"The Southern Cross"



Hermanus Astronomy

Centre Newsletter

DECEMBER 2022

MONTHLY MEETING

29th November – Dr Pierre de Villiers - "Gearing's Point Astronomy Education Display" (GPAED).

Pierre de Villiers presented us with an astonishing account of the scale and complexity of this project which initially sounded, at least in principle, a relatively simple construction in comparison with the originally planned observatory on Rotary Drive. He outlined, and I stress *outlined*, the gathering of a team of experts involved in the financing (mainly by the National Lottery Commission), management, design, fabrication, editing and construction of an undoubtedly world-class education and tourist attraction. No small help came from his carefully selected team from within the Hermanus Astronomy Centre of Deon Krige and Derek Duckitt, along with Laura Norris (finances) and Jenny Morris (admin). To top it all was the dedication of HIS TIME to the facility.

A thoroughly informative and entertaining hour. The presentation is an absolute must for those who missed it on Zoom and for those, like myself, who would just like to go through it again. Herewith the You Tube link: <u>https://www.youtube.com/watch?v=rN2NxgWzoEY&t=288s</u>

Next: 16th January 2023- Prof P Meintjies-- "Cosmic Power Stations: Fast Rotating Stars"

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

<u>Cosmology</u>

(the first Monday of each month)

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

7th November - The History of the Universe- *Is There One All Powerful SUPERFORCE Controlling The Universe?*

Next: **Tuesday 13th December** (moved to this date due load shedding)- The History of the Universe-Why does the Universe Look the Same Everywhere? For further information, please contact Derek Duckitt:<u>derek.duckitt@gmail.com</u>

Astrophotography

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

14th November- no meeting held.

Next: 9th January 2023.

Study Group

(The last Monday of each month)

31st October: Almost Human: How New Discoveries from South Africa Change Our View of Human Origin. <u>https://www.youtube.com/watch?v=nkxOBmFeCcU</u>

Next: 30th January 2023- 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://ww	ww.herma	nusastro	nomy.co.za					

SEASONAL GET-TOGETHER

It has been suggested we gather together for this festive season on Thursday 15th December at 18.00,

- To welcome new members whom we have yet to meet
- To renew our friendships
- And to take delivery of our Sky Guides for 2023. There will be extras on sale for the Christmas stockings!

Sandy and Susanne Herman have kindly offered their home as a venue. The precise address will be advised shortly but it is in the Onrus area to the north of Kidbrooke.

The format is yet to be finalised, but I suspect we shall be asked to bring a plate of finger snacks and our choice of beverage.

Astronomy News (compiled by Pieter Kotzé)

December 2022

James Webb Space Telescope reveals hidden star formation in pair of colliding galaxies



The pair of merging galaxies known as IC 1623 photographed by the James Webb Space Telescope. (Image credit: ESA/Webb, NASA & CSA, L. Armus & A. Evans)

The James Webb Space Telescope photographed a collision of two galaxies that's sparking a flurry of star formation invisible to other telescopes. The wave of star birth was triggered by the encounter of two galaxies known by the common name IC 1623. The merging couple is producing stars at a rate 20 times faster than that of our own Milky Way galaxy, scientists said. The galactic clash was previously imaged by other telescopes, including Webb's predecessor the Hubble Space Telescope, which specializes in detecting optical light (the kinds of wavelengths visible to the human eye). But because IC 1623 is wrapped in a thick shield of dust, astronomers had not been able to peer deeper inside the galaxies to see the forming stars. The James Webb Space Telescope, with its dust-penetrating infrared gaze, pierced through the shroud with ease, revealing a luminous center that is giving off so much infrared light (essentially heat) that the galaxy produces the trademark eight-spike refraction pattern usually seen in Webb's images containing bright stars.

https://www.space.com/james-webb-telescope-star-formation-galactic-crash-photo

World's Oldest Known Map of Stars Found Hiding in Medieval Manuscript



Faint traces of the parchment's undertext, revealed by multispectral imaging, appear in lighter brown. Journal for the History of Astronomy

More than 2,100 years ago, Greek astronomer Hipparchus mapped out the stars -- and for a long time, his document had been considered humanity's earliest attempt to assign numerical coordinates to stellar bodies. But despite its fame, the treatise was only known to exist through the writings of another well-known astronomer, Claudius Ptolemy, who compiled his own celestial inventory some 400 years later. Researchers believe they've found fragments of Hipparchus' lost historical document hidden in a medieval manuscript. This new evidence is the most authoritative to date and allows major progress in the reconstruction of Hipparchus' Star Catalogue. This discovery could shed new light not only on Hipparchus' attempt to map the night sky through precise measurements and calculations, but on the history of astronomy.

https://www.cnet.com/science/space/oldest-known-map-of-stars-found-hiding-in-medievalmanuscript/

InSight Felt the Ground Shake From a Meteorite Impact on Mars

The Mars InSight lander might be nearing the end of its life on the Red Planet, but its scientific data are still shaking up the planetary science community. That's because it detected another Marsquake on December 24, 2021. It was a major shaker and generated surface waves that rippled across the crust of the planet. The data from that quake allowed science team members to get a better idea of the Martian crust's structure. Now, this wasn't just any old magnitude-4 Marsquake. It was evidence of a major meteoroid impact on the planet. So, scientists began looking for a crater. Before-and-after images from NASA's Mars Reconnaissance Orbiter (MRO, which reached orbit in 2006) revealed a new one in Amazonis Planitia. That's a region that lies between the Tharsis and Elysium regions on the planet.



Boulder-sized blocks of water ice lie around a crater blasted out by a meteoroid on December 24, 2021. NASA's InSight lander measured the earthquake the impact caused. Credit: NASA/JPL-Caltech/University of Arizona

With images and seismic data that pinpoint the crater's location, scientists think it's of the largest craters ever witnessed forming any place in the solar system. Of course, many larger ones exist on Mars, but they're older than any of the missions sent to the Red Planet. Luckily, InSight was there to measure the seismic aftermath of the event. Scientists used some of its data to create a sound "recording" of the impact. It is unprecedented to find a fresh impact of this

size," said Ingrid Daubar of Brown University, who leads InSight's Impact Science Working Group. "It's an exciting moment in geologic history, and we got to witness it." The crater is about 150 meters across and 21 meters deep.

https://www.universetoday.com/158390/insight-felt-the-ground-shake-from-a-meteorite-impact-on-mars/

https://www.marsdaily.com/reports/Meteorite impacts on the surface of Mars provide ne w details of the planets crust 999.html



Hubble captures rare 'light echo' from star explosion

Host-subtracted F555W-band HST image of SN 2016adj on +1991 days, with the positions of LE1, LE2, LE3, and LE4 highlighted by colored rings and labeled. Credit: The Astrophysical Journal Letters (2022).

When a star explodes (a supernova), it sends its intense burst of light out in all directions. On rare occasions, in the months and years that follow, rings of light or "light echoes" spread out from the original supernova position. This is what is described in a recent paper in Astrophysical Journal Letters The based on observations with the Hubble Telescope Space (HST) bv а collaboration of astronomers from Dublin, Barcelona, Aarhus, New York

and Garching. The paper, "Hubble Space Telescope Reveals Spectacular Light Echoes

Associated with the Stripped-envelope Supernova 2016adj in the Iconic Dust Lane of Centaurus A," was published this week. The supernova in question, named SN 2016adj, was first seen in 2016 and belongs to the well-known peculiar galaxy Centaurus A, situated between 10 and 16 million lightyears from Earth. For five and a half years, the astronomers watched the area around the supernova after it slowly faded away. Centaurus A is full of dust lanes and when the sideways spreading light from the supernova hit these dusty areas over time, they lit up further and further away from the original supernova position, creating a series of expanding rings of emission called light echoes. The variations in these rings during the years of observation enables researchers to probe the lay-out of the dust lanes in the galaxy near the explosion. The data suggests that they consist of columns of dust with large holes in between, resembling a chunk of Swiss cheese.

https://phys.org/news/2022-10-hubble-captures-rare-echo-star.html



ANU scientists use deep planetary scan to confirm Martian core

Illustration of the Martian interior

Seismologists from The Australian National University (ANU) have developed a new method to scan the deep interior of planets in our solar system to confirm whether they have a core at the heart of their existence. The scanning method, which works in a similar way to an ultrasound scan using sound waves to generate images of a patient's body, requires only a single seismometer on a planet's surface in order to work. It can also be used to confirm the size of a planet's core. Using the ANU model to scan the entirety of Mars' interior, the researchers confirmed the Red Planet has a large core at its centre - a theory first confirmed by a team of scientists in 2021. To carry out their research, ANU scientists used data collected from a seismometer attached to NASA's InSight lander, which has been collecting information about marsquakes, Martian weather and the planet's interior since touching down on Mars in 2018.

https://www.marsdaily.com/reports/ANU_scientists_use_deep_planetary_scan_to_confirm_ Martian_core_999.html Stripped, pulsating core of a massive star' spotted for the first time



Credit: Pixabay/CC0 Public Domain

Researchers have discovered a "stripped, pulsating core of a massive star" for the first time. Stellar cores, as their name suggests, are the innermost parts of stars. Most often, such cores are covered by what space scientists call their "opaque envelope." Theory has suggested that such cores can

appear without their envelope if conditions arise that lead to its removal. But until now, this had never been observed. In their paper, the researchers write that their discovery of what was believed to be an average, normal star, called γ Columbae, was purely "serendipitous." They were looking at a group of stars and found that their data suggested that one of them was unusual. That led them to take a closer look at the light spectrum emitted by the star, and in the process, discovering evidence of a missing envelope. They estimate that star γ Columbae was likely approximately 12 times the mass of the sun before losing its envelope—it is now just five times the size of the sun.

https://phys.org/news/2022-11-pulsating-core-massive-star.html

First Glimpse in to the Inner Depths of an Active Galaxy Provided by Ghostly Neutrino Particles



Hubble image of the spiral galaxy NGC 1068. Credit: NASA / ESA / A. van der Hoeven

Evidence of high-energy neutrino emission from the galaxy NGC 1068 has been found by an international team of scientists for the first time. First spotted in 1780, NGC 1068, also known as Messier 77, is an active galaxy in the constellation Cetus and one of the most familiar and well-studied galaxies to date. Located 47 million light-years away from us, this galaxy can be observed with large binoculars. The detection

was made at the IceCube Neutrino Observatory. This massive neutrino telescope, which is supported by the National Science Foundation, encompasses 1 billion tons of instrumented

ice at depths of 1.5 to 2.5 kilometers (0.9 to 1.2 miles) below Antarctica's surface near the South Pole. This unique telescope explores the farthest reaches of our universe using neutrinos. It reported the first observation of a high-energy astrophysical neutrino source in 2018.

https://scitechdaily.com/first-glimpse-into-the-inner-depths-of-an-active-galaxy-provided-by-ghostly-neutrino-particles/

This im Wide-fie Survey features Gunn. study, compile water, and ca gases fri test pre system evolution

New study of comets provides insight into chemical composition of early solar system

This image from NASA's Wide-field Infrared Survey Explorer (WISE) features comet 65/P Gunn. For the UCF the researcher compiled the amounts of water, carbon dioxide, and carbon monoxide gases from 25 comets to test predictions of solar system formation and evolution. Credit: NASA

A new study from the University of Central

Florida has found strong support that the outgassing of molecules from comets could be the result of the composition from the beginning of our solar system. One of the most interesting results is that comets very far from sun with orbits in the Oort cloud that have never, or only rarely, orbited near the sun, were seen to produce more CO_2 than CO in their coma, whereas comets that have made many more trips close to the Sun behave the opposite. This had never been seen conclusively before.

https://phys.org/news/2022-11-comets-insight-chemical-composition-early.html

Meteorite offers insight into building blocks of early life

A new study from Britain's Natural History Museum and the University of Glasgow has found that carbonaceous asteroids may have played a key role in seeding the Earth with the ingredients of early life. A fragment of the Winchcombe meteorite, which is believed to have broken off of an asteroid near Jupiter and reached earth within the last million years, has been found to contain extraterrestrial water, and organic compounds, that provide insight into the origin of Earth's oceans. Scientists examined atoms created by irradiation from cosmic rays to determine that the meteorite traveled through space for approximately 200,000 to 300,000 years.

https://www.spacedaily.com/reports/Meteorite_offers_insight_into_building_blocks_of_early_ life_999.html Oldest planetary debris in our galaxy found from new study



of the old white WDJ2147and by planetary will the and pollute atmospheres. is extremely red and while is

unusually blue. Credit: University of Warwick/Dr Mark Garlick.

Astronomers led by the University of Warwick have identified the oldest star in our galaxy that is accreting debris from orbiting planetesimals, making it one of the oldest rocky and icy planetary systems discovered in the Milky Way. Their findings conclude that a faint white dwarf located 90 light years from Earth, as well as the remains of its orbiting planetary system, are over ten billion years old. Using spectroscopic and photometric data from GAIA, the Dark Energy Survey and the X-Shooter instrument at the European Southern Observatory to work out how long it has been cooling for, the astronomers found that the 'red' star WDJ2147-4035 is around 10.7 billion years old, of which 10.2 billion years has been spent cooling as a white dwarf.

https://www.spacedaily.com/reports/Oldest planetary debris in our galaxy found from ne w study 999.html



Red-supergiant supernova images reveal secrets of an earlier universe

international research An team led by the University of Minnesota Twin Cities has measured the size of a star dating back more than 11 billion years ago using images that show the evolution of the star exploding and cooling. Credit: Wenlei Chen, NASA

An international research team led by the University of Minnesota Twin Cities has measured the size of a star dating back 2 billion years after the Big Bang, or more than 11 billion years

ago. Detailed images show the exploding star cooling and could help scientists learn more about the stars and galaxies present in the early universe. "This is the first detailed look at a <u>supernova</u> at a much earlier epoch of the universe's evolution," said Patrick Kelly, a lead author of the paper and an associate professor in the University of Minnesota School of Physics and Astronomy. "It's very exciting because we can learn in detail about an individual star when the universe was less than a fifth of its current age, and begin to understand if the stars that existed many billions of years ago are different from the ones nearby."

https://phys.org/news/2022-11-red-supergiant-supernova-images-reveal-secrets.html

New Observations Confirm That a Magnetar has a Solid Surface and No Atmosphere

Can a star have a solid surface? A new study says that one of these magnetars has a solid surface and no atmosphere. It's called 4U 0142+61, and it's about 13,000 light years away from Earth in the Cassiopeia constellation. The study is <u>"Polarized x-rays from a magnetar,"</u> and it's published in the journal Science. The lead author is Dr. Roberto Taverna, from the University of Padova (Padua), Italy. "The star's gas has reached a tipping point and become solid in a similar way that water might turn to ice. This is a result of the star's incredibly strong magnetic field." This study marks the first time that scientists have observed polarised x-rays from a magnetar. IXPE observed the magnetar for a total of 840 kiloseconds (about 233 hours) in January and February of 2022. What did those observations show? The researchers found a much lower proportion of polarised light than there should be if the x-rays had passed through an atmosphere. An atmosphere around the magnetar would act like a filter and allow only one polarisation state of light to pass through.



An artist's impression of a magnetar, a highly magnetic, slowly rotating neutron star. Credit: ESO/L. Calçada

https://www.universetoday.com/158556/new-observations-confirm-that-a-magnetar-has-a-solid-surface-and-no-atmosphere/

https://www.nasa.gov/mission_pages/ixpe/news/2022/nasa-s-ixpe-finds-powerful-magnetic-fields-and-solid-crust-at-neutron-star.html

Webb observations point to a shorter cosmic dark age

The first galaxies may have formed far earlier than previously thought, according to observations from the James Webb Space Telescope that are reshaping astronomers' understanding of the early universe. Researchers using the powerful observatory have now published papers in the journal Astrophysical Journal Letters, documenting two exceptionally bright, exceptionally distant galaxies, based on data gathered within the first few days of Webb going operational in July. These galaxies are very massive, with lots of low-mass stars like galaxies today, and had to start forming 100 million years after the Big Bang which occurred 13.8 billion years ago. That is 100 million years earlier than the currently held end of the so-called cosmic dark age, when the universe contained only gas and dark matter. A second possibility is that they are made up of "Population III" stars, which have never been observed but are theorized to have been made of only helium and hydrogen, before heavier elements existed.

https://www.spacedaily.com/reports/Webb_observations_point_to_a_shorter_cosmic_dark_a ge_999.html

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