"The Southern Cross"

HERMANUS ASTRONOMY CENTRE NEWSLETTER

MARCH 2019

Monthly meeting This month's meeting will take place on **Monday 18 March** at the **Catholic Church Hall** starting at **19.00.** Case Rijsdijk, President of ASSA will be talking on 'The New Horizons mission. See below for details.

Cosmology The date for this month's next meeting on 'Natural philosophy: science for non-scientists' has been **changed** from Monday 4 March to **Monday 11 March**.

Membership renewal for 2019 – final reminder

There will be a small increase in the fees for 2019, following 2 years at the current rate.

The 2019 fees are as follows:

Member: R160

Member's spouse/partner/child, student: R80

New members joining after 1 October 2018 will have membership until the end of 2019.

Payment can be made in cash (at meetings directly to the Treasurer), or via online transfer. The Standard Bank details, for the latter, are as follows:

Account name – Hermanus Astronomy Centre

Account number – 185 562 531

Branch code – 051001

If you make an online donation, please reference your name and 'subs' or 'membership', or it is not possible to attribute the payment to you.

WHAT'S UP?

Rigel The distinctive constellation Orion is visible towards the north-west at this time of year. Its brightest star is Rigel ((beta) β Orionis), the bright blue-white star which forms the left knee of the upside-down hunter. For most of the time, Rigel is actually the brightest star in Orion. However, Betelgeuse ((alpha) α Orionis) is a variable star whose varying brightness sometimes outshines that of Rigel. It is this feature which demoted Rigel to second in status, although it holds a higher rank (7th) than Betelgeuse (10th) in the list of brightest stars. Located 863 light years from Earth, it is at least 40,000x brighter than the Sun, with an apparent (visible) magnitude of 0.18. Rigel is not a single star, but part of a multiple, star system. Its companion stars are much fainter. The name Rigel' is an English corruption of the Arabic word for the 'left leg or foot', which has been dated to the 10th century CE , and which recognises where it is located on the body of the hunter.

LAST MONTH'S ACTIVITIES

Monthly centre meeting The Centre's AGM took place on 18 February. In his report, Pierre de Villiers summarised the numerous regular and other activities which took place during 2018. After reminding attendees of the presenters and topics for the monthly meetings, he thanked those who lead the interests groups meetings ie cosmology, astro-photography and the study group. The weather only allowed a few of the planned stargazing events to take place, but both learner and public groups enjoyed some good viewing. Educational outreach included activities for learners – meetings and sundial construction – workshops for science teachers, and an outing to Cape Town with learners from two schools. Centre members also visited the Cederberg for a weekend, enjoying the many land-based sites and two evenings of excellent stargazing. Before thanking the committee and other members who have responsibilities, Pierre updated attendees on the status of the planned AECA, informing them of a new set of proposals, which he outlined in a presentation after the AGM.

The treasurer, Laura Norris, then presented the summary finances for the year, mentioning some notable income and expenses, and confirming the sound overall state of the Centre's finances

Following the AGM, Bennie Kotze gave a short presentation on the visit which he, Johan Retief and Pierre de Villiers made with learners from Lukhanyo Primary and Hawston Sekondêr schools last November. They enjoyed visiting the Science Centre, noon gun, a presentation on 'The sky tonight' at the Iziko Planetarium and a tour of the and the SAAO. Although the hydraulic floor at the McLean telescope was not working, they enjoyed seeing it and other structures and equipment at the site.

Pierre de Viliers then gave a presentation on the proposed Astronomy Self-guided Education Centre planned for Gearing's Point. It was a repeat of the presentation he had made at the last Ward 3 meeting, where the proposal was unanimously approved. These new plans replace the proposed development on Rotary Way, which the Municipality has rejected for security reasons. Plans for the new centre will add to the astronomy features already in place. They include a series of engraved granite tablets mounted on, and cardinal direction slots notched into, the existing walls and three sundials erected round and on the existing survey beacon.

Finally, Bennie showed a short, but interesting video on Laniakea galaxy supercluster, which is home to the Milky Way.

Interest groups

Cosmology At the meeting on 4 February, Pierre Hugo presented the sixth part in the current series on 'Natural philosophy: science for non-scientists'. The topic was 'Gravity – spatial flow'.

Astro-photography No meeting was held in February.

Other activities

Educational outreach

Hawston Secondary School Space Cadets Weekly meetings continued during February.

Lukhanyo Youth Club No update.

Stargazing Unfortunately, unfavourable weather conditions meant that the events shielded for both 1 and 2 February were cancelled.

Whale Talk article An article by Jenny Morris titled 'Was it a meteor or meteorite?' in the March/April issue of the magazine.

THIS MONTH'S ACTIVITIES

Monthly centre meeting

This month's meeting, will take place on **Monday 18 March** at the **Catholic Hall** starting **19.00**. Case Rijsdijk, President of ASSA will be the presenter. Case has been a regular and popular presentee at HAC. His talks are always very enjoyable as well as being informative, and usually address issues of current interest. His talk on 'The New Horizons mission' is a case in point. The mission is still ongoing and, no doubt, Case will include the latest information on its progress during his presentation.

Interest group meetings

The **Cosmology** group meets on the first Monday of each month. The next meeting is on **Monday 11 March** at the **Catholic Hall**, starting at **19.00.** Pierre Hugo will lead the seventh session in the series 'Natural philosophy: science for the non-scientist'. The topic will be "Gravity – fabric of space'.

There is an entrance fee of R10 per person for members, R25 per person for non-members, and R10 for children, students and U3A members. For further information on these meetings, or any of the group's activities, please contact Pierre Hugo at pierre@hermanus.co.za

Astro-photography This group meets on the second Monday of each month. Please contact Deon Krige for confirmation of the meeting date this month.

To find out more about the group's activities and the venue for particular meetings, please contact Deon Krige at astronomy.hermanus@gmail.com

Hermanus Youth Robotic Telescope Interest Group Developmental work on this will resume soon.

For further information, please contact Deon Krige at deonk@telkomsa.net

Other activities

Stargazing The next event is scheduled for **Friday 1 March** at **Gearing's Point,** weather permitting. The decision on whether the event will take place will be circulated to members on the day. If this does not take place, a Moonwatch event is planned for **Friday 8 March** at **Gearing's Point**. Again, members will be informed on the day whether it will be able to take place.

FUTURE TRIPS

Planning is underway for an outing this year. Members will be sent details once the arrangements have been made.

2018 MONTHLY MEETINGS

Unless stated otherwise, meetings take place on the **third Monday** of each month at the **Catholic Church Hall**, beginning at **19.00**.

18 March	'The New Horizons mission'. Presenter: Case Rijsdijk, President of ASSA
15 April	'Another one bites the dust'. Presenter. Dr Shazrene Mohaned, SAAO, CT

20 May	'The upgraded HESS facility'. Presenter, Herbert Pioller, Centre member
24 June	'Star formation and the gas cycle in galaxies'. Presenter: Dr Moses Mogotsi, SAAO., CT
15 July	'Near-Earth asteroids: monitoring close approaches and mitigating objects'. Presenter: Dr Nicolaus Ersamus, SAAO, CT
19 August	'More unusual curvaceous geographical wonders of Earth'. Presenter: Jenny Morris, Centre member
16 September	Topic TBA. Presenter: Pierre de Villiers, Centre chairman
21 October	TBA
18 November	'The Cassini family dynasty and their Saturnian legacy'. Presenter: Jenny Morris, centre member
9 December	Xmas party

ASTRONOMY EDUCATION CENTRE AND AMPHITHEATRE (AECA)

The Centre has been informed that Overstrand Municipality will not be approving the amended application submitted for a structure on Rotary Way, due to security concerns. Committee members are thus working on a new proposal for an Astronomy Self-guided Education Centre, to be located within the existing whale-watching area at Gearing's Point.

This will add to the area without changing any other features of the site. 48-50 engraved granite plates providing information on a wide range of astronomy and related topics will be mounted on the inside of the present walls. Six cardinal direction sunrise/sunset notches will also be cut into the top of the wall. In addition, the erection of three sundials is planned on and around the existing trig. survey beacon. The beacon will also be upgraded and an explanatory plaque on their role in surveying added. Top grade materials will be used to minimise maintenance and provide a unique experience to visitors and locals for many years. Money will still be available for a couple of other small projects planned for the area, but details cannot be released until interested parties have been fully consulted.

The project received unanimous support from those present at the 13 February Ward 3 meeting. A further public information event was held at the site on 20 February.

The **Friends of the Observatory campaign** was launched several years ago when preliminary work began on plans to construct an astronomical observatory in Hermanus. Over the years, members have been very generous, for which we are deeply grateful. It may seem logical to assume that, now money has been awarded by the National Lotteries Board, pledge monies are no longer needed. Unfortunately, that is not the case. NLC funds can only be used once the plans have been formally approved by the Municipality.

We would, therefore, be very grateful if members could either continue to contribute to the campaign or start becoming a contributor. Both single donations and small, regular monthly donations, of any amount, are welcome. Contributions can take the form of cash (paid at meetings), or online transfer, The Standard Bank details are as follows:

Account name – Hermanus Astronomy Centre
Account number – 185 562 531
Branch code – 051001

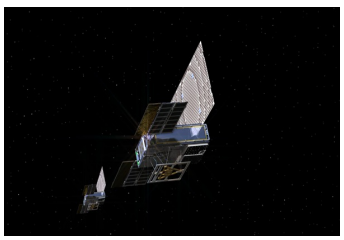
If you make an online donation, please include the word 'pledge', and your name, unless you wish to remain anonymous.

ASTRONOMY NEWS

Galactic twist: The Milky Way's disk is warped 4 February: The shape of the Milky Way, usually pictured as a flat spiral, may actually be more like a warped and twisted disk. That is according to a new study of 1,339 stars whose distances could be measured with great accuracy. The stars are all Cepheid variables, a type of pulsating star whose intrinsic brightness depends on how long it takes to vary from bright to dim and back again. Normally, it is difficult to tell if a star is truly bright or simply close, truly dim or simply very far away. Since a Cepheid's period tells astronomers how bright the star truly is, measuring how bright it appears lets them draw an accurate distance map. Astronomers looked at data from the WISE survey of infrared stars and noted that it contained a large sample of Cepheids. By measuring their distances and then plotting those stars in 3D, the team from Macquarie University in Australia and the Chinese Academy of Sciences have produced a new map of the Milky Way, one that shows a distinct twist. Astronomers have known for decades that the gas disk in the Milky Way is warped. However, the gas also extends nearly twice as far as the stars in the visible disk and it flares out, extending both higher and lower at the edges than the flat pancake of stars. So the stars do not necessarily follow the gas' shape. It took finding accurate distances to the Cepheid stars to make the stellar map clear.

The new data also add a literal twist to the story, showing that the warp precesses, or turns. "The twisting of the warp is new," says astronomer Richard deGrijs of Macquarie University in Australia. "It's been seen in a dozen other galaxies before, but not ours." While the recent study focused on making the map, not explaining it, the authors hypothesize that as the Milky Way's inner disk of stars rotates, it drags on the outer disk as well, distorting the flat spiral. By: Korey Haynes

The first CubeSats ever to visit Mars have gone silent 6 February: When NASA's Insight mission reached Mars last year, it was not alone. It was accompanied by two tiny satellites called CubeSats or, in this case, MarCO, for Mars Cube One. They were the first CubeSats ever to visit the Red Planet. The pair, nicknamed EVE and WALL-E, after Pixar's fictional robots, relayed information from InSight's descent. However, their real mission was simply to show off their abilities so far from home and prove that such small missions – the total MarCO program only cost $18.5 million – could succeed in deep space. The satellites did their job, but now, more than two months after InSight landed, the CubeSats have gone silent as they continue drifting past Mars, and NASA doesn't expect to hear from them again.



The MarCO spacecraft reached Mars last year. NASA/JPL-Caltech

CubeSat missions have proven popular in Earth orbit, as their low cost and tiny launch weight means many universities can afford to perform their own orbital science. However, it is rare for them to go adventuring so far from home. WALL-E and EVE's success are proof that small satellites are up to the challenge. They show that it is possible to send follow-along, highly-focused science missions to Mars. Most CubeSats are roughly 10cm square, but the MarCO satellites are actually six units packed into one, leaving each one

about the size of a briefcase.

The MarCO satellites carried cameras, communications equipment, and solar panels to keep themselves charged. They launched with InSight on the same rocket, but then separated and made their own way to Mars. They kept pace, arriving on target in order to send back pictures and information on InSight's landing. NASA had backup in the form of full-size satellites to track InSight, should MarCO have gone astray, but the help was not necessary, as the tiny satellites did their jobs admirably.

However, NASA has not heard from the MarCO satellites in more than a month. WALL-E last pinged home on 29 December, while EVE last checked in 4 January. NASA is doubtful that they will check in again, but their success is seen as a good sign for the future of CubeSats on NASA missions. By: Korey Haynes

NASA declares 'mission complete' for Opportunity rover 13 February: On January 24, 2004, the Opportunity rover sent back its first signal from the Red Planet. That marked the start of a 90-day planned mission for the six-wheeled, golf cart-sized rover. Fifteen years later, the rover's mission has finally ended, NASA announced today.

Its longevity and discoveries are a testament to Opportunity's design and construction. The rover ultimately sent back more than 200,000 raw images and travelled a total of 45 km, farther than a standard marathon and an accomplishment its mission planners never expected. Beyond the design performance, Opportunity's findings have helped researchers reconstruct Mars' wet past, raising the possibility that microbial life could have survived on its ancient surface.

Opportunity and its twin, Spirit, "gave us a planet," Scott Maxwell, former rover planning lead for Spirit and Opportunity. They were our eyes and ears, our remote robot bodies." However, on 10 June 2018, after outlasting Spirit by eight years, Opportunity fell silent under the shroud of a planet-encircling dust storm. By 6 February, NASA reported that more than 835 recovery commands had been sent to the rover over a span of frequencies, including those outside its normal communications range. None had been answered. According to the mission site, this was the team's "strategy of last resort."

Today, NASA announced the completion of the Mars Exploration Rover mission. "Our beloved Opportunity remains silent," said Thomas Zurbuchen, associate administrator of the Science Mission Directorate, NASA Headquarters. Zurbuchen was present Tuesday night during a final planned attempt to reach the rover Tuesday evening, asking the rover to respond. No response came, prompting NASA to conclude that she remains asleep, and her mission can now be honoured as a resounding success. "Today we get to celebrate the end of this mission," said NASA administrator Jim Bridenstine. He went on to say that scientists will be benefiting for years from the data taken during Opportunity's 14 years spent roving the Red planet.

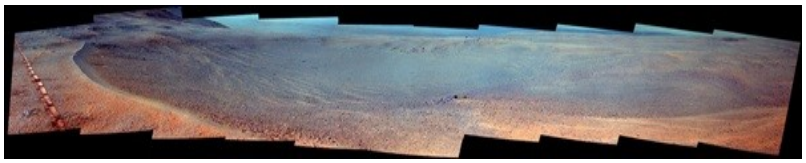
As of 24 January, Opportunity - with an original mission plan lasting just 90 days and covering only about 1 km of distance - had clocked 15 years on Mars. The rover had long surpassed both its original three-month warranty period, and its twin rover, Spirit, which fell silent in 2010 from a location NASA named "Troy," on the western side of the Home Plate plateau. Spirit, which suffered wheel damage, became stuck at Troy and was unable

to collect sufficient sunlight during the following Martian winter, similarly suffering a lack of power and cold damage.

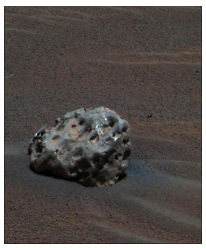
By early last June, the rover's location, in 'Perseverance Valley' on the western rim of the crater Endeavour, had been engulfed by a growing dust storm. That storm clouded the red Planet's skies with dust and blotting out the Sun. Opportunity, which relied on sunlight to charge its batteries and keep its electronics warm, went to sleep as a protective measure against the prolonged period of darkness. However, even after the skies above it began to clear in early August, the rover slept on.

By 11 September, the atmosphere above the rover's location had cleared enough for adequate sunlight to reach the rover's panels, provided they were relatively free of dust. It also started the clock on a 45-day period that NASA believed would be the best window of time for getting a response from the rover. Throughout that period, NASA's Deep Space Network continued to broadcast commands to the rover, which likely suffered a number of 'faults' due to the prolonged lack of sunlight. By consistently actively pinging the rover during both preplanned recovery times and other random intervals, engineers had hoped to catch Opportunity during an awake period. Following the final planned attempt, NASA has now concluded that Opportunity will remain silent and stationary at her final location. By: Alison Klesman

The greatest discoveries from NASA's Mars Opportunity Rover 13 February: The Opportunity rover, like its twin Spirit, was designed for an original mission of just three months. When engineers lost contact on 10 June of last year, it had been exploring for fourteen years. Today, mission scientists finally declared an official end to the mission. Here are just a few of Opportunity's many successes during its long Red Planet expedition.


Opportunity travelled for 14 years on Mars, taking data and images such as this one from Orion Crater. NASA/JPL-Caltech/Cornell Univ./ Arizona State Univ.

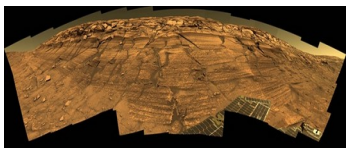
Opportunity discovered the first meteorite on Mars, sitting near its own heat shield. While a few meteorites had been found on the moon, this was the first time one was discovered on another planet. It is mostly made of nickel and iron, a type of meteorite that's rarely found on Earth. Opportunity went on to find more meteorites, both metallic and stony.


Opportunity discovered the first meteorite on Mars close to its own discarded heat shield. NASA/JPL/Cornell

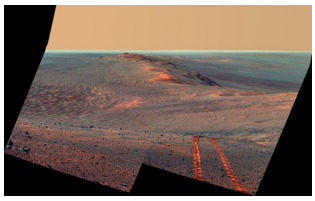
In its first few months on Mars, Opportunity also discovered stones that contained the minerals hematite and jarosite, which only form when rocks are exposed to acidic water. By finding these 'blueberries' across Meridiani Planuma, Opportunity's original stomping

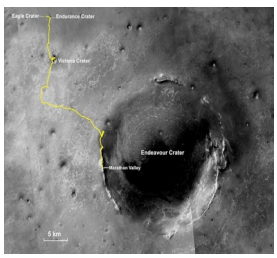
ground, the rover proved that Mars once had abundant surface water. It would continue finding blueberries throughout its travels.

Opportunity's second venture was into a deep crater called Endurance, and it later spent two Earth years exploring Victoria Crater. Again, both yielded signs of Mars' watery past. Endurance's cliffs showed layers of rock, some laid down in watery times and others during dry periods, showing a varied history of Martian water. More hematite dotted Victoria Crater's ridge, indicating it had been thrown there during the impact that formed the crater. Scientists think that these minerals formed underground, suggesting that water soaked through the surface and stayed there long enough to form the minerals. All of this water would have been salty and acidic.


The cliffs of Endurance Crater show layers that were and were not laid down in the presence of water. JPL/NASA/CalTech

At the edge of Endeavour Crater, Opportunity found its first signs of non-acidic water that would have been conducive to life – and there was a lot of it. The walls of Endeavor held abundances of clays that only form in neutral water. While plentiful on Earth, the clays were Opportunity's first sign that life could've had a chance on early Mars.

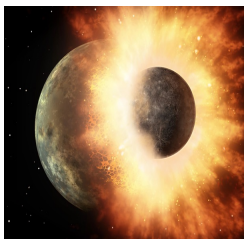

Opportunity took this shot looking back on its tracks along the rim of Endeavor Crater. NASA/JPL-Caltech/Cornell Univ./Arizona State Univ.



Opportunity roved from its landing site at Eagle Crater all the way to Marathon Valley on an 11-year journey. NASA/JPL-Caltech/MSSS/NMMNHS

In March 2015, Opportunity celebrated the completion of its first marathon, or 26.2 miles. By 2018, it had travelled just over 28 miles, and still holds the record for the most travelled off-world rover. By: Korey Haynes

Astronomers find the first evidence of a giant collision between exoplanets 14 February: For the first time ever, astronomers think they have discovered an exoplanet that survived a catastrophic collision with another planet. According to the new research, evidence for the impact comes from two twin exoplanets that seem to be more fraternal than identical.


Unlike an asteroid impact, in a planetary collision, there is not just a crater left behind. NASA/JPL-Caltech

The pair of planets in question orbit a Sun-like star (along with two other planets) in the Kepler-107 system, which is located roughly 1,700 light-years away in the constellation Cygnus the Swan. Known as Kepler-107b and Kepler-107c, these planets have nearly identical sizes (both have a radius of roughly 1.5 times that of Earth), yet the innermost planet, Kepler-107b, is about 3.5 times as massive as Earth, while Kepler-107c, which sits farther out, is a whopping 9.4 times as massive as Earth. The inner planet, Kepler-107b, has an Earth-like density of around 5.3 grams per cubic centimetre, while the more distant Kepler-107c has a density of around 12.6 grams per cubic centimetre - which is extremely dense, even for an alien world. (For reference, water has a density of 1 gram per cubic centimetre.)

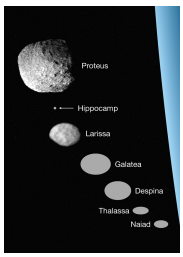
How could two equally sized exoplanets in the same system (and at nearly the same orbital distance) have such different compositions? To determine exactly why Kepler-107c is so dense, first the researchers considered what they already knew. Previous research has shown that intense stellar radiation can strip the atmosphere from a planet that sits too near its host star. However, if the innermost planet lost its lighter atmospheric elements, it should be more dense than its twin, not less. According to the study, this would "make the more-irradiated and less-massive planet Kepler-107b denser than Kepler-107c," which is clearly not the case.

However, there is another way that a planet can lose a lot of mass: by getting smacked with another planet, which this is exactly what the researchers think happened to Kepler-107c. They argue that the denser planet, Kepler-107c, likely experienced a massive collision with a third, unknown planet at some point in its past. Such a gigantic impact, would have stripped the lighter silicate mantle from Kepler-107c, leaving behind an extremely dense, iron-rich core. According to the study, Kepler-107c could be as much as 70 percent iron.

Because the mass and radius of Kepler-107c matches what would be expected from a giant planetary impact, the researchers are fairly confident that the collisional scenario they have outlined is accurate; however, they still need to confirm their hypothesis.

By: Jake Parks

Meet Neptune's new moon, Hippocamp 20 February: Neptune has a new moon. It iss also the gas giant’s smallest to date —only a little over 32km across. The brand new satellite is called Hippocamp.



Hippocamp is tiny compared to Neptune's other moons. Mark R. Showalter, SETI Institute

Astronomers led by Mark Showalter of the SETI Institute discovered it using the Hubble Space Telescope combined with an innovative method to track dim and tiny objects as they orbit. Because the object is so tiny, there is still a lot astronomers do not know about Hippocamp, named after a Greek sea monster in keeping with Neptune's nautical theme, but the moon does offer some clues about its history.

It orbits quite close to one of Neptune's larger moons, Proteus. That, combined with its tiny size, makes astronomers think it may be a fragment of the larger moon. In fact, something like 4 billion years ago, an asteroid struck Proteus, leaving behind a crater that covers most of the moon's surface. If Hippocamp is a product of this impact, as Showalter speculates, then it is just a tiny piece of the total wreckage, about 2% of the total mass excavated from Proteus during the shattering collision. Whether the moon comes from that particular impact or not, scientists still think it is likely that Proteus and Hippocamp share a past. Like our own Moon and Earth, Proteus is slowly spiralling away from Neptune due to tidal forces. Hippocamp, being so much smaller, is not subject to the same forces – and it is orbiting just where Proteus used to a long time ago.

It is unlikely that Hippocamp has had an easy time of it. Given the amount of debris in that region of the solar system, Showalter estimates that a body the size of Hippocamp would have been struck by a large impactor something like nine times in the past 4 billion years, with each strike breaking the tiny moon apart and leaving it to reform. "That's an average," Showalter points out. "It could be six times, or it could be twenty."

The moon is so tiny and dim that most images of the Neptune system do not reveal it at all. Astronomers had to guess at the object's movement based on Newton's laws of motion. By moving and stacking their images according to where they think the moon should be, they can artificially extend the exposure time of their images, brightening even very dim features. This new trick revealed the tiny moon. Astronomers still do not know what Hippocamp is made of, but they are assuming for now it is similar to the material that makes up Proteus. Showalter says that none of our current telescopes can resolve the moon well enough to say more. By: Korey Haynes

This star in Andromeda has exploded every year for millions of years 20 February: Astronomers have discovered a star in the Andromeda galaxy that has been regularly erupting for the past million years, leaving behind one of the biggest shells of ejected material scientists have ever seen. The new research not only marks the first discovery of such a super-remnant in another galaxy, it also paves the way for detecting a potentially massive population of repeatedly exploding stars, called recurrent novae, which may help shed light on how the universe has changed over time.


GK Persei, seen above, is a prime example of a nova remnant. X-ray: NASA/CXC/RIKEN/D.Takei et al; Optical: NASA/STScI; Radio: NRAO/VLA

The star responsible for this expansive remnant, which stretches over 400 light-years across, is actually from one of the most diminutive types of star: a white dwarf. These stellar corpses are left behind after a smallish star dies and blows off its outer layers, leaving behind only its dense core. In the case of this remnant, named M31N 2008-12a, the culprit is not your ordinary white dwarf. This tiny star has a dance partner. As the white dwarf and its nearby companion star orbit each other, the white dwarf rapidly siphons hydrogen from its buddy. As this unspent hydrogen fuel reaches the surface, it is heated and compressed thanks to the white dwarf's intense gravitational pull. Eventually, the hydrogen reaches a breaking point and spontaneously fuses to create helium, resulting in a powerful surface explosion called a nova.

This burst of fusion causes the white dwarf to temporarily brighten up to a millionfold as it ejects material outward at about 3% the speed of light. In the case of M31N 2008-12a, over time, these repeated explosions have created an extensive and ever-expanding cocoon of gas and dust around the white dwarf. According to the study, "Larger than almost all known remnant of even supernova explosions, the existence of this shell demonstrates that the nova M31N 2008-12a has erupted with high frequency for millions of years."

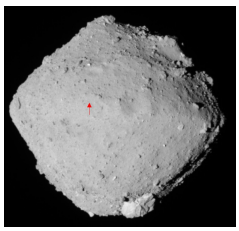
The massive size of the remnant is not its only claim to fame. M31N 2008-12a also now holds the title of most frequently recurring nova, as it erupts at least once a year. "When we first discovered that M31N 2008-12a erupted every year, we were very surprised," said Allen Shafter of San Diego State University. This is because most recurrent novae only explode about once a decade. Despite the fact that the white dwarf has spent the past million years or so exploding annually, researchers do not think it will last forever. Once the white dwarf surpasses the Chandrasekhar limit - which is about 1.4 times the mass of the Sun - it will irreparably blow itself apart as a supernova or collapse down into a neutron star.

According to theory, white dwarfs that are approaching the Chandrasekhar limit should undergo frequent nova explosions, resulting in gigantic remnants. Because that is exactly what astronomers see happening around M31N 2008-12a, they think this star may be priming up for a supernova explosion itself. "In less than 40,000 years," the study says, "the underlying composition of the white dwarf will be revealed incontrovertibly when either a type Ia supernova or an accretion-induced collapse of the white dwarf to a neutron star is observed."

If the researchers are able to find other examples of huge remnants around different novae, they think they may learn a bit about type Ia supernovae. Because type Ia supernovae have very predictable brightnesses (which is why they're called standard candles, by studying them, researchers can pin down cosmic distances with extreme

accuracy. Ultimately, this helps them better understand how the universe grows and evolves over time. By: Jake Parks

Japan's Hayabusa2 shot an asteroid last night 21 February: Hayabusa2 swooped close to Ryugu today to collect asteroid dust. The JAXA spacecraft had spent the previous day leaving its usual orbit around the asteroid to zoom in close. After just a few hours, it flew in low enough to touch Ryugu before darting away again. It did not stay long. The touchdown was more of a quick tag, and Hayabusa2 stayed just long enough to fire a tiny bullet into the asteroid's surface, in order to stir up material.


Hayabusa2 touched down on Ryugu at the location indicated by the red arrow. JAXA

Because Ryugu is so tiny (less than 1km across), with hardly any gravity, even this small blow should have kicked up enough space dust for Hayabusa2 to collect - hopefully - about 10 grams of material into the horn that hangs from its underside.

An hour after the planned maneuver, engineers reported that the command to shoot the projectile had gone off successfully, and that the spacecraft was departing the asteroid as planned and reporting in normally. Hayabusa2 should be back on its normal orbit around Ryugu by tomorrow. By: Korey Haynes

NASA selects 12 science experiments it wants to send to the Moon this year 22 February: Following on the heels of its announcement to return to the Moon this year, NASA has announced the first batch of science projects and technology demonstrations they want to send skyward in 2019, assuming their commercial partners can launch on time. The selections highlight the science questions NASA wants answered as it ramps up robotic missions to the moon and shoots for placing humans back on the surface within the next decade, this time on a more permanent basis.

The science payloads cover a wide range of topics. One will measure the chemical composition of the lunar surface. Another will detect how much radiation astronauts would be exposed to on the moon. A variety of other tools will offer insights into spacecraft descent and landing to ease the way for future missions. Another experiment NASA selected is a magnetometer to measure the moon's surface magnetism, like the one that just launched on the Israeli Beresheet mission.

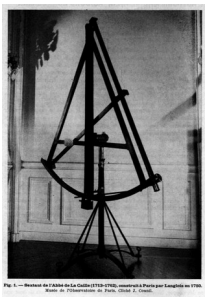
The two technology demonstrations NASA picked include a solar panel array that could be used to power future long-term missions and a navigational beacon to help lunar orbiters and landers find their location accurately. The space agency will be developing the projects themselves at centres across the United States. NASA says the timing for flying is dependent on their commercial partners' availability, but they hope to launch before the end of the year. Last year, NASA announced nine companies that are approved to bid on these projects. If NASA wants to fly this year, the bidding and final selection process need to happen in short order. By: Korey Haynes

Source of these and further astronomy news items: www.astronomy.com/news

DID YOU KNOW?

Astronomical catalogues Part 5: Nicolas-Louis de Lacaille's catalogue – first large-scale survey of the southern skies

Abbé de Lacaille



Sextant telescope used for observations

Coelum Australe Stelliferum

Mensa Mons as drawn in the catalogue

The first person to systematically observe the whole sky was the French astronomer and mathematician Abbé Nicolas-Louis de Lacaille (1713 – 1762). During the 1730s and 1740s, he worked, first, at the Paris Observatory and, later, at a university in Paris. His astronomical work at the observatory, with members of the Cassini family, had been undertaken as part of work being done to measure the shape of the Earth. When his professorial position at the university enabled him to establish his own observatory, de Lacaille's was able to focus on his main interest, pure astronomy. In 1742, he started a full northern hemisphere sky survey, with the aim of producing a comprehensive, current, accurate star catalogue.

De Lacaille's vision was not limited to the northern part of the world, however, and he is best known for being the first person to formally observe the skies in the Southern Hemisphere. In the 1759s, after numerous political and logistical challenges, he travelled to the Cape to undertake a structured survey of the southern skies, the first of its kind. He spent two years at the Cape, from 1751-1753, undertaking a range of astronomical tasks in addition to the large-scale stellar observations he wanted to make. From the observatory he built in the house he rented in Strand Street, his unwavering commitment to his work and focus on precision resulted in him charting the positions of over 10,000 stars, discovering 24 new nebulae and clusters and 14 new constellations. The names he gave to almost all these reflected his interest in the sciences eg Microscopium, Telscopium. The star chart he published of the new constellations also included Mons Mensa, the only constellation named for a terrestrial feature.

Whilst at the Cape, he also wrote a short list of the most remarkable objects he had come across. Most were visible to the naked eye, and are all visible with binoculars. The 41 objects were published as the *Catalogue of Southern Deep Sky Objects.* The list included 24 open clusters, 7 globular clusters, 2 bright nebulae, 1 galaxy, and 7 asterisms and stars. Like others before him, he developed his own classification system. Each was identified with Lacaille numbers and grouped into three Lacaille classes eg I.4, II.13, III.8

After his return to Paris, he started work on cataloguing his southern star observations, but did not complete it during his lifetime, dying at the age of 49, possibly form overwork. His full southern star catalogue *Coelum Aaustrale Stelliferum* (The southern starry sky) was published posthumously in 1763.

It contained 1,952 items, the accompanying details showing that he had measured positions with notable accuracy for that time. The content was written in both French and Latin. In line with the importance de Lacaille placed on detail and accuracy, the catalogue also included a detailed description of the observation and measurement techniques which he had used. Full reductions, including the effects of precession, aberration and nutation for the year 1750 were also given for each of the nearly 2,000 stars. To complete the project, the raw data for the other thousands of stars was also included.

Details on the fully reduced southern stars listed in *Coelum Aaustrale Stelliferum* proved so useful that, in 1838, the British Association for the Advancement of Science, decided that reductions also needed to be made for the other 9,766 stars, using the raw data which de Lacaille had recorded. The work was undertaken in Edinburgh and the extended catalogue published in 1847. The calculations comparing present values with Lacailles's ones had demonstrated the very high quality of his observations and measurements, considering the technology of the time.

Sources: Ridpath, I (Ed) (2012) Oxford dictionary of astronomy 2nd ed rev, Glass, I S (2013) Nicolas-Louis De La Caille: astronomer and geodesist Oxford University Press
www.assa.saao.ac.za, www.en.wikipeda.org

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