"The Southern Cross"

HERMANUS ASTRONOMY CENTRE

NEWSLETTER

MARCH 2010

Welcome to the newsletter and to new member Delene Ljungqvist. We hope you will find it and the attached New Scientist articles on 'primordial giants' and 'moon mirrors' interesting and informative.

A couple of future events to note….

The Hobbies Showcase will take place, this year, on 27 April at Hermanus High School and the Centre plans to have a stand. Our participation last year enabled members to talk about astronomy, both in general and in Hermanus, to a large number of interested visitors.

If any member has a desire for an "Away Trip" such as to the Cedarberg Observatory or Sutherland, or anywhere else that may be of interest to Centre members, please let us know and we will see how much support for such a trip there is out there, and what can be arranged.

Remember that information and links to a wealth of news and material is available on our website at www.hermanusastronomy.co.za

Two crosses are visible in the night sky. The Southern Cross is clearly identified by its Pointers. Nearby, near to Canopus (Carina), is another cross, the 'false cross', so-called because it is easily mistaken for the 'true' Southern Cross. Canopus and the stars of the 'false cross' form part of what used to be the large constellation of Argo Navis, the mythical ship of Jason

and the Argonauts. It has subsequently been divided into three constellations: Carina (the ship's keel), Vela (the ship's sail) and Puppis (the ship's stern).

CENTRE MEETING – 18 FEBRUARY 2010

Geologist Izak Rust gave a very interesting and informative verbal and visual presentation on the structure of Earth, the geological features of the south-western Cape, and the causes of the Haiti earthquake. Those attending were struck by how thin the crust on which we live is, and also by the extent of activity and volatility in the underlying molten mantle. (See 'Did you know?' below for more).

MONTHLY CENTRE EVENINGS 2010

These take place at 7 pm at the **Hermanus Magnetic Observatory**.

18 March	'Galaxies: cosmic collisions' by Petri Vaisanen, SAAO, Cape Town
15 April	'My son's journey into space' by Dr Rick Shuttleworth
20 May	'Twinkle, twinkle, little star: How astronomers determine what you are' by Pierre de Villiers
17 June	'19th Century astronomy at the Cape' by Johan Retief
17 July	'Deep space and deep time: related or not?' by Ed Foster, biochemist and amateur astronomer

ACTIVITIES

Absolute beginner's group Now taking place at the HMO, 38 people attended the meeting on 15 February. Following the presentation on astronomy, improving weather allowed for identification of Orion, Taurus and the Pointers, and the opportunity to see the Orion nebula and the Pleides through the Centre's Dobsonian telescope.

Cosmology interest group Eight group members continued to learn about Pierre Hugo's homeostatic model on 8 February, and, on 22 February, nine people discussed Einstein's theory of general relativity at the general group meeting.

Telescope skills group Although only running for a few months, the online system being followed by members is proving a successful one.

Educational outreach On 4 February, Pierre de Villiers and Derek Duckitt gave presentations on general astronomy and the program Stellarium to Grade 7 learners from Kleinmond Primary School. A warm, clear evening allowed the talk to take place under the stars, and enabled us to point out a whole sky of stars, constellations and planets.

Progress is being made on our Monet Telescope project for the students of the Hermanus schools to use a live telescope. More information plus a formal launch will hopefully be announced in the near future.

'Whale Talk' article An article by John Saunders on the Orion constellation was published in the March/April issue of the magazine.

OBSERVATORY NEWS

The observatory project is currently at a standstill until sufficient funds are raised to enable progress with the Environmental Impact Assessment. The Friends of the Observatory pledge appeal continues. A few more very kind donations have been made to the fund but more is needed, and we appeal to any member who has not yet made a pledge, no matter how small, to come forward, and become a Friend of the Observatory. Committee members are also currently working on four possible sources of major funding.

ASTRONOMY NEWS FROM STEVE KLEYN

NASA poised to launch solar watchdog The sun will soon come under its closest scrutiny yet with NASA's $808 million Solar Dynamics Observatory, which launched on 11 February. The spacecraft will study how solar activity gets its start, revealing more about the sun's wide variability, which can knock out space satellites and power grids and affect Earth's climate. Solar storms can wreak havoc on space satellites and power grids, but predicting when they will happen and what causes them is still an ongoing mystery. One surprise in recent years has been the discovery of solar tsunamis – waves that can spread across the surface of the sun and trigger the release of high-energy particles. These tsunamis can originate in a distant part of the sun, but trigger events that directly impact Earth.

NASA's Solar Dynamics Observatory (SDO) will be able to image the whole disc of the Sun in high resolution every 10 seconds, providing an unprecedented look at these waves. SDO will circle the Earth once per day, on a geosynchronous orbit that hovers some 36,000 kilometres above the US state of New Mexico. That vantage point will allow it to stream troves of data – 1.5 terabytes a day – back to two antennas located near the city of Las Cruces. SDO's cameras will be able to send back IMAX-resolution images of the full disc of the sun every 10 seconds, revealing an unprecedented portrait of the sun's atmosphere and visible surface.

SDO's goal is to study how the sun changes. By simultaneously measuring the sun's interior, visible surface and outer corona, the probe will focus on understanding how its magnetic field is structured and how the energy stored in magnetic fields is released. Working in concert, two instruments could make the first precise measurements of the temperature of long arches of plasma called coronal loops. These structures can be as large as several Earths and are precursors to solar flares, dramatic explosions that can release as much energy as a billion megatonnes of TNT. Measuring the loops' temperature will illuminate their energy source.

DID YOU KNOW?

We are going to interrupt our monthly look at the brightest stars to answer a question raised at the last centre meeting: Do other planets and moons have similar structures to Earth?

Mercury is the only rocky planet, apart from Earth, to have a magnetic field. This is generated by a large iron core which generates a magnetic field 1% as strong as Earth's. The large relative size of its core means that it is a very dense planet, comprising approximately 70% metallic and 30% rocky material. It has the 2nd highest density in the solar system after Earth (5.427g/cm3 v 5.515 g/cm3). The density is calculated by dividing the mass of a planet by its volume, values which can be calculated mathematically.

Knowing its density allows for inference about a planet's internal structure. Knowing the average density of rocky material allows for prediction of the presence and size of a core. As Mercury is so dense and small, the core must be large, and contain mostly iron. The core is estimated to occupy 47% of its volume (Earth – 17%) and about 75% of its cross-sectional area. The outer part of core is believed to be molten. The solid mantle, approximately 500 –

700 km deep, consists of rocky material, while the rocky crust is believed to be 100 – 300 km thick.

Venus is similar in size, density and bulk composition to Earth **(**95% size of Earth, 81% mass of Earth), and also has gravity similar to that of Earth. No direct measurements have been able to be made, but it is likely to have a largely solid core, rocky mantle (suggested by the lack of plate tectonics) and crust in similar proportions to Earth. Like Earth, the core is likely to be partially liquid. However, despite this, Venus has no magnetic field, possible because its rotation (spin) is slower than it solar orbit, too slow to generate magnetism.

Mars is half radius of Earth and 10% of its mass. It has no magnetic filed, but possibly did in the past, as there is evidence of past plate tectonics. It is likely to have a small core, mainly iron and sulphur, which is partially or completely solid (it is smaller and further from Sun than Earth, so likely to have cooled to the core). The mantle is solid and the crust an average 50 km thick (thicker than Earth).

All four gas giants have magnetic fields and, thus, contain metallic material. **Jupiter** is thought to have a small, possibly rocky, core, 3 – 15% of its total mass. The core is surrounded by liquid metallic hydrogen and helium (the largest part of the planet), and an outer layer of gaseous molecular hydrogen and helium. The large magnetic field influences its moons. Like Jupiter, **Saturn** is believed to have a core (possibly rocky) surrounded by liquid hydrogen and helium, and an outer gaseous hydrogen and helium layer.

The outer gas planets are believed to have a similar three-part structure. **Uranus** is thought to have a small, possibly rocky, core making up 20% of its radius, with 60% being an icy mantle consisting of water, methane and ammonia. The outer 20% is gaseous hydrogen and helium. **Neptune's** core and liquid layer are thought to be similar in size and composition as those of Uranus, while its outer gaseous layer contains methane in addition to hydrogen and helium.

The large moons of the solar system are also thought to have a similar three-part layered structure as the planets, although the details vary. The **Moon** has a crust, mantle and core and is the second densest moon in the solar system after Io. The core is believed to be small, about 20% of volume (average 50% for other rocky bodies). It is estimated to be approximately

500 km in radius and is believed to be mainly iron, with the outer core possibly being molten. The mantle is calculated to be 1,000 km thick and the crust an average of 65 km deep. Although there is evidence of past magnetism (basalt forming the seas), and a metallic core, it has no magnetic field.

While the **other large moons** are believed to have cores which are mostly rocky, **Io** is thought to have a molten iron or iron sulphide core. Also, the reminder of Io is mostly rocky, while ice dominates in the other moons. **Callisto's** surface layer is ice, possibly covering a thick liquid water layer and a deeper rocky mantle. **Ganymede** is also thought to have a thin rigid ice crust, an outer warm ice mantle, and an inner rocky mantle. On **Europa**, the outer water layer in approximately 100 km deep, frozen at the surface, liquid or soft ice below. The largest part of Europa is thought to be a rocky mantle. **Titan's** bulk density suggests it is half water ice and half rocky material and is thought to have a large rocky core surrounded by several layers composed of different forms of ice.

Sources http://en.wikipedia.org, www.windows.ucar.edu, Astronomy (Dorling Kindersley Eyewitness companions)

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