

"The Southern Cross"



HERMANUS ASTRONOMY CENTRE NEWSLETTER

APRIL 2011

Welcome to this month's newsletter and the New Scientist article entitled 'Eight extremes', which contains fascinating information on extreme features in the universe. We also welcome new members Annatjie van Graan, Claudie Lemoine, and Amy and Simon Ohlson.

This month, we have a baker's dozen questions to test your cosmic knowledge. The answers to the brain teasers are given in the 'Did you know?' section towards the end of the newsletter.

- 1 As Pluto orbits the Sun, which planet does it come closest to?
- 2 What naked-eye object regularly vanishes for millions of years?
- 3 Which two planets have the greatest chance of colliding?
- 4 Which well-known celestial body has the shortest life expectancy?
- 5 What is the most massive object within 1 light-year of Earth found since the 1800's?
- 6 What is the smallest deep-space object a telescope can photograph?
- 7 What constellation is part of the zodiac for astronomy, but not astrology?
- 8 What celestial body comes closest to not spinning at all?
- 9 What constellation is a geographic location?
- 10 Where is Puck?
- 11 Which planet has three moons with raised equators, like walnuts?
- 12 The Moon's dark 'seas' are named for either emotions (e.g. Sea of Serenity) or what else?
- 13 Libra the Scale's star Zubeneshamali means "the northern claw" even though a scale with claws is straight out of a nightmare. At 14 letters, it's the longest star name in use. What is the shortest?

WHAT'S UP?

The eponymous constellation of Leo (the lion) can be easily identified to the north. Upside down in the southern hemisphere, the crouching animal and large raised head are outlined by stars. The inverted and back-to-front 'sickle' outlines the head and mane. The brightest two stars, Regulus (Alpha Leonis) and Denebola (Beta Leonis), both visible to the naked eye, mark the heart and 'tail of the lion' (the meaning of 'Denebola'), respectively. Blue-white Regulus ('little king' in Latin, but, more accurately, 'heart of the lion' in Arabic), located 77.5 ly away, is a multiple star system of four stars organised into two pairs. In contrast, Denebola, 36 ly away, is a single, fast-rotating, variable star.

LAST MONTH'S ACTIVITIES

Monthly centre meeting The DVD 'Hubble - 15 years of discovery' was fascinating and stunning to watch. It started with information on the history of Hubble's development, maintenance and upkeep, and details of its design, structure and components. Including stunning images, the majority of the DVD illustrated the massive contribution which Hubble has made to our knowledge and understanding of many aspects of the universe: structure and features of planets, lives and deaths of stars, collisions between galaxies, huge gas and dust clouds which contain star nurseries, gravitational effects on light, history and future of the universe, and, via the incredible deep field images, the sheer size of the observable universe.

Interest groups The 27 people who attended the **Beginners astronomy** meeting on 14 March watched an updated version of the 'Introduction to astronomy' presentation. Unfortunately, cloud interfered with the planned star-gazing.

Viewing of the DVD on cosmology continued at the **Cosmology** group meetings. 21 and 15 people attended on 7 and 21 March, respectively.

THIS MONTH'S ACTIVITIES

Monthly centre meeting The 'Astronomy of the Pyramids' is the topic to be presented by scientist and amateur astronomer Wayne Trow on 7 April at 7.00 pm at the HMO.

As usual, tea and coffee will be available after the presentation and, weather permitting, an opportunity for star-gazing. Non-members are welcome for a fee of R20 (R10 for students and children).

Interest group meetings The **cosmology** group's series of DVD viewings will continue to take place on the first and third Mondays of the month, at 7.30 pm at the HMO. Details for April are as follows: 4 April - Topics 17 and 18, 'Primordial roughness - seeding structure' and 'The dark age - from sound to the first stars', and 18 April - Topics 19 and 20, 'Infant galaxies' and 'From child to maturity - galaxy evolution'.

Visitors who attend for one evening are welcome for free, but will need to join the Centre if they wish to attend further meetings. For further information on these meetings, or any of the group's activities, please contact Pierre Hugo at pierre@hermanus.co.za

Educational outreach Monet project Sundays from 0700-1400 Universal Time have been reserved for the following dates: 10 April, 1 May, 8 May and 29 May. HAC members will be working with learners in local schools. Please contact John Saunders at shearwater@hermanus.co.za or Pierre de Villiers at pierredev@hermanus.co.za for more information about the project.

2011 MONTHLY CENTRE MEETING SCHEDULE

These will take place at 7 pm at Hermanus Magnetic Observatory.

7 April	'Astronomy of the Pyramids' by Wayne Trow, scientist and amateur astronomer, ASSA
5 May	'Nicholas de LaCaille's work in South Africa' by Dr Ian Glass, senior astronomer, SAAO, Cape Town
2 June	'SETI, METI and little green men' by Johan Retief, committee member
7 July	'The story of CERN: a fifty year journey into the heart of the matter' by David Kershaw, centre member
4 August	'Useful observations that can be done by amateurs; by Cliff Turk, ASSA, Cape Town
1 September	'The ionosphere' by Dr Lee-Anne McKinnel, MD, HMO
6 October	'The southern constellations using radio astronomy, and SKA' by Dr Debra Shepherd, Director, educational outreach, SKA
3 November	'Sir John Herschel' by Auke Slotegraaf, psychohistorian and amateur astronomer
8 December	Christmas party

OBSERVATORY NEWS

In light of feedback at the AGM, and discussion between committee members and the architect, an important change has been made to the plans presented at the AGM. The amended plans include two structures, rather than the

three originally proposed. Rather than being separate structures, the amphitheatre will be placed on top of the education centre/hall which, itself, will be located between two berms which already exist on the site. The second building will be the observatory, which will be located closer to the other building than was proposed in the earlier plan. From both ecological and environmental perspectives, these changes will reduce the footprint of the development, and lower the profile of the buildings.

The Department of Environmental Affairs and Development Planning at the Western Cape Provincial Administration has confirmed that the observatory project falls within current legal boundaries and that completion of a full environmental impact assessment is no longer required. This eagerly awaited decision is very good news, and we can now progress to the next stages of project planning and development.

ASTRONOMY NEWS FROM STEVE KLEYN

'Dawn' opens its eyes, checks its instruments After a hibernation of about six months, the framing cameras on board NASA's Dawn spacecraft have again ventured a look into the stars. The spacecraft also powered up its visible and infrared mapping spectrometer, which investigates surface mineralogy, and the gamma ray and neutron detector, which detects elemental composition. The re-activation prepares the instruments for the May approach and July arrival at Vesta, Dawn's first port of call in the asteroid belt.

"Last week, we gently 'woke up' Dawn's three science instruments, which typically spend most of their time sleeping during the three-and-a-half-year journey to Vesta," said Robert Mase, Dawn project manager at NASA's Jet Propulsion Laboratory, Pasadena, California. "This activity confirms that Dawn is on track for the first close examination of one of the last unexplored worlds of the inner solar system."

NASA's Stardust spacecraft officially ends operations NASA's Stardust spacecraft sent its last transmission to Earth at 7:33 p.m. EDT on 24 March, shortly after depleting fuel and ceasing operations. During an 11-year period, the venerable spacecraft collected and returned comet material to Earth and was re-used after the end of its prime mission in 2006 to observe and study another comet during February 2011.

The Stardust team performed the burn to depletion, because the comet hunter was literally running on fumes. The depletion manoeuvre command was sent from the Stardust-NExT mission control area at Lockheed Martin Space

Systems in Denver, Colorado. The operation was designed to fire Stardust's rockets until no fuel remained in the tank or fuel lines. The spacecraft sent acknowledgment of its last command from approximately 194 million miles away in space. "This is the end of the spacecraft's operations, but really just the beginning of what this spacecraft's accomplishments will give to planetary science," said Lindley Johnson, Stardust-NExT and Discovery program executive at NASA Headquarters in Washington. "The treasure-trove of science data and engineering information collected and returned by Stardust is invaluable for planning future deep space planetary missions."

After completion of the burn, mission personnel began comparing the computed amount of fuel consumed during the engine firing with the anticipated amount based on consumption models. The models are required to track fuel levels, because there are no fully reliable fuel gauges for spacecraft in weightless space. Mission planners use approximate fuel usage by reviewing the history of the vehicle's flight, how many times and how long its rocket motors fired. "Stardust's motors burned for 146 seconds," said Allan Chevront, Lockheed Martin Space Systems Company programme manager for Stardust-NExT in Denver. "We'll crunch the numbers and see how close the reality matches up with our projections. That will be a great data set to have in our back pocket when we plan future missions."

Launched on 7 February 1999, Stardust flew past the asteroid named Annefrank and traveled halfway to Jupiter to collect the particle samples from the comet Wild 2. It returned to Earth's vicinity to drop off a sample return capsule eagerly awaited by comet scientists.

NASA re-tasked the spacecraft as Stardust-NExT to perform a bonus mission and fly past comet Tempel 1, which was struck by the Deep Impact mission in 2005. The mission collected images and other scientific data to compare with images of that comet which had been collected by the Deep Impact mission. Stardust travelled approximately 13 million miles around the Sun in the weeks after the successful Tempel 1 flyby. The Stardust-NExT mission met all mission goals, and the spacecraft was extremely successful during both missions. From launch until final rocket engine burn, Stardust travelled approximately 3.54 billion miles.

After the mileage logged in space, the Stardust team knew the end was near for the spacecraft. With its fuel tank empty and final radio transmission concluded, history's most traveled comet hunter will move from NASA's active mission roster to retired. "This kind of feels like the end of one of

those old western movies where you watch the hero ride his horse towards the distant setting sun -- and then the credits begin to roll," said Stardust-NExT project manager Tim Larson from NASA's Jet Propulsion Laboratory in Pasadena, California. "Only there's no setting sun in space."

Chandra finds superfluid in neutron star's core NASA's Chandra X-ray Observatory has discovered the first direct evidence for a superfluid, a bizarre, friction-free state of matter, at the core of a neutron star.

Superfluids created in laboratories on Earth exhibit remarkable properties, like the ability to climb upward and escape airtight containers. The finding has important implications for understanding nuclear interactions in matter at the highest known densities.

Neutron stars contain the densest known matter that is directly observable. One teaspoon of neutron star material weighs six billion tons. The pressure in the star's core is so high that most of the charged particles, electrons and protons, merge resulting in a star composed mostly of uncharged particles called neutrons.

DID YOU KNOW?

Answers to the quiz questions listed in the Introduction

- 1 Pluto comes closer to Uranus than to Neptune. The reason is fascinating. Looking down from above, Pluto's lopsided path appears to cross Neptune's. However, seen in 3-D, Pluto is then high above the solar system's plane. Their odd stable resonance makes Pluto perform exactly two orbits of the Sun just as Neptune makes three. They are 'connected' in a strange way that keeps them permanently apart.
- 2 The Andromeda Galaxy (M31) just barely escapes being hidden behind light-years of dusty nearby gas because it is only 13 degrees from the centre line of the Milky Way. As our galaxy spins, Earth gets carried every 110 million years to where our galaxy's central bulge blocks M31 for a few million years.
- 3 Venus does not deserve to smash into anything since it has the most perfectly round orbit. However, Mercury is not so well behaved. Its orbit - already the most lopsided - wildly changes shape. Influence from far-away Jupiter will eventually make its path so elliptical that it will swing out to Venus. Then those two worlds may collide.
- 4 Phobos - the closest moon to any planet - is falling. Recent research suggests it will disintegrate and crash into Mars just 10.4 million years

from now. If humans then have Martian colonies, the meaning of Phobos - "fear" - will be spookily prophetic. (If you said Halley's Comet, you still get full credit. Periodic comets don't live long either.)

- 5 This is Eris, discovered in 2005 and 25 per cent more massive than Pluto.
- 6 Nothing is smaller than the Crab Pulsar in Taurus with its radius of less than 16 kilometres (10 miles).
- 7 Nobody says "I'm an Ophiuchan" even though the Sun spends 3 weeks a year there, compared to just a week in Scorpius.
- 8 You can walk faster than Venus rotates. It is the slowest-spinning object in the known universe.
- 9 The constellation Mensa the Table Mountain. It depicts and honours a flat-topped peak near Cape Town, South Africa.
- 10 All of Uranus' moons are Shakespearian characters.
- 11 Saturn's satellite Iapetus has a raised ridge that perfectly circles the equator 6 miles (10 km) high. It is baffling. The moons Atlas and Pan have them too.
- 12 Lunar seas are named for emotions or weather phenomena (e.g. Ocean of Storms).
- 13 The shortest common star name is Sol or Sun - three letters.

For more information on the Hermanus Astronomy Centre, visit our website at www.hermanusastronomy.co.za

COMMITTEE MEMBERS

John Saunders (Chairman)	028 314 0543
Steve Kleyn (Technical Advisor)	028 312 2802
Pierre de Villiers (Treasurer)	028 313 0109
Irene Saunders (Secretary)	028 314 0543
Jenny Morris (Newsletter editor)	071 350 5560
Derek Duckitt (IT & website co-ordinator)	082 414 4024
Johan Retief (Monthly sky maps)	028 315 1132
Peter Harvey (Membership secretary)	028 316 3486
Lynette Geldenhuys (Education co-ordinator)	028 316 2428