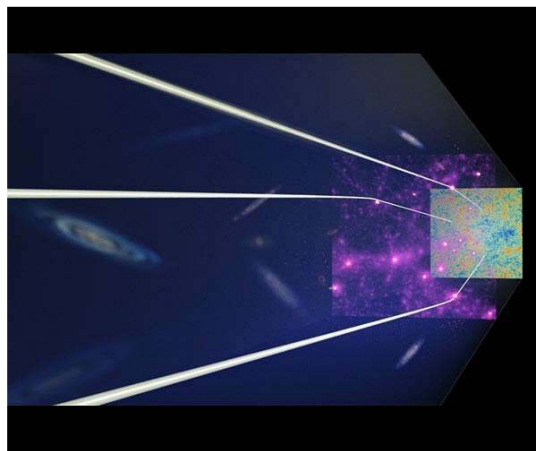
The Magellanic Clouds are irregularly shaped galaxies that are a stunning feature of the Southern Hemisphere sky, visible to the naked eye. But the brightness of these dwarf galaxies coupled with the fact that they take up a large area of the night sky means that the Milky Way's neighbors block our view of many much more distant galaxies. So, when astronomers are observing the billions of galaxies in the universe, they tend to avoid this part of the sky.



The Small Magellanic Cloud obscures galaxies in the Southern Hemisphere. (Image credit: ESA/Hubble and Digitized Sky Survey 2)

<https://www.space.com/map-galaxies-hidden-by-magellanic-clouds>

Unveiling the distribution of dark matter around galaxies 12 billion years ago



The radiation residue from the Big Bang, distorted by dark matter 12 billion years ago.

A collaboration led by scientists at Nagoya University in Japan has investigated the nature of dark matter surrounding galaxies seen as they were 12 billion years ago, billions of years further back in time than ever before. Their findings, published in Physical Review Letters, offer the tantalizing possibility that the fundamental rules of cosmology may differ when examining the early history of our universe.

https://www.spacedaily.com/reports/Unveiling_the_distribution_of_dark_matter_around_galaxies_12B_years_999.html

A cosmic tango points to a violent and chaotic past for distant exoplanet



file illustration only

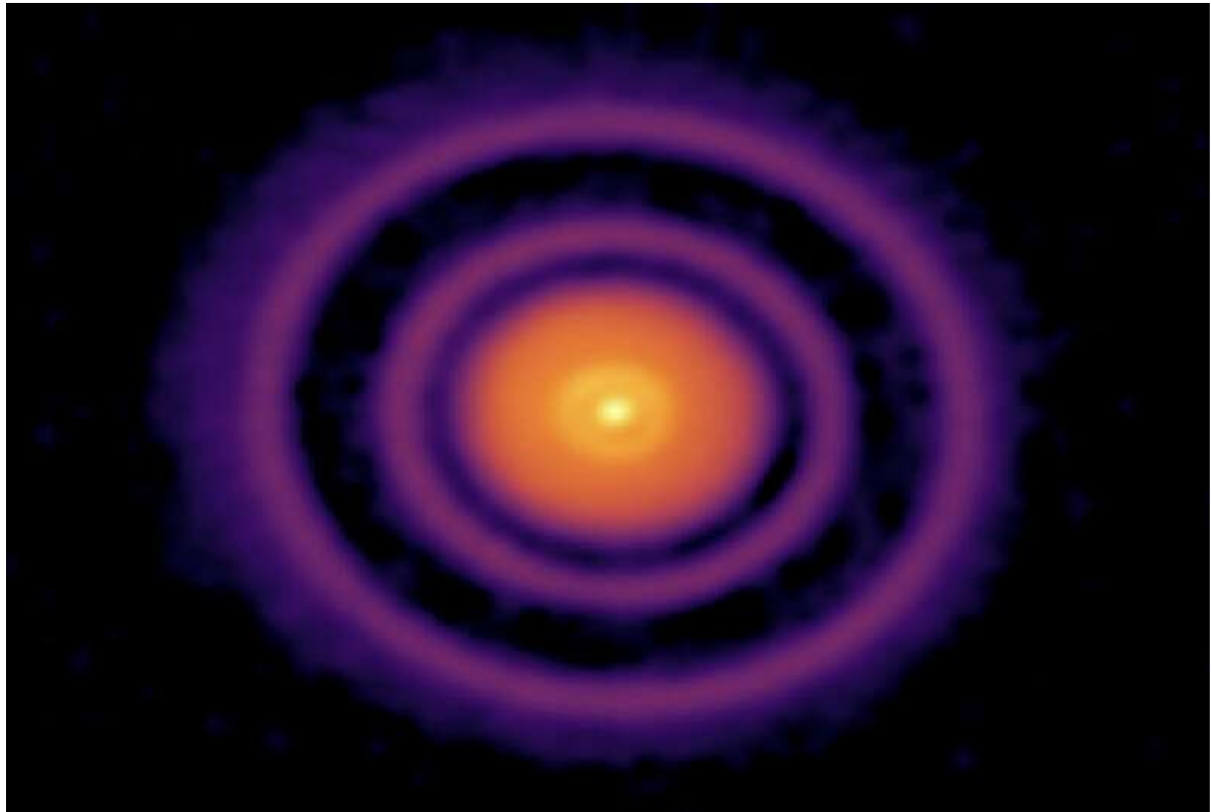
Using the 3.9 metre Anglo-Australian Telescope at the Siding Spring Observatory, researchers discovered a planet orbiting the star HD83443. This planet, HD83443b, was as massive as the gas giants Saturn and Jupiter.

HD83443b is a "hot Jupiter": a giant gas planet skimming the surface of its host star (which is a little smaller and cooler than the Sun), and completing each lap in less than three Earth days! By combining their observations, the astronomers discovered a strange new planet in the system. This world, HD83443c, takes more than 22 years to orbit its host star, and is some 200 times more distant than its hellish sibling. But what's really unusual is the eccentricity of its orbit. While the planets in the Solar System follow near-circular orbits, HD83443c follows a much more elongated path reminiscent of comets in our Solar System.

https://www.spacedaily.com/reports/A_cosmic_tango_points_to_a_violent_and_chaotic_past_for_distant_exoplanet_999.html

First-ever detection of gas in a circumplanetary disk

Scientists using the Atacama Large Millimeter/submillimeter Array (ALMA) and partners at the National Radio Astronomy Observatory (NRAO) have made the first-ever detection of gas in a circumplanetary disk. What's more, the detection also suggests the presence of a very young exoplanet.



AS 209 is a young star in the Ophiuchus constellation that scientists have now determined is host to what may be one of the youngest exoplanets ever. Credit: ALMA (ESO/NAOJ/NRAO), A. Sierra (U. Chile)

The new observations of gas in a circumplanetary disk at AS 209 may shed further light on the development of planetary atmospheres and the processes by which moons are formed.

<https://phys.org/news/2022-08-first-ever-gas-circumplanetary-disk.html>

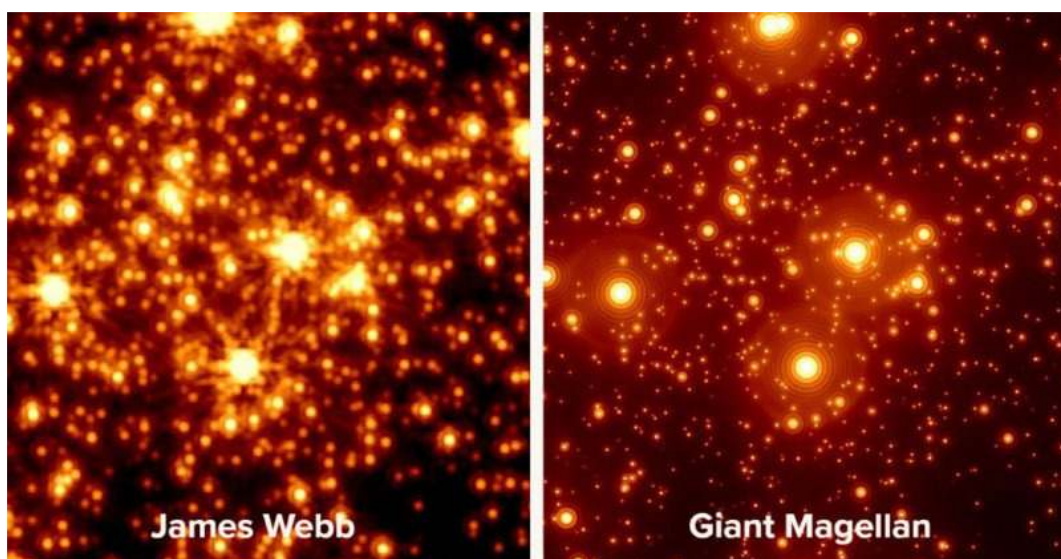
\$1B Giant Magellan Telescope to Have 4x the Resolution of James Webb



The Giant Magellan Telescope, the most powerful telescope ever engineered, has secured a new \$205M funding infusion that will be used to accelerate its construction. When finished, it will be four times more powerful than the James Webb Space Telescope.

According to the Giant Magellan Telescope Organization (GMTO), the investment is one of the largest funding rounds for the telescope since its founding and will be used to manufacture the giant 12-story telescope structure that will be housed at the Las Campanas Observatory in Chile's Atacama Desert.

When finished, the Giant Magellan Telescope will have ten times the light collecting area and four times the spatial resolution of the James Webb Space Telescope (10 times the resolution of the Hubble Space Telescope).



It will also be 200 times more powerful than any current existing research telescope. While no firm date for its completion has been noted, commissioning is expected to begin in the late 2020s, and this latest cash infusion will certainly go a long way to making that goal a reality.

The GMTO says that the construction of the telescope has already achieved significant progress over the last few years.

The Giant Magellan Telescope is considered the future of space exploration. It will use seven of the world's largest mirrors — The 25.4-meter primary mirror array consists of seven 8.4-meter diameter mirrors that weigh 18 metric tons — to produce the most detailed images ever taken of the Universe — even outclassing the James Webb Space Telescope (JWST) that has recently dazzled the world with its incredible resolution. But the Giant Magellan Telescope will take things to the next level.

<https://petapixel.com/2022/08/09/1b-giant-magellan-telescope-to-have-4x-the-resolution-of-james-webb/>

X-rays have been detected from behind a black hole for the first time ever as predicted by Einstein.

Researchers at Stanford University have found an odd pattern while observing the X-rays from the supermassive black hole at the center of a galaxy 800 million light-years away. The black hole, it appears, is spewing out these rays into the universe around it.

Such a phenomenon has been theorized to exist before and is explained by the fact that as gas descends into a supermassive black hole, brilliant flares of X-ray emissions are produced -- exactly as seen by researchers.



Black hole. Source : brightstars/iStock

Short X-ray flashes were then observed after the flares subsided. These flashes corresponded to the reflection of the flares from the far edge of the disc, which had been curved around the black hole by its potent gravitational field. The flares then reverberated off of the gas plunging towards the black hole. It is the first direct observation of light coming directly from behind a black hole, a scenario that Einstein's theory of general relativity predicted but which had never been verified before.

<https://interestingengineering.com/science/x-rays-behind-black-hole-first-time>

NASA Says Restless Red Giant Star Betelgeuse Had an Unprecedented Explosion

Its famous dimming event from a few years ago turns out to be evidence of a recent explosion rather than an imminent supernova.

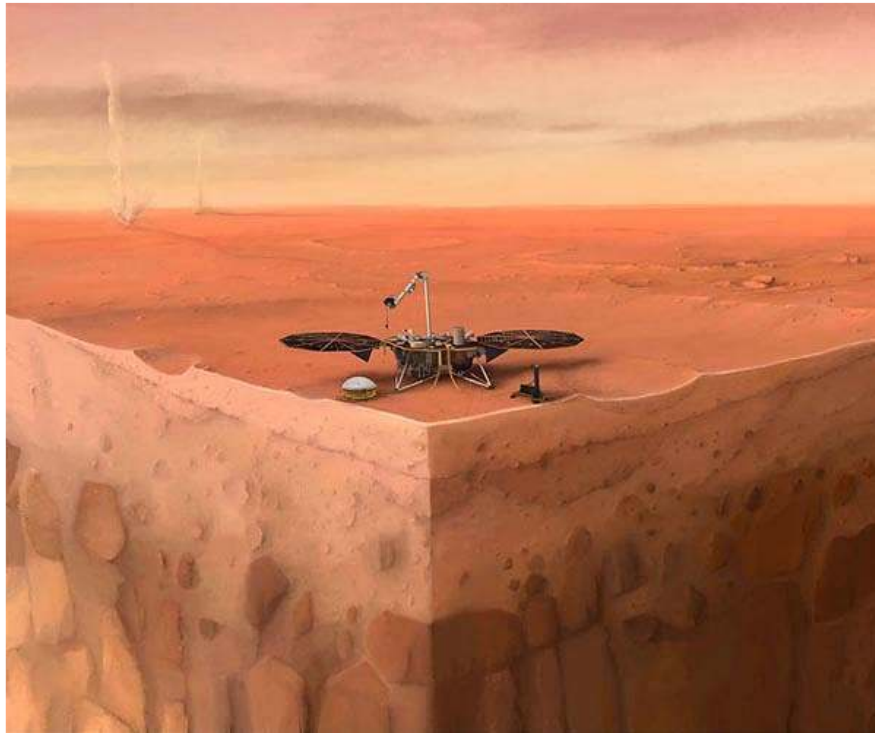


An illustration of a roiling Betelgeuse. NASA

Massive red supergiant star Betelgeuse is at the end of its life span, at least on cosmic timescales, but the gargantuan fireball is going out kicking and screaming. Astronomers used NASA's Hubble Space Telescope and other observatories to determine that the senior star actually blew off part of its surface in 2019. The researchers refer to the 2019 event as a "surface mass ejection," or SME, which is somewhat similar to the coronal mass ejections we see erupt from our own sun's outer atmosphere, often causing bright auroras and radio disruptions on Earth. However, the eruption from Betelgeuse ejected about 400 billion times as much mass as an average CME.

<https://www.cnet.com/science/space/nasa-says-restless-red-giant-star-betelgeuse-had-an-unprecedented-explosion/>

Surprise, surprise: Subsurface water on Mars defy expectations

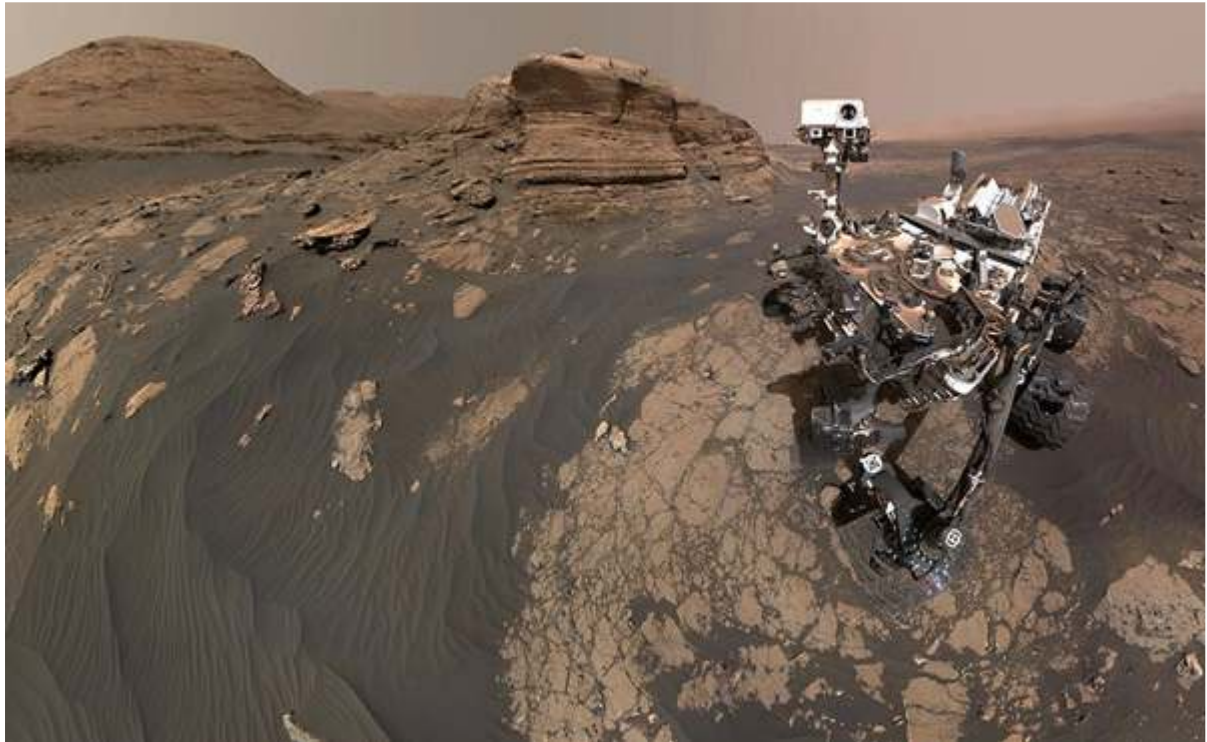


Physics connects seismic data to properties of rocks and sediments.

A new analysis of seismic data from NASA's Mars InSight mission has revealed a couple of surprises. The first surprise: the top 300 meters of the subsurface beneath the landing site near the Martian equator contains little or no ice. The second surprise contradicts a leading idea about what happened to the water on Mars. The red planet may have harboured oceans of water early in its history. Many experts suspected that much of the water became part of the minerals that make up underground cement. The lack of cemented sediments suggests a water scarcity in the 300 meters below InSight's landing site near the equator. The below-freezing average temperature at the Mars equator means that conditions would be cold enough to freeze water if it were there.

https://www.marsdaily.com/reports/Surprise_surprise_Subsurface_water_on_Mars_defy_expectations_999.html

Curiosity rover celebrates 10 years of Mars exploration

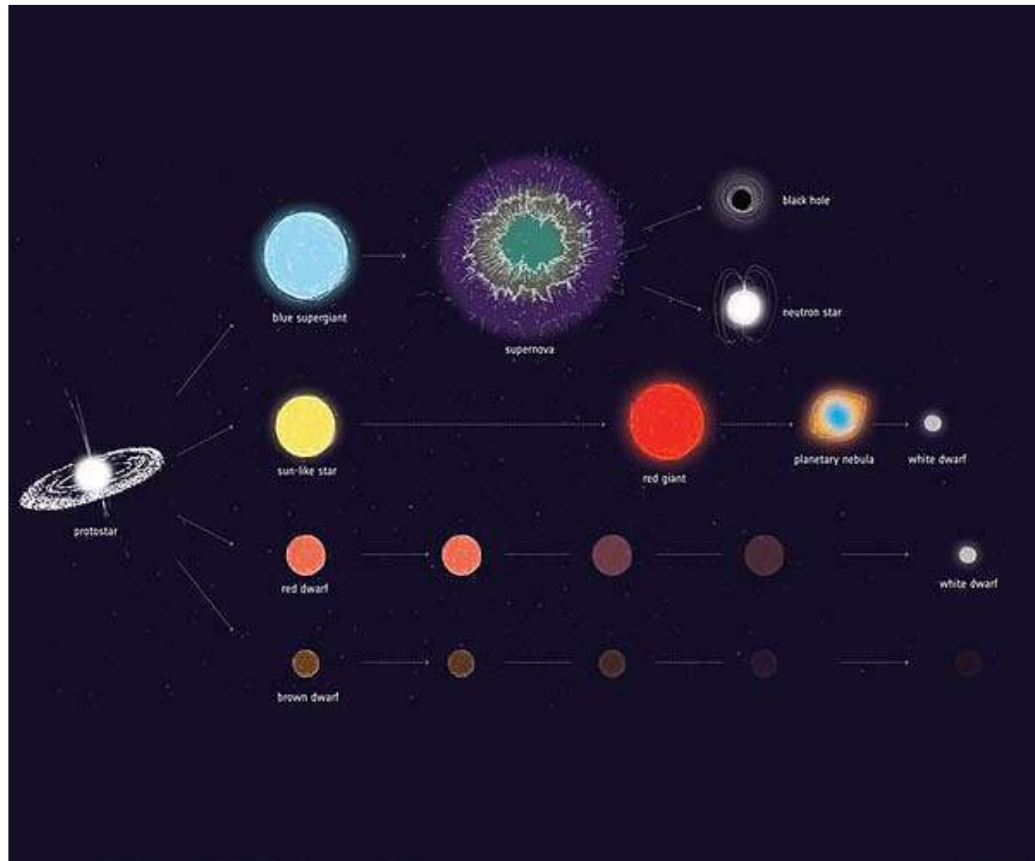


Curiosity snapped this stunning selfie in front of the 20-foot-tall (6 m) rock feature Mont Mercou, which appears behind the rover. The final image is a combination of 60 photos taken by the MAHLI instrument at the end of the rover's arm and 11 images taken with the Mastcam on its mast, or "head." NASA/JPL-Caltech/MSSS

Mars is a world entirely populated by robots: Orbiters and landers from a half-dozen space agencies scout its wafer-thin atmosphere and stark surface to unveil a surprisingly active past. On the ground, a hardy six-wheeled rover named Curiosity observed its 10th anniversary on the Red Planet this summer. Dust-streaked and running on punctured wheels, it continues to explore a desiccated landscape of wind-chiseled mesas, isolated buttes, and swirling sands for relics of a warmer, wetter, perhaps habitable Mars.

<https://astronomy.com/magazine/news/2022/08/curiosity-celebrates-10-years-on-mars>

Gaia reveals the past and future of the Sun



Artist impression of some possible evolutionary pathways for stars of different initial masses. Some proto-stars, brown dwarfs, never actually get hot enough to ignite into fully-fledged stars, and simply cool off and fade away. Red dwarfs, the most common type of star, keep burning until they have transformed all their hydrogen into helium, turning into a white dwarf. Sun-like stars swell into red giants before puffing away their outer shells into colourful nebula while their cores collapse into a white dwarf. The most massive stars collapse abruptly once they have burned through their fuel, triggering a supernova explosion or gamma-ray burst, and leaving behind a neutron star or black hole.

We all wish that we could sometimes see into the future. Now, thanks to the very latest data from ESA's star mapping Gaia mission, astronomers can do just that for the Sun. By accurately identifying stars of similar mass and composition, they can see how our Sun is going to evolve in the future. And this work extends far beyond a little astrophysical clairvoyance. Gaia's third major data release (DR3) was made public on 13 June 2022. One of the major products to come out of this release was a database of the intrinsic properties of hundreds of millions of stars. These parameters include how hot they are, how big they are, and what masses they contain.

https://www.spacedaily.com/reports/Gaia_reveals_the_past_and_future_of_the_Sun_999.html

R136 is the Most Massive Star Astronomers Have Ever Found.



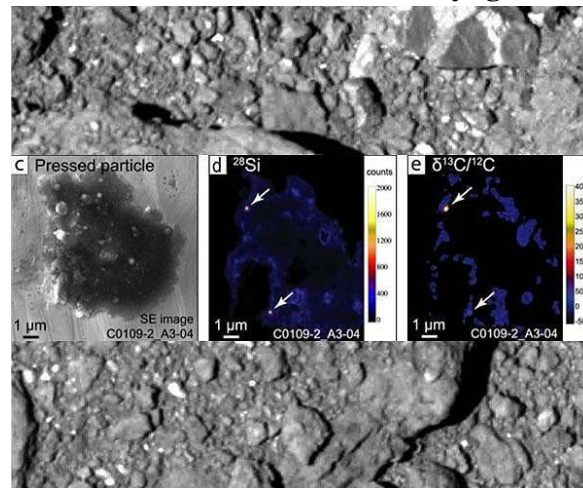
Near-infrared image of the R136 cluster, from ESO's Very Large Telescope. The most massive known star, labeled R136a1, is located at the center of the image. Image via [ESO](#)/ P. Crowther/ C.J. Evans

Located in the Large Magellanic Cloud, R136a1 is a hulking behemoth weighing somewhere between 150 and 200 times the mass of the Sun. A team of astronomers have studied in detail the star cluster known as R136. This star cluster is located in the Large Magellanic Cloud about 150,000 light-years from Earth. The star cluster itself is huge, featuring many incredibly bright newborn stars. R136a1 is what's known as a *Wolf-Rayet star*. Its surface temperature is over 100,000 degrees F. It's also the most luminous star known at more than 7 million times the luminosity of our sun.

<https://www.universetoday.com/157070/r136-is-the-most-massive-star-astronomers-have-ever-found-we-just-got-some-new-images-of-it/>

<https://earthsky.org/space/how-big-is-the-biggest-monster-star/>

Dust grains older than our sun found in Asteroid Ryugu samples



Microscopic grains of ancient material that

predate our Sun's birth were found in samples returned from the asteroid Ryugu by the Hayabusa2 mission, according to new work from an international team led by Carnegie's Jens Barosch and Larry Nittler and published in The Astrophysical Journal Letters.

On the left is a secondary electron image of a Ryugu particle pressed into gold foil in which two silicon carbide presolar grains were detected, as indicated by white arrows on the center and left images. Background image show a close up view of Asteroid Ryugu's surface.

https://www.spacedaily.com/reports/Dust_grains_older_than_our_sun_found_in_Asteroid_Ryugu_samples_999.html

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