

“The Southern Cross”



Hermanus Astronomy Centre Newsletter

JANUARY 2023

MONTHLY MEETING

(Monthly Meetings are held on the third Monday of every month except December unless otherwise advised)

Next: **16th January 2023- Johan Smit** — “*The Eye as an Observing Instrument*”

2023 meeting dates: For your diaries – January 16, February 20, March 20, April 17, May 15, June 19, July 17, August 21, September 18, October 16, November 20.

SPECIAL INTEREST GROUP ACTIVITIES

Cosmology

(the first Monday of each month)

This is a series of 17 videos titled “COSMOLOGY, THE HISTORY OF THE UNIVERSE”.

13TH December 2022 - The History of the Universe- ***Why is the Universe the Same Everywhere?***

https://www.youtube.com/watch?v=5JM9RJFMHgc&list=PLROBLIvnR7BEF9b1NOvRf_zhboibmywJb&index=5 - 38:25 minutes

Next: 6th February -The History of the Universe-***What Really is Everything?***

https://www.youtube.com/watch?v=euNr9PozCmg&list=PLROBLIvnR7BEF9b1NOvRf_zhb oibmywJb&index=6 - 42:58 minutes

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

Astrophotography

This SIG meets on the second Monday of each month as requested by group members. For further information, please contact Deon Krige: krige.deon44@outlook.com

14th November- no meeting held.

Next scheduled: 9th January 2023.

Study Group

(The last Monday of each month)

31st January - topic to be advised.

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

Stargazing

No Hermanus Astronomy Centre events are currently planned but we shall let you know if a suitable evening is scheduled.

Future Trips

No outings are planned at present.

Please check our website calendar for HAC scheduled events: <https://www.hermanusastronomy.co.za>

The “Seasonal Get-together”

Provisionally planned for 15th December, this is now postponed to possibly sometime in January. We shall advise you when this is finalised.

GPAED

(Pierre de Villiers)

Project is now complete and being very well received by tourists and all viewers. We are looking forward to the official opening, the date to be announced soon.

Outreach

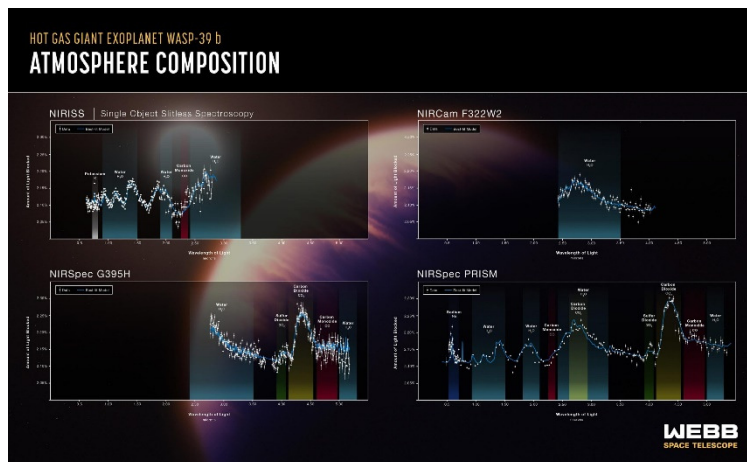
(Mick Fynn)

Outreach activities will resume in 2023 under the expert leadership of Mick Fynn et al.

Astronomy News ...

(compiled by Pieter Kotzé)

As Never Seen Before: NASA's Webb Reveals an Exoplanet Unlike Any in Our Solar System

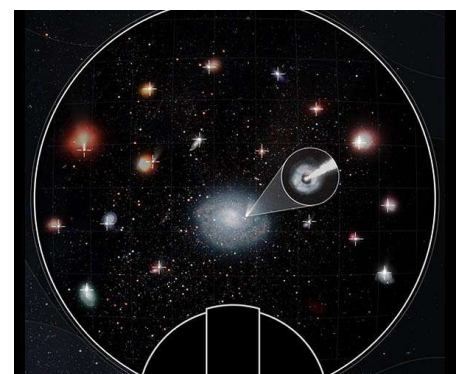


Observations of Exoplanet WASP-39b show fingerprints of atoms and molecules, as well as signs of active chemistry and clouds. At upper left, data from NIRISS shows fingerprints of potassium (K), water (H₂O), and carbon monoxide (CO). At upper right, data from NIRCams shows a prominent water signature. At lower left, data from NIRSpec indicates water, sulfur dioxide (SO₂), carbon dioxide (CO₂), and carbon monoxide (CO). At lower right, additional NIRSpec data reveals all of these molecules as well as sodium (Na). Credit: NASA, ESA, CSA, Joseph Olmsted (STScI)

WASP-39 b is a planet unlike any in our solar system – a *Saturn*-sized behemoth that orbits its star closer than Mercury is to our Sun. When *NASA's James Webb Space Telescope* initially began regular science operations, this *exoplanet* was one of the first to be examined. The exoplanet science community is buzzing with excitement over the results. Webb's incredibly sensitive instruments have provided a profile of WASP-39 b's atmospheric constituents and identified a plethora of contents, including water, sulphur dioxide, carbon monoxide, sodium, and potassium. The findings bode well for the capability of Webb's instruments to conduct a broad range of investigations of all types of exoplanets, including small, rocky worlds like those in the TRAPPIST-1 system.

<https://scitechdaily.com/as-never-seen-before-nasas-webb-reveals-an-exoplanet-unlike-any-in-our-solar-system/>

A Northwestern University-led team of astronomers has developed the most extensive inventory to date of the galaxies where short gamma-ray bursts (SGRBs) originate. Using several highly sensitive instruments and sophisticated galaxy modelling, the researchers pinpointed the galactic homes of 84 SGRBs and probed the characteristics of 69 of the identified host galaxies. Among their findings, they discovered that about 85% of the studied SGRBs come from young, actively star-forming galaxies. The astronomers also found that more SGRBs occurred at earlier times, when the universe was much younger - and with greater distances from their host galaxies' centres - than previously known. Surprisingly, several SGRBs were spotted far outside their host galaxies - as if they were "kicked out," a finding that raises questions as to how they were able to travel so far away.

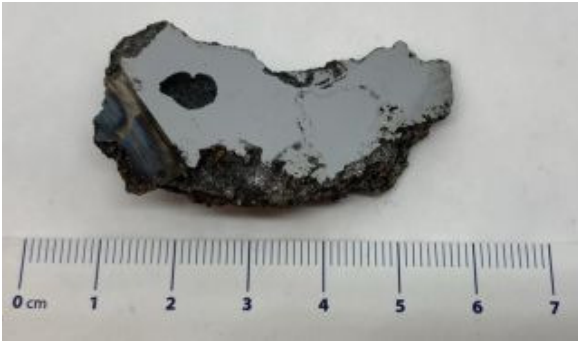


Short gamma-ray burst host galaxies across cosmic time.

https://www.spacedaily.com/reports/Short_gamma_ray_bursts_traced_further_into_distant_universe_999.html

Two minerals never seen before on Earth found inside 17-ton meteorite

The minerals were found inside a slice of the El Ali meteorite, which landed in Somalia in 2020.



The 2.5-ounce slice which contains the two brand-new minerals. (Image credit: University of Alberta Meteorite Collection)

Two minerals that have never been seen before on Earth have been discovered inside a massive meteorite in Somalia. They could hold important clues to how asteroids form.

The two brand new minerals were found inside a single 70 g slice taken from the 16.5 ton (15 metric tons) El Ali meteorite, which crashed to Earth in 2020. Scientists named the minerals elaliite after the meteor and elkinstantonite after

Lindy Elkins-Tanton, the managing director of the Arizona State University Interplanetary Initiative and principal investigator of NASA's upcoming Psyche mission, which will send a probe to investigate the mineral-rich Psyche asteroid for evidence of how our solar system's planets formed.

<https://www.livescience.com/two-new-minerals-found-inside-meteorite>

Non-detection of key signal helps determine what first galaxies were and were not like

Researchers have been able to make some key determinations about the first galaxies to exist, in one of the first astrophysical studies of the period in the early Universe when the first stars and galaxies formed, known as the cosmic dawn. Using data from India's SARAS3 radio telescope, , researchers led by the University of Cambridge were able to look at the very early Universe - just 200 million years after the Big Bang - and place limits on the mass and energy output of the first stars and galaxies. Counterintuitively, the researchers were able to place these limits on the earliest galaxies by not finding the signal they had been looking for, known as the 21-centimetre hydrogen line. This non-detection allowed the researchers to make other determinations about the cosmic dawn, placing restraints on the first galaxies, enabling them to rule out scenarios including galaxies which were inefficient heaters of cosmic gas and efficient producers of radio emissions. While we cannot yet directly observe these early galaxies, the results, reported in the journal Nature Astronomy, represent an important step in understanding how our Universe transitioned from mostly empty to one full of stars.



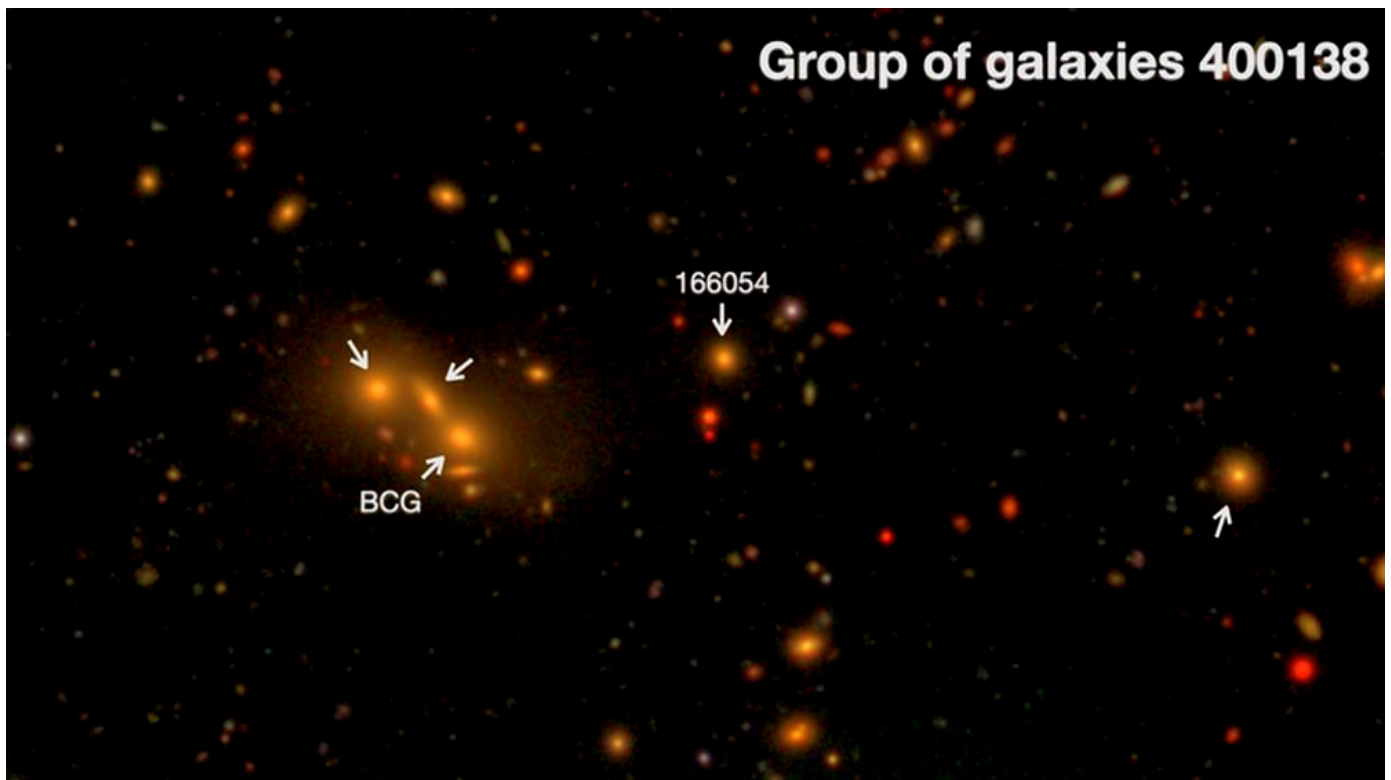
Understanding the early Universe, when the first stars and galaxies formed, is one of the major goals of new observatories. The results obtained using the SARAS3 data are a proof-of-concept study that paves the way to understanding this period in the development of the Universe. The SKA project - involving two next-generation telescopes due to be completed by the end of the decade - will likely be able to make images of the early Universe, but for current telescopes the challenge is to detect the cosmological signal of the first stars re-radiated by thick hydrogen clouds .

https://www.spacedaily.com/reports/Non_detect ion_of_key_signal_helps_determine_what_first_galaxies_were_and_were_not_like_999.html

Astronomers Detect the Faint Glow of Stars in Between Galaxies

Not all stars are members of galaxies. Some stars exist in the space between galaxies, though they didn't form there. They're called intra-group stars, and astronomers study them by observing their light, called intra-group light (IGL.) They're challenging to observe because their light is extremely faint and overpowered by the light of nearby galaxies. Astronomers sometimes refer to these intra-group stars as orphans. They formed inside a galaxy somewhere, then were somehow set loose into intergalactic space. The most likely cause is gravitational interaction between galaxies that are merging or passing close by each other.

The work focuses on a group of galaxies denoted by number only: 400138. The group is very distant, and observing the light is like looking back in time 2.5 billion years. The group is at redshift $z=0.2$. That means the galaxies in the Universe were 20% closer together than they are now when they emitted the light. That light is just reaching us now. 400138 is a fairly loose group of galaxies, with three galaxies making up its dense core: 1660730, 1660646, and BCG (Bright Cluster Group.) Even though galaxy group 400138 is considered a fairly loose group, the core is dense. Galaxies in these associations interact gravitationally with one another, and those interactions tear stars from their original galaxies and leave them orphaned in the space between galaxies. Astronomers can't view these individual stars. They're much too faint for any observatory to sense them. But as a group, they give off enough light to observe if you have the proper technique. This pilot study is the first time astronomers have observed IGL from this galaxy group. The observations allow astronomers to begin to piece together the interaction histories of the galaxies that comprise it.



Light 'between' the groups of galaxies – the "intra-group light" – however dim, is radiated from stars stripped from their home galaxy. Image Credit: MARTÍNEZ-LOMBILLA ET AL./UNSW SYDNEY

<https://www.universetoday.com/158785/astronomers-detect-the-faint-glow-of-stars-in-between-galaxies/>

Scientists may have just identified the culprit behind signs of recently active volcanism on Mars. Beneath a broad plain called the Elysium Planitia, a colossal, 4,000-kilometer (roughly 2,500-mile) wide convection plume in the Martian mantle could be driving molten magma up as far as the surface. This could explain multiple lines of evidence that tantalizingly point to a volcanic Mars. It's a result that means some pretty interesting things for Mars. Maybe not surface volcanoes spewing lava everywhere, but interior heating that could keep lakes under the Martian surface from freezing solid. This has implications for the search for Martian life – microbes that might be hidden in such lakes.

<https://www.sciencealert.com/colossal-discovery-on-mars-could-drive-surging-magma-under-the-surface>

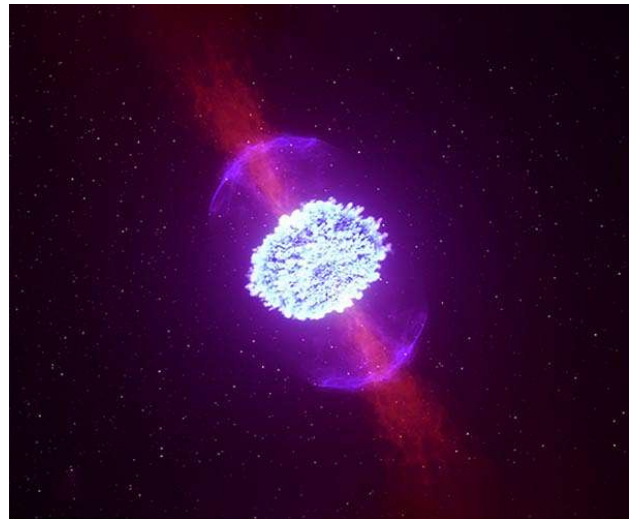
Unusual gamma-ray burst reveals previously undetected hybrid neutron-star merger event

Recent astronomical observations, supported by theoretical modeling, reveal a new observational fingerprint of neutron-star mergers, which may shed light on the production of heavy elements throughout the universe.

Astronomers have long believed that gamma-ray bursts fell into two categories: long-duration bursts from imploding stars and short-duration bursts from merging compact stellar objects. But in a recently observed event, astronomers found a kilonova along with a long-duration gamma-ray burst, and that has thrown a wrench into this simple picture. We can no longer assume that all short-duration bursts come from neutron-star mergers, while long-duration bursts come from supernovae. We now realize that gamma-ray bursts are much harder to classify. This detection pushes our understanding of gamma-ray bursts to the limits.

https://www.spacedaily.com/reports/Unusual_gamma_ray_burst_reveals_previously_undetected_hybrid_neutron_star_merger_event_999.html

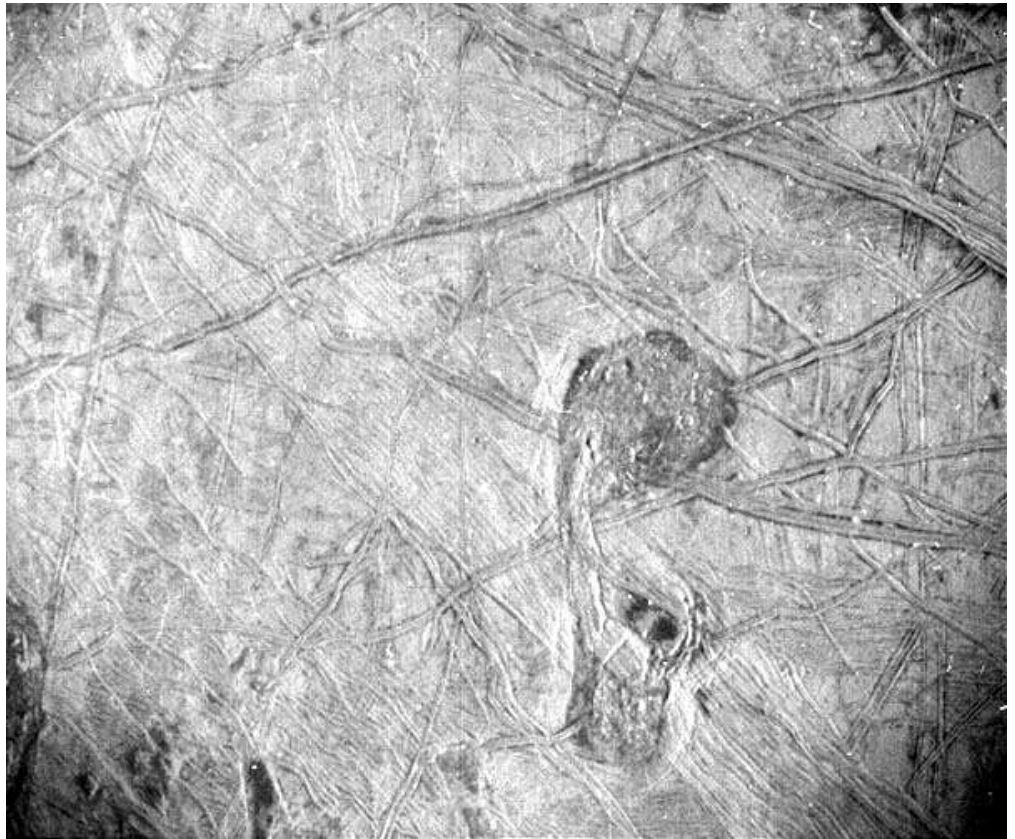
https://www.spacedaily.com/reports/Gamma_ray_burst_is_Rosetta_Stone_for_finding_neutron_star_collisions_999.html



When neutron stars merge, they can produce radioactive ejecta that powers a kilonova signal, as this conceptual image shows. A recently observed gamma-ray burst looked like the emissions from a supernova but turned out to signal a previously undetected hybrid event involving a kilonova.

NASA's Juno gets highest-resolution close-up of Jupiter's moon Europa

Observations from the spacecraft's pass of the moon provided the first close-up in over two decades of this ocean world, resulting in remarkable imagery and unique science. The highest-resolution photo NASA's Juno mission has ever taken of a specific portion of Jupiter's moon Europa reveals a detailed view of a puzzling region of the moon's heavily fractured icy crust. The image covers about 93 miles (150 kilometers) by 125 miles (200 kilometers) of Europa's surface, revealing a region crisscrossed with a network of fine grooves and double ridges (pairs of long parallel lines indicating elevated features in the ice). Near the upper right of the image, as well as just to the right and below center, are dark stains possibly linked

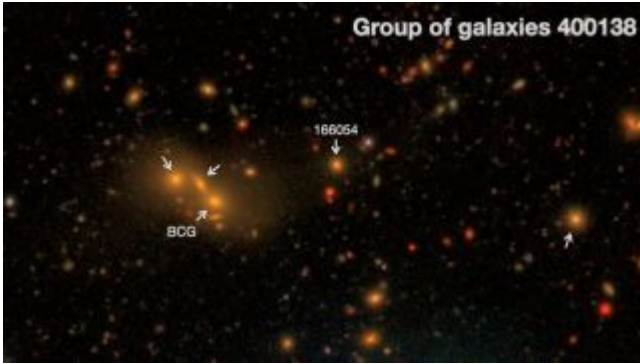


Surface features of Jupiter's icy moon Europa are revealed in an image obtained by Juno's Stellar Reference Unit (SRU) during the spacecraft's Sept. 29, 2022, flyby. Credit: NASA/JPL-Caltech/SwRI

to something from below erupting onto the surface. Below center and to the right is a surface feature that recalls a musical quarter note, measuring 42 miles (67 kilometers) north-south by 23 miles (37 kilometers) east-west. The white dots in the image are signatures of penetrating high-energy particles from the severe radiation environment around the moon.

[https://www.spacedaily.com/reports/NASAs Juno gets highest resolution close up of Jupiters moon Europa 999.html](https://www.spacedaily.com/reports/NASAs_Juno_gets_highest_resolution_close_up_of_Jupiters_moon_Europa_999.html)

Elusive intergalactic light from orphaned stars studied for 1st time



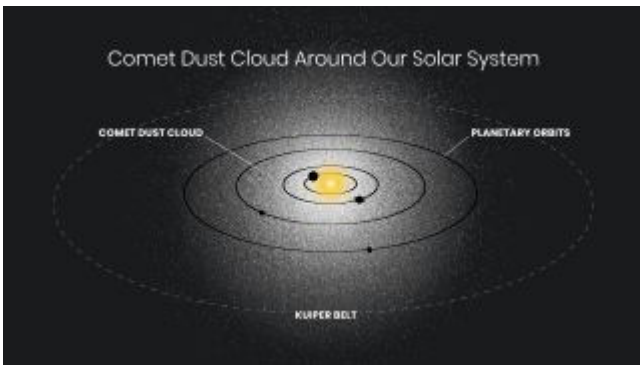
Light 'between' the groups of galaxies – the 'intra-group light' – however dim, is radiated from stars stripped from their home galaxy. (Image credit: Martínez-Lombilla et al./UNSW Sydney)

Astronomers have for the first time studied the elusive faint glow emanated by stars that have been ripped from their homes and now exist as cosmic orphans between galaxies. The team used a new technique to study this so-called "intra-group light" and tell the story of how

displaced [stars](#) were woven through a group of galaxies. Because these [galaxies](#) are seen as they were 2.5 billion years ago, the research could make a valuable contribution to our understanding of cosmic evolution.

<https://www.space.com/orphan-stars-intergroup-glow-between-galaxies>

Hubble Space Telescope spots haunting glow surrounding the solar system



An illustration showing a hypothetical cloud of dust that could come from infalling comets. (Image credit: NASA, ESA, Andi James (STScI))

Did someone leave a light on?

The solar system is surrounded by an eerie ghostly glow that persists after all known light sources are accounted for, according to new research from the Hubble Space Telescope. The discovery suggests that models of the

solar system's structure may have to be revised. The findings came about when astronomers attempted to answer the question, "How dark is dark?" As part of a project called SKYSURF, the team sorted through 200,000 images from the Hubble Space Telescope, systematically eliminating the glow from planets, stars, galaxies, and from dust in the plane of our solar system and making tens of thousands of measurements to detect the residual glow in the night sky after these sources were removed. They found a tiny excess of light, equivalent to the glow of 10 fireflies spread across the entire sky. In a statement, NASA officials described this as being similar to walking into a room at night, turning out all the lights and closing the shades. Despite the darkening of the room, an eerie glow comes from the walls, ceiling and floor even after all light sources have been eliminated.

<https://www.space.com/hubble-space-telescope-solar-system-glow>

Mars interior is not behaving, active mantle plume reveals

In a first, planetary geologists describe an active mantle plume on the surface of Mars.



An illustration of Olympus Mons, the largest known volcano in the solar system. Mars may have a mantle plume that's fueling its earthquakes and recent volcanism. (Image credit: SEBASTIAN KAULITZKI/SCIENCE PHOTO LIBRARY via Getty Images)

For decades, astronomers assumed that Mars was geodynamically dead — a planet without rumbling earthquakes and erupting volcanoes. Though remnants of towering volcanoes exist on the surface of the Red Planet today, these colossal structures have been dormant for millions of years. With little to no heat firing the planet's engine, scientists reasoned, Mars became dormant long ago. However, over the last five years, this assumption has been proven wrong. NASA's InSight mission has detected quakes and even evidence of recent volcanism around one Martian region, known as Elysium Planitia. And now, they think they know why this activity is occurring. In a paper published in the journal [Nature Astronomy](#) Dec. 5, scientists describe what appears to be the first active mantle plume discovered on the Martian surface. The finding suggests that Mars may be cooling significantly more slowly than scientists had anticipated. If this is the case, it could have profound implications not just for the planet's geology but also in the search for water — or perhaps even alien life.

<https://www.livescience.com/mantle-plume-mars>

COMMITTEE MEMBERS

Derek Duckitt	(Chairman, GPAED project, website editor, Cosmology SIG co-ordinator, “Southern Cross”)	082 414 4024 derek.duckitt@gmail.com
Pierre de Villiers	(Vice-chairman, GPAED project leader)	082 854 2277
Elaine Sykes	(Treasurer)	083 286 2683 elaineatboshof@gmail.com
Peter Harvey	(Secretary, “Skynotes”, “Southern Cross”, Study Group SIG coordinator)	081 212 9481 petermh@hermanus.co.za
Mick Fynn	(Educational outreach)	082 443 0848
Pieter Kotzé	(Events co-ordinator, “Southern Cross”)	082 581 3233

Non-committee members with portfolios:

Deon Krige	(GPAED project, Astro-photography SIG coordinator)	krige.deon44@outlook.com
Johan Retief	(Membership)	028 315 1132 hermanus.astronomy@gmail.com