

"The Southern Cross"



HERMANUS ASTRONOMY CENTRE NEWSLETTER NOVEMBER 2009

Welcome to the latest newsletter, and also to new members Alan and Judith Calder, and Angela and Wesley Shields. The topics of the three attached New Scientist articles are: space junk, Cassini and Saturn's moon Enceladus, and multiverses.

There are two important announcements. Firstly, the date of the **Christmas party** has been changed to **11 December**. It will be a meal at the Baleens Auberge Hotel in Voelklip. A few places are currently still available for the 3-course meal, which will cost approximately R100. Members need to bring their own wine. Please contact John Saunders if you would like to attend. Secondly, the **venue for 2010 meetings** will be the **Hermanus Magnetic Observatory** in Westcliff.

The large constellation of Pegasus, the winged horse, is visible to the north at this time of year. Its main feature, the large 'square of Pegasus' represents the forequarters of the horse and can be easily identified. The angled neck and head can be seen projecting to the left from the upper left hand star in the square (Alpha Pegasi), and the two front legs from the lower left star (Beta Pegasi).

CENTRE MEETING - 24 SEPTEMBER

Committee member, Steve Kleyn, gave a fascinating presentation on the challenges of measuring time, and the large range of designs and types of sundials used to calculate it. In addition to photographs, Steve also had some examples of easily produced instruments which he had made. We were able to study the real sundial located in the area in front of the hall and fairly clear

skies also allowed members to view the crescent Moon through the Centre's portable telescope.

FUTURE MONTHLY CENTRE EVENINGS 2009

The Thursday meetings will be held at 19.00 on the following days:

- 19 November "Moons and Asteroids of the Solar System' by John Saunders (Centre chairman)
- 11 December Christmas Party (please see details above)

SCHEDULE FOR MONTHLY MEETINGS FOR EARLY 2010

- 21 January AGM
- 18 February 'Looking down, not up - planet Earth' by Izak Rust
- 18 March 'Galaxies: cosmic collisions' by Petri Vaisanen

ACTIVITIES

Absolute beginners astronomy interest group The 10 members who attended the meeting on 19 October enjoyed a clear night sky. After watching the 'Introduction to Astronomy' presentation, participants studied the October star map before identifying a number of constellations with the naked eye and observing Jupiter and three of its moons through the Centre's 11" Dobsonian telescope.

Cosmology interest group. 14 people attended the monthly meeting held on 26 October. The allegedly 'non-controversial' topic of Energy proved to be the opposite, provoking lively discussion and debate. In addition to the regular monthly meetings, six meetings are being held to discuss committee member Pierre Hugo's thesis on an alternative view of the formation and nature of the universe, the so-called 'Homeostatic model'. Seven members attended the first meeting, which proved to be thought-provoking and challenging.

Educational outreach On 8 October, Jenny Morris led the 'Introduction to Astronomy' presentation to senior primary learners at the Montessori school. The children asked many relevant questions, demonstrating their interest in the topic.

OBSERVATORY NEWS

The Observatory development programme is progressing. The public consultation is about to commence, with an advertisement in the 28 October Hermanus Times notifying interested parties of the plan and asking for them

to comment. Local residents will also receive letters explaining the programme for them also to comment, should they wish to do so.

Work continues on securing the funds needed for the ongoing planning process, particularly, the environmental impact assessment, and for the funding required to build the observatory and its necessary amenities.

ASTRONOMY NEWS FROM STEVE KLEYN

Messenger's final flyby The Messenger spacecraft's third flyby of Mercury has given, for the first time, an almost complete view of the planet's surface and revealed some dramatic changes in Mercury's comet-like tail. Messenger flew by Mercury on 29 September, executing a critical gravity assist maneuver to enable it to enter Mercury-orbit in 2011. Approximately 98% of Mercury's surface has now been imaged. After Messenger goes into orbit, it will see the polar regions, the only remaining unobserved areas of the planet.

One of the spacecraft's instruments conducted its most extensive observations to date of Mercury's ultra-thin atmosphere or "exosphere." Material in the exosphere comes mainly from the surface of Mercury, knocked aloft by solar radiation, solar wind bombardment and meteoroid vaporisation. This wispy gaseous envelope is stretched by solar radiation pressure into a long, comet-like tail, which seems to be changing as Mercury moves around the sun. A seasonal effect in Mercury's exosphere is that the neutral sodium tail, so prominent in the first two flybys, is now significantly reduced in extent. This difference relates to expected variations in solar radiation pressure as Mercury orbits elliptically around the Sun.

The observations also show that calcium and magnesium in the exosphere exhibit different seasonal changes than sodium - a difference that researchers do not yet fully understand. After Messenger enters Mercury's orbit in 2011, it can make a continuous study of seasonal changes in all exospheric constituents.

Exploding Asteroid On 8 October, an asteroid detonated high in the atmosphere above South Sulawesi, Indonesia, releasing about as much energy as 50,000 tons of TNT, according to a NASA estimate. That's about three times more powerful than the atomic bomb that levelled Hiroshima, making it one of the largest asteroid explosions ever observed. However, the blast caused no damage on the ground because of the high altitude, 15 to 20 kms above Earth's surface,

The amount of energy released suggests the object was about 10 m across. Such objects are thought to hit Earth about once per decade. No telescope spotted the asteroid ahead of its impact. That is not surprising, given that only a tiny fraction of asteroids smaller than 100 m across have been catalogued, yet objects as small as 20 or 30 m across may be capable of doing damage on the ground.

.....AND FROM JOHN SAUNDERS

Jupiter takes a hit 15 years after pieces of Comet Shoemaker-Levy 9 rained down onto its atmosphere, Jupiter, was bruised again by another asteroid or comet. On 19 July, an amateur astronomer in Australia spotted a dark spot near to Jupiter's south polar region close to the Red-spot. After checking it wasn't the shadow of one of Jupiter moons, the importance of the find became clear. Once the news spread, other amateur astronomers and major observatories swung into action. The impact has now been studied in great detail, photographed in infra-red, and published in astronomy magazines.

Tropical storms on Titan Saturn's large moon Titan is the only known world that has something like Earth's *hydrologic cycle*. When the Cassini spacecraft was launched in 1997 on its long trip to explore Saturn, it had attached to it a circular disc-shaped European Space Agency probe. The attachment, known as the Huygens Probe was approximately 1.5 meters in diameter and 1.2 meters in height. Its job was to explore Saturn's largest moon Titan. Once released from Cassini in 2004, it would circle Titan and eventually land on its surface and send back pictures plus of course lots of scientific data.

No-one knew how deep the clouds over Titan were or precisely what they consisted of, until this event. It was thought that there were large oceans on Titan and that the probe might land with a splash or get sucked down into a soupy oblivion. The good news, despite a few hiccups is that it landed safely and sent back superb pictures of Titans surface and details of the, mainly methane, gas clouds above the moon associated with its surface temperature of -180°C.

DID YOU KNOW?

As one of the 'Pointers', one of the easiest stars to identify in the southern hemisphere, Alpha Centauri is the third brightest star in the skies. We also look in more detail at star systems.

Alpha Centauri (Centaurus)

Its proper name is Rigil Kent(aurus), Arabic for 'foot of the centaur'.

With the other star of the Pointer, Beta Centauri, it assists with identification of the Southern Cross as such, and not as one of the false crosses.

Recognised as the nearest star to the earth, it is, in fact, a **triple star system** of 3 stars: A, B and C. Because the latter (Proxima Centauri), is so small and distant from the others, it is often considered to be a **binary system** - Alpha Centauri AB - in which the two stars are so close they appear to be one unless seen through binoculars or a telescope. The orbital period of the binary system is 79.9 yrs. The system can approach as close as 11.2 astronomical units (AU) (distance from the Sun to Saturn) and recede to 35.6 AU (Sun to Pluto).

Distance: 4.3 ly, $m = -0.27$ (AB combined), $M = 4.07$ (AB (combined))

It is visible south of 28 degrees North. South of 29 degrees South, it is circumpolar (never sets below the horizon)

Alpha Centauri A

- a yellow star, similar to the Sun
- mass 10% greater than the Sun
- radius 23% larger than the Sun
- 1.5x luminosity of the Sun
- $m = -0.01$, $M = 4.34$

Alpha Centauri B

- less luminous than Alpha Centauri A
- slightly smaller and less luminous than the sun
- mass 90% less than the Sun
- radius 14% smaller than the Sun
- $m = 1.30$, $M = 5.70$

Alpha Centauri C

- name: Proxima Centauri
- far from Alpha Centauri AB, forming a 'visual double' star with it
- distance about 13,000 AU from Alpha Centauri AB
- a red dwarf, 10,000x less luminous than the Sun
- unclear whether it is gravitationally bound to Alpha Centauri AB

Star systems

Many stars are part of binary or multiple star systems

Multiple star systems contain 3, 4, 5 or more stars, but most are triples. They are smaller than open star clusters, which consist of 100 - 1000 stars. They are more difficult to model than binary systems, and tend to be more unstable, with one tending to approach another and being accelerated to the extent that it leaves the system. These dynamic instabilities mean that these systems are often hierarchical, containing a close binary pair and a more distant companion eg Alpha Centauri, with smaller orbits within larger ones. Once established, these systems tend to be stable.

Binary star systems consist of 2 stars orbiting round their common centre of mass eg Sirius A and B. The brighter star is considered the primary, the other the companion or secondary star. Binary systems assist astrophysics, as calculations of their orbits enable the masses of their component stars to be directly determined, allowing other stellar parameters eg radius, density, to be indirectly estimated. This, then, allows for determination of their mass-luminosity relationship from which masses of single stars can be calculated.

Many visual binaries (detected optically as opposed to those detected indirectly eg spectroscopy) have long orbital periods of several centuries or millennia, limiting understanding of their orbits.

Binary systems with orbits in the plane along our line of sight, which mean that the component stars mutually eclipse and transit each other are known as 'eclipsing binaries'

References <http://en.wikipedia.org>, www.space.com/scienceastronomy, Oxford dictionary of astronomy, Astronomy (Dorling Kindersley Eyewitness companions)

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