"The Southern Cross"

HERMANUS ASTRONOMY CENTRE NEWSLETTER

AUGUST 2022

Monthly Meeting

(The third Monday of each month)

18th July - Dr Nicolas Erasmus presented *"Observations Characterising Asteroids using Telescopes located in Sutherland."*

Nic outlined the migrations of objects, ejected from the main asteroid belt between Mars and Jupiter by the perturbation of planets, to the outer solar system and beyond and also among the inner planets, the latter being the focus of this presentation. Though asteroids were first discovered more than two hundred years ago, it was only in the mid-1990s that there were programmes dedicated to the finding of asteroids. Situated at the Sutherland Observatory, new telescopes have been built, commenced in 1919 and completed in 2021, to accommodate the southern hemisphere and a different time zone. These included telescopes, such as Atlas, with computer software to identify moving objects in images. Discoveries have included comets and supernovae and some near-earth asteroids with a wide variety in size, shape, albedo and make-up. This helps with learning about the evolution of the solar system. Of more immediate interest is the determination of their level of danger should the object hit the earth. The presentation ended with a short recording of the movement of asteroid "Hermanus"!

You can view the full presentation on this You Tube site. https://youtu.be/-JJtdFmFjLs

15th August – Stefan Lotz presents *"Artificial Intelligence in Space Weather Predictions".* Further details will be circulated closer to the time.

2022 meeting dates: For your diaries - The monthly meetings of 2022 are scheduled as follows: 15 August, 19 September, 17 October and 21 November. Unless otherwise advised, all our meetings are virtual using Zoom, commencing 18.30.

SPECIAL INTEREST GROUP ACTIVITIES

Cosmology

(the first Monday of each month)

4th July: *Giant Magnetic Waves Inside Planet Earth; Particle Experiment Creates Tetraneutrons; Nuclear Bomb Test Data Was Used To Discover That Earth Core Is Oscillating.*

1st August: *"History of the Universe - First of a series of 17 videos - 1. What Was The Big Bang?"*

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

Astrophotography

(The second Monday of each month)

At our meeting on **Monday 11th July**, Pete Scully presented a tutorial on the processing of Derek's M8 (Lagoon Nebula) image, particularly the use of Siril and Starnet++.

Coming up: 8th August, this meeting will only take place in accordance with members' wishes. For further information, please contact Deon Krige: krige.deon44@outlook.com

Study Group

(The last Monday of each month)

25th July: *"Are Viruses Alive?"*

29th August: 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 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)

This project is progressing in accordance with the planned schedule. The scientific and graphical editing of the information tablets have been completed except for a few modifications to be implemented. The next phase that involves the chemical etching of the information on stainless steel and the physical design of the actual tablets has commenced.

Astronomy News (compiled by Pieter Kotzé)

The star that survived a supernova

Galaxy NGC 1309. Credit: NASA, ESA, The Hubble Heritage Team (STSCI/AURA), and A. Riess (JHU/STSCI)

A supernova is the catastrophic explosion of a star. Thermonuclear supernovae, in particular, signal the complete destruction of a white dwarf star, leaving nothing behind. At least that's what models and observations suggested. So when a team of astronomers went to look at the site of the peculiar thermonuclear supernova SN 2012Z with the Hubble Space Telescope, they were shocked to discover that the star had survived the explosion. Not only had it survived—the star was even brighter after the supernova than it had been before.

https://phys.org/news/2022-06-star-survived-supernova.html

Astronomers link 64 telescopes to observe the structure of the universe

An international team of astronomers have for the first time combined the power of 64 radio telescope dishes to detect the faint signatures of neutral hydrogen gas across cosmological scales. The feat was achieved using the South African-based MeerKAT telescope, a precursor to the world's largest radio observatory, the SKA Observatory (SKAO), which will probe the universe in unprecedented detail.

https://phys.org/news/2022-06-astronomers-link-telescopes-universe.html

Newfound fast radio burst challenges what astronomers know about the powerful astronomical phenomena

Researchers used a radio telescope in New Mexico to study a particularly interesting fast radio burst. (Image credit: Diana Robinson/Flickr, CC BY-NC-ND)

A newly discovered fast radio burst has some unique properties that are simultaneously giving astronomers important clues into what may cause these mysterious astronomical phenomena while also calling into question one of the few things scientists thought they knew about these powerful flares. Fast radio bursts, or FRBs, are extremely bright pulses of radio waves that come from faraway galaxies. They release as much energy in a millisecond as the sun does.

https://www.space.com/fast-radio-burst-challenges-astronomers

Exotic carbon microcrystals in meteorite dust

File image by Dishchii Bikoh of meteorite fall creating a cloud of dust.

The largest meteorite observed so far this century entered the Earth's atmosphere above Chelyabinsk in the Southern Urals, Russia on February 15, 2013. Unusually, dust from the surface of this meteorite survived its fall and is being extensively studied. This dust includes some unusually shaped microcrystals of carbon. A study of the morphology and simulations of the formation of these crystals by a consortium led by Sergey Taskaev and Vladimir Khovaylo from Chelyabinsk State University. Further analysis using Raman spectroscopy and X-ray crystallography showed that the carbon crystals were, actually, exotically-shaped forms of graphite. The researchers propose that the most likely candidates for these nanoclusters are buckminsterfullerene (C60), a cage-like ball of carbon atoms, or polyhexacyclooctadecane (C18H12), a molecule made from carbon and hydrogen.

https://www.spacedaily.com/reports/Exotic_carbon_microcrystals_in_meteorite_dust_999.html

NASA's Curiosity takes inventory of key life ingredient on Mars

From a position in the shallow "Yellowknife Bay" depression, NASA's Mars rover Curiosity used its right Mast Camera (Mastcam) to take the telephoto images combined into a new panorama of geological diversity.

Scientists using data from NASA's Curiosity rover measured the total organic carbon - a key component in the molecules of life - in Martian rocks for the first time. Total organic carbon is one of several measurements [or indices] that help us understand how much material is available as feedstock for prebiotic chemistry and potentially biology. The concentrations found are comparable to or even more than the amount found in rocks in very low-life places on Earth, such as parts of the Atacama Desert in South America, and more than has been detected in Mars meteorites.

https://www.marsdaily.com/reports/NASAs_Curiosity_takes_inventory_of_key_life_ingredient_on_Mars_999.html

The Largest Alcohol Molecule Found in Space Yet May Be The Key to Star Formation

There's alcohol up in space. No, it's not bottles of wine discarded by careless astronauts; rather, it's in microscopic molecular form. Now researchers think they've discovered the largest alcohol molecule in space yet, in the form of propanol. These discoveries should shed light on how celestial bodies such as comets and stars are formed. These alcohol molecules have been found in what's known as a 'delivery room' of stars, the gigantic star-forming region called Sagittarius B2 (Sgr B2). The region sits near the centre of the Milky Way and close to Sagittarius A* (Sgr A*), the supermassive black hole that our galaxy is built around.

https://www.sciencealert.com/this-is-the-largest-alcohol-molecule-we-ve-found-in-space-yet

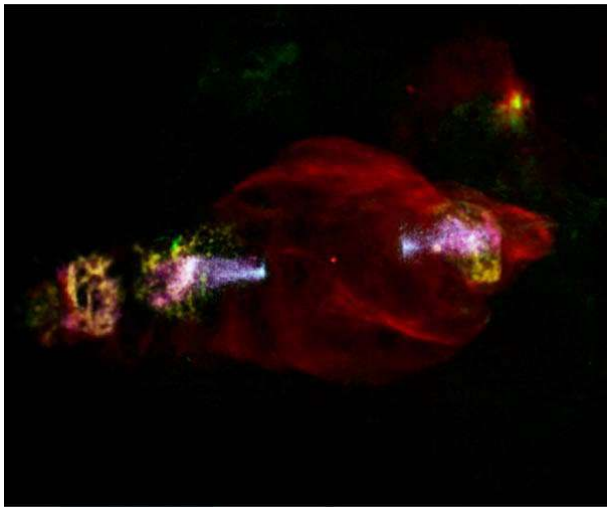
New fossil galaxy discovery could answer important questions about the history of the universe

A new fossil galaxy, which was uncovered via a systematic visual search of legacy survey images using the Mayall 4-meter telescope, led by Dr. David Martinez Delgado, could teach scientists about how galaxies form and confirm their understanding of cosmology and dark matter.

Dr. Michelle Collins, an astronomer at the University of Surrey, UK and lead author of the paper announcing this discovery says that they "have found a new, extremely faint galaxy whose stars formed very early in the history of the Universe. This discovery marks the first time a galaxy this faint has been found around Andromeda using an astronomical survey that wasn't specifically designed for the task." Named "Pegasus V," the dwarf galaxy is located on the outskirts of Andromeda and appears as just a few sparse stars hidden in the sky. The discovery was made in collaboration with NSF NOIRLab and the International Gemini Observatory.

https://phys.org/news/2022-06-fossil-galaxy-discovery-important-history.html

Cosmic manatee accelerates particles from head

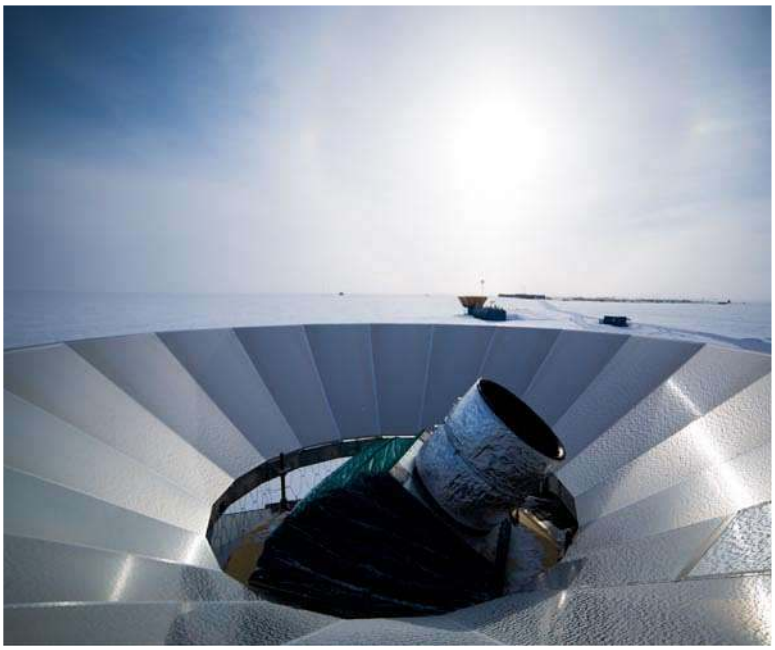


The nebula acts as a nearby laboratory for exploring a wide range of astrophysical phenomena associated with the outflows of many galactic and extragalactic sources and will be subject to further investigation. Furthermore, follow-up studies by ESA's future Athena X-ray observatory will provide even more sensitive details about the inner workings of this curious cosmic Manatee.

ESA's XMM-Newton has X-rayed this beautiful cosmic creature, known as the Manatee Nebula, pinning down the location of unusual particle acceleration in its 'head'. The Manatee Nebula, or W50, is thought to be a large supernova remnant created when a giant star exploded around 30 000 years ago, flinging its shells of gases out across the sky. It is one of the largest such features known, spanning the equivalent size of four full Moons. Unusually for a supernova remnant, a black hole remains in its core. SS 433 is identified by the red dot in the middle of the image. The X-ray data acquired by XMM-Newton are represented in yellow (soft X-rays), magenta (medium energy X-rays) and cyan (hard X-ray emission), while red is radio and green optical wavelengths imaged by the Very Large Array and the Skinakas Observatory in Greece, respectively. The nebula attracted attention in 2018 when the High-Altitude Water Cherenkov Observatory, which is sensitive to very high energy gamma-ray photons, revealed the presence of highly energetic particles (hundreds of tera electron volts), but could not pinpoint from where within the Manatee the particles were originating.

https://www.spacedaily.com/reports/Cosmic_manatee_accelerates_particles_from_head_999.html

The futuristic South Pole Telescope looks far back in time



File image of the South Pole Telescope.

Surveying the cosmos from its isolated position in Antarctica, a collaborative project aims to reveal insights about the universe's beginnings. In summer at the South Pole, which lasts from November through February, the average temperature is a biting minus 18 degrees F. The sun does not set during this time, making sleep a challenge. The environment is harsh and dry. And the Internet connection at the Amundsen-Scott South Pole Station, when you can access it, is painfully slow. On the other hand, distractions from work are few, and the landscape is stunning. The meals from the onsite kitchen are great. The best part? There's an unparalleled view of the early universe. That view, which comes from the research station's South Pole Telescope (SPT), isn't what many of us would imagine when we look up at the sky. Rather than

stars and planets, the SPT's images look more like a Jackson Pollock painting. They capture data related to the origin of the universe and its evolution over billions of years.

https://www.spacedaily.com/reports/The_futuristic_South_Pole_Telescope_looks_far_back_in_time_999.html

Asteroid Bennu Reveals its Surface is Like a Plastic Ball Pit

Near-Earth asteroid Bennu is a rubble pile of rocks and boulders left over from the formation of the solar system. On October 20, 2020, NASA's OSIRIS-REx spacecraft briefly touched down on Bennu and collected a sample for return to Earth. During this event the spacecraft's arm sank far deeper into the asteroid than expected, confirming that Bennu's surface is loosely bound. Now, scientists have used data from OSIRIS-REx to revisit the sample-collection event and better understand how Bennu's loose upper layers are held together.

After analysing data gathered when NASA's OSIRIS-REx spacecraft collected a sample from asteroid Bennu in October 2020, scientists have learned something astonishing: The spacecraft would have sunk into Bennu had it not fired its thrusters to back away immediately after it grabbed dust and rock from the asteroid's surface. It turns out that the particles making up Bennu's exterior are so loosely packed and lightly bound to each other that if a person were to step onto Bennu they would feel very little resistance, as if stepping into a pit of plastic balls that are popular play areas for kids.

https://www.spacedaily.com/reports/Asteroid_Bennu_Reveals_its_Surface_is_Like_a_Plastic_Ball_Pit_999.html

Scientists discover how first quasars in universe formed

stock illustration only

The mystery of how the first quasars in the universe formed - something that has baffled scientists for nearly 20 years - has now been solved by a team of astrophysicists whose findings are published in Nature. The existence of over 200 quasars powered by supermassive black holes less than a billion years after the Big Bang had remained one of the outstanding problems in astrophysics because it was never fully understood how they formed so early. The team of experts led by Dr Daniel Whalen from the University of Portsmouth have found that the first quasars naturally formed in the violent, turbulent conditions of rare reservoirs of gas in the early universe.

https://www.spacedaily.com/reports/Scientists_discover_how_first_quasars_in_universe_formed_999.html

Neutrino Factories in Deep Outer Space

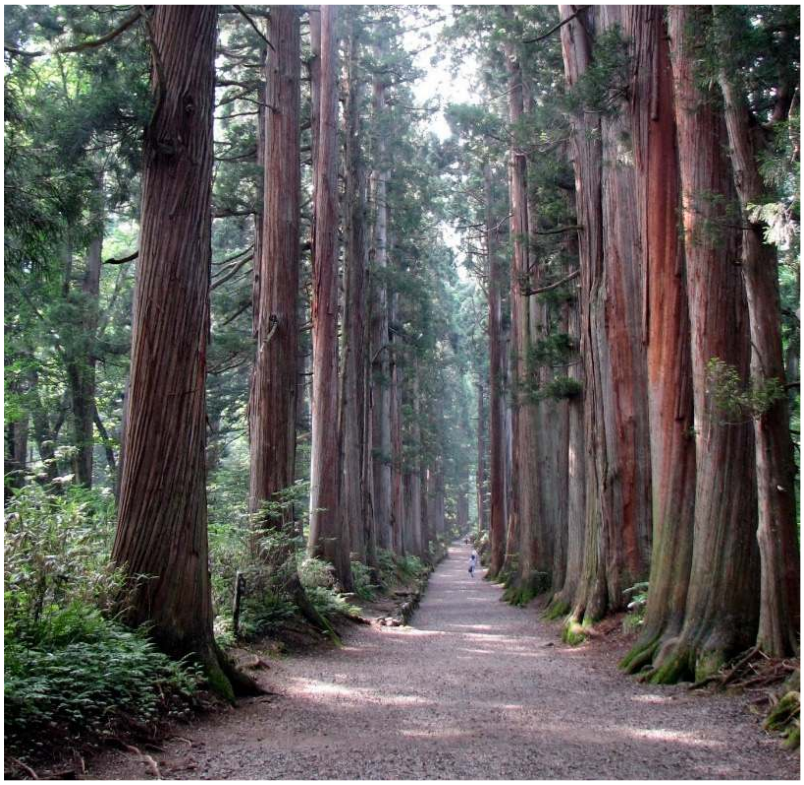
An artistic illustration of a blazar accelerating cosmic rays, neutrinos and photons up to high energies, as observed in PeVatron blazars.

The Earth's atmosphere is continuously bombarded by cosmic rays. These consist of electrically charged particles of energies up to 1020 electron volts. That is a million times more than the energy achieved in the world's most powerful particle accelerator, the Large Hadron Collider near Geneva. The extremely energetic particles come from deep outer space, they have travelled billions of light years. Where do they originate, what shoots them through the Universe with such tremendous force? These questions are among the greatest challenges of astrophysics for over a century. Cosmic rays' birthplaces produce neutrinos. Neutrinos are neutral particles difficult to detect. They have almost no mass and hardly interact with matter. They race through the Universe and can travel through galaxies, planets and the human body almost without a trace. A new study shows that blazars can be now be confidently associated with astrophysical neutrinos at an unprecedented degree of certainty. Blazars are active galactic nuclei powered by supermassive black holes that emit much more radiation than their entire galaxy.

https://www.spacedaily.com/reports/Neutrino_Factories_in_Deep_Outer_Space_999.html

World's oldest trees reveal the largest solar storm in history

1859's Carrington event gave us a preview of how catastrophic the Sun could be for humanity. But it could get even worse than we imagined. Japanese cedar trees, shown here lining the path to Togakushi Shrine in Nagano, Japan, can live to be thousands of years old. Inside, their tree rings reflect the amount of carbon-14 that was in them at the time they formed, minus whatever fraction of those atoms have radioactively decayed in the intervening time. Trees like these

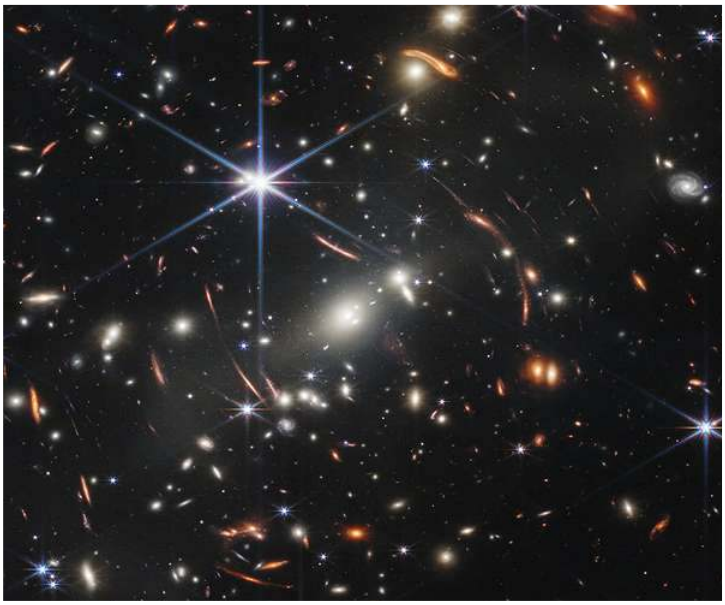


provided the key evidence in uncovering the solar storm of 774-775: a storm that may have been even more powerful than 1859's famed Carrington event.

The Earth, as a result, may be at an even greater risk from a worst-case solar storm than anyone thought possible. While the Carrington event is the most powerful solar flare ever recorded in modern times, a full analysis of the data suggests that this 774-775 event, from more than 1200 years ago, may have been up to or even more than *ten times* as powerful. Although the data is much worse, there's new evidence just published this year that suggest a solar storm from ~9200 years ago may have even been more powerful than the 774-775 event.

https://bigthink.com/starts-with-a-bang/oldest-trees-solar-storm/

Webb telescope may have already found most distant known galaxy



Just a week after its first images were shown to the world, the James Webb Space Telescope may have found a galaxy that existed 13.5 billion years ago. Known as GLASS-z13, the galaxy dates back to 300 million years after the Big Bang, about 100 million years earlier than anything previously identified, Rohan Naidu of the Harvard Centre for Astrophysics. We are potentially looking at the most distant starlight that anyone has ever seen. Although GLASS-z13 existed in the earliest era of the universe, its exact age remains unknown as it could have formed anytime within the first 300 million years.

https://www.spacedaily.com/reports/Webb_telescope_may_have_already_found_most_distant_known_galaxy_999.html

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