



# The PRETORIA CENTRE

of the

## Astronomical Society of Southern Africa

[www.pretoria-astronomy.co.za](http://www.pretoria-astronomy.co.za)

### NEWSLETTER AUGUST 2009

The next meeting will take place on Wednesday 26 August at 19h15 at Christian Brothers College, Mount Edmund, Pretoria Road, Silverton, Pretoria.

#### PROGRAMME

Beginner's Corner: **"The celestial sphere"** by Bosman Olivier

What's Up in the Sky? by Michael Poll

10 minute break — library will be open

**Main talk: "Galileo" by Brian Fraser**

The meeting will be followed by tea/coffee and biscuits as usual.

The next observing evening will be held on Friday 21 August at the Pretoria Centre Observatory, which is also situated at CBC. Arrive any time from 18h30 onwards.

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## Last Month's Meeting - by Michael Poll

The meeting opened with the AGM which will be recorded elsewhere. Michael Poll stepped down as Chairman, and Johan Smit was elected as Chairman of the Centre.

Gareth Gregory opened the normal programme with a discussion of "What's Up? Gareth gave the dates for the phases of the moon, and indicated which nights in August would be "dark sky nights" when the moon would not interfere with observing. The visibility of the planets was next discussed - Saturn and Jupiter, and later in the month, Mercury, are in the evening sky in August, and Venus and Mars are in the morning sky. Gareth illustrated how Jupiter would be retrograding (i.e moving westwards) against the background stars of Capricornus. Finally some telescopic objects in Cygnus were mentioned, including M29 and M39.

The main topic of the evening was presented by Dr Rodney Milford from the Construction Industry Development Board of South Africa. The talk was entitled "**From Green to Climate Change**"

### Background

Rodney started by stating the science alone does not achieve change, although the popularization of science supports change. However, change takes a long time. Greenpeace achieved a lot in drawing attention to environmental problems on Earth, as did the popular media. Emotional appeals change our perception of issues.

Rodney mentioned the film "The Day After Tomorrow" and showed a light pollution picture of the Earth at night. Most of this light comes from electricity which has been generated by coal powered power stations. A graph was shown which indicated that CO<sub>2</sub> levels had increased, and that global temperature had increased by 1°C, since 1850. Efforts are being made to try and limit this increase to 2°C. If the increase goes above 2°C, the effects will be irreversible, but what has to be considered is that CO<sub>2</sub> increases have occurred before during the last 600 million years of the Earth's history. Nevertheless the world has recognized the Kyoto Protocol of 1997.

Surveys of peoples' opinion in developed countries showed that the majority of people believe that climate change *is* an issue. For example 80% of a group surveyed in Spain thought that action was required, but there the Spanish Prime Minister had put his weight behind the idea. Similar figures were shown for the United Kingdom suggesting perhaps that, in the developed world, the views of the people represented the views of the leader – only 60% of people in the USA agreed that action was required – and 19 000 United States scientists even signed a petition to reject Kyoto, arguing that an increase in CO<sub>2</sub> levels was beneficial. In surveys in developing countries (Russia and India were examples), the majority of people do not believe that global warming is an issue.

British Prime Minister Gordon Brown instituted a "Review of the Economics of Climate Change", which was released in 2006. The review concluded that 1% of the world GDP needs to be spent *now* to avoid the worst effects of climate change. If climate change continues then world GDP would be 20% less than it would have been. However there were still those who told Brown that his methodology was wrong. Rodney mentioned at this stage that Patrick Moore (not the astronomer but another of the same name), one of the co-founders of Greenpeace, is now a lobbyist for the nuclear power industry!

In 1988 there was established an Intergovernmental Panel of Climate Change (IPCC). In 2007 it published its 4th Assessment Report which stated that there was "conclusive evidence" of climate change. The IPCC received a share of the Nobel Peace Prize for its advocacy of the message – the other share was awarded to Al Gore.

After the IPCC report Martin Durkin in the UK produced a documentary called "The Great Global Warming Swindle", which was shown on Channel 4 in 2007. Durkin argued that the IPCC scientists were mis-represented, and that, in any case, solar activity could account for the changes.

President Obama has said "Yes We Can" on climate change, and the American "Clean Energy and Security Act" requires the emission of greenhouse gases to be reduced by 17% by 2020. The IPCC says this falls short of what is required.

Rodney gave some instances of recent events that seem to contra-indicate global warming – in 2003 the Taklamakan desert in China was covered in snow, China recently had its coldest winter in 100 years and in 2008 Baghdad had its first snow in more than 100 years. Rodney showed a graph which illustrated that 20 years of increasing temperatures had been wiped out in 3 months. It has also been suggested by Ian Palmer in Australia that the computer modeling is too primitive at present.

### **The Built Environment.**

The IPCC stated that the building sector has the greatest potential for reducing emissions. A pie chart showed that Residential areas used 20% of electricity generated and Commerce 14%. Although Kyoto did not focus on any specific sector, it has been proposed that there should be binding targets for buildings. European directives are requiring the details of the energy price of all new buildings. They have a 20-20-20 rule – all buildings must have 20% decrease in energy use, and a 20% reduction in greenhouse gas emissions by 2020. And by 2019 all buildings must produce as much energy as they consume. Although the media have brought the idea of targets to public attention, nothing has been done yet. Such change is usually done by regulations and policy instruments such as tax exemptions. At present South Africa is behind in this respect.

In the USA, in spite of rejecting Kyoto, the Bush Administration introduced the most stringent regulations (but did not promote them). Every Federal facility must have a 30% reduction in energy use by 2015, fossil fuel dependency must be reduced by 80% by 2020, and 30% of hot water must be produced by solar heaters. The aim is for a net zero energy balance in every building by 2025. Rodney said that in South Africa we have not achieved even 30% yet.

Rodney concluded that perhaps we should go back to the sun for energy – using solar or wind derived electricity. The meeting ended with tea, biscuits - and discussion!

### **Last month's observing evening - by Johan Smit**

With much excitement, many of the regular observers went to the Settlers dark sky weekend. Only a few die-hards that could not make the Settlers trip attended our viewing evening. Despite an expected poor turnout, with a group of visitors arriving to enjoy the evening with us, there were more than 30 attendees. There were six member telescopes available, including Joop de Jager's home-made 12 inch telescope. This is an impressive instrument capable of being mounted on a split ring equatorial mount as well as a normal Dobsonian mount.

The seeing was particularly good and we made the most of it. Listening to some feedback from Settlers I deduced that they passed on the good seeing to us in exchange for dark skies.

Early in the evening we observed Saturn, because this would be the last viewing evening this year that it will be visible at a reasonable hour and altitude. Later in the evening we opened the dome and looked at Jupiter with the 12 inch. All the visitors were able to get a good view of this splendid target. Because of the number of visitors we also visited all the favourites, such as the Southern Cross, Jewel Box and Omega Centauri.

We also had a look at some of the brighter clusters, M6 and M7, near Scorpius. We also used Joop's telescope to have a good look at M57, the Ring Nebula, in Lyra, and much to Danie's and Johan Hartmann's surprise this challenging object was also visible in their 6 and 8 inch telescopes respectively.

I had my trusty binocular stand set up and we followed the telescopes around the sky introducing visitors to the joys of low power observing. Typical targets included the Coat-hanger cluster, which looks much better in binoculars than in a telescope.

As a challenge we used various instruments to try and split the double-double (Epsilon Lyrae). I am glad to report that most instruments managed to split the individual pairs.

Our next viewing evening is on Friday, 21 August 2009. Consider yourself invited!

## Summary of "What's Up" to be presented on August 26<sup>th</sup> 2009.

Prepared by Michael Poll.

### Moon's phases

August 27 <sup>th</sup>	First quarter moon.
September 4 <sup>th</sup>	Full moon
September 12 <sup>th</sup>	Last quarter moon.
September 18 <sup>th</sup>	New moon
September 26 <sup>th</sup>	First quarter moon.

### The moon passes bright objects during the month.

#### Evening sky

August 27 <sup>th</sup>	Moon near the bright star Antares, in Scorpius
September 2 <sup>nd</sup> -3 <sup>rd</sup>	Moon and Jupiter are close together all night.
September 20 <sup>th</sup>	Moon is near the bright star Spica, in Virgo.
September 24 <sup>th</sup>	Moon near Antares.
September 29 <sup>th</sup>	Moon near Jupiter all evening.

#### Morning Sky

Time of viewing not critical but look just before twilight starts – about 5.00 am in August and 4.30 am in September.

September 3 <sup>rd</sup>	Moon and Jupiter in the north west. (See September 2 <sup>nd</sup> , evening sky, above)
September 13 <sup>th</sup>	Moon near Mars.
September 16 <sup>th</sup>	Moon near Venus.
September 17 <sup>th</sup>	The moon, Venus and the star Regulus are in a group. Regulus is the brightest star in Leo.
September 20 <sup>th</sup>	Venus is very close to Regulus.

#### Planets

Saturn is in conjunction with (i.e is on the far side of) the sun on September 17<sup>th</sup>, and is not visible in September.

Mercury is visible in the western evening sky after sunset until about September 10<sup>th</sup>

Jupiter is high in the east in the evening sky.

### Mars and Venus are in the morning sky.

#### Constellations

Constellations up during September include two of the Southern Birds – Grus, the Crane, and Pavo, the Peacock.

## More about the moon - by Michael Poll

### Highlands and Maria

The most obvious thing seen when looking at the surface of the moon are the dark and light areas. The light ("white") regions are rugged mountainous highlands, and are older than the dark areas. The highlands are made mainly of a rock called anorthosite, and a breccia. The anorthosite is largely a white calcium aluminium silicate mineral called plagioclase, while the breccia consists mainly of angular pieces of anorthosite and other materials broken and compacted together by many meteorite impacts.

Crater rims and rays of ejecta can also look white, because, if rock is pulverized, as in an impact, many small facets are created and these can be highly reflective, even if the original rock was dark in colour.

The dark areas are known as "maria" (singular "mare"), meaning "seas". They were called maria

because it was originally thought that they *were* seas, on account of their apparent smoothness. As well as being smooth, the maria are low lying. They consist of basalt lavas, which are rich in iron, magnesium, and sometimes titanium. The maria appear dark because the basalts reflect little light.

The basalt lavas were formed from molten rock which was in a previously hot lunar interior. The heat to melt the rock was generated by the radioactive decay of uranium, thorium and potassium. The heat melted parts of the lunar interior and created vast reservoirs of magma. In most places the magma remained trapped, and was unable to reach the surface. However the big pre-existing mare basins had a deeply fractured crust, which provided pathways for the release of the magma, which then welled up, and oozed out over the lunar surface, covering and filling the old basins. This welling up process took hundreds of millions of years. Mare lava has a fine grained, even glassy texture, indicating that it cooled rapidly after erupting.

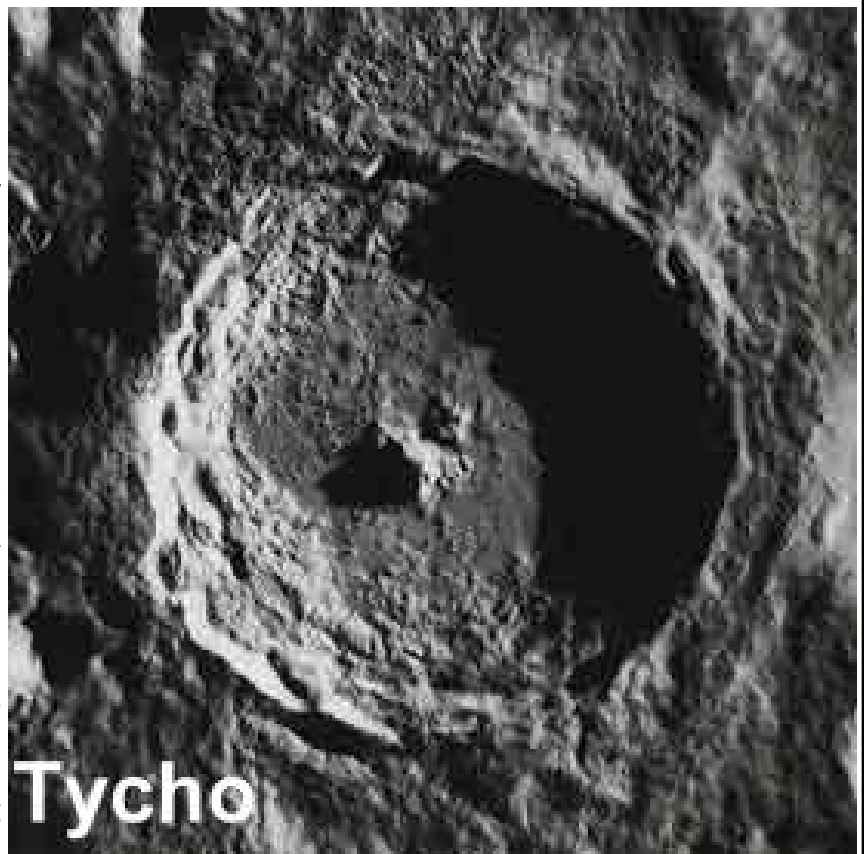
Over time “space weathering” can alter the hue of the lunar rocks. The highland rock has darkened due to radiation from sun and space (microscopic blebs of dark iron are formed), nevertheless, these rocks are still much brighter than the maria. The maria themselves may be lightened by impact ejecta. Dark lavas and bright crater rims become more moderately grey with time. However, space weathering is a very lengthy process, and it could take a billion years for a ray of ejecta to lose its brightness.

The lunar surface is strewn with a covering of loose fragments of rock and dust known as “regolith”. The regolith is the debris created by impactors that struck the moon and disintegrated.

### Craters

Because of the apparent bewildering variety of types of crater, observers in times past invented assorted names to characterize crater types – for example, in their 1955 book Patrick Moore and Hugh Wilkins described ringed plains, walled plains, mountain rings, crater plains, crater rings, craters, craterlets, crater-cones, crater pits, obscure rings and depressions. It was not realized until the 1960s that the way craters look depends on their diameter. Shapes and features change systematically from small to large diameter craters. Fresh craters that are smaller than about 15 km across have a simple bowl shape with smooth inner walls and small flat floors. These are called **simple craters**. The impacts that formed them were small, but had enough energy to eject dust and rock fragments beyond the rim. Simple craters are too small to reveal much detail telescopically – even with the highest magnifications they appear only as tiny circles, with shadows in them depending on the illumination

When larger projectiles collide with the moon, the resulting holes are deeper and wider and **complex craters** are formed. The walls of these craters are too weak to remain unsupported. Where the crater is from about 15 km – 30 km in diameter large masses crumble randomly onto the crater floor in the form of isolated slumps. The energy of the impact also compresses the rock below ground zero to such an extent that it rebounds upwards creating a peak in the middle of the cra-



ter floor.

If the complex crater formed is larger than about 30 km (i.e from an even higher energy impact) – the entire wall of rock around the rim fails and slides down the slope as benches or terraces, for example, Tycho (85 km in diameter – see picture taken by Lunar Orbiter 5 in August 1967) and Copernicus (93 km in diameter. (*See July 2009 newsletter*)). These types of crater have a series of terraces, showing that the wall fractured a number of times, each time dropping a ring of rock that steps down to the crater floor. In addition, the greater energy of the impact enhances the rebound of the floor, creating larger and more complex central peaks.

Nearly every crater on the moon had the typical characteristics of their type when they formed, but they have changed over time. Simple craters are often partially filled with ejecta from later impacts, giving them a shallow broad floor, and are sometimes obliterated by subsequent impacts or the flow of mare lava. Complex craters can also become shallower with time, by being filled with ejecta or lava so that the central peaks are covered over.

#### References.

Decoding Mare Imbrium. Charles A Wood. Sky and Telescope, December 2007, p 67.

A colourful moon? Charles A Wood. Sky and Telescope, September 2008, p 60.

The crater main sequence. Charles A Wood. Sky and Telescope, June 2008, p 63.

A swim in Mare Humorum. Charles A Wood. Sky & Telescope, October 2008, p 63.

Website : “Astronomy Today”

### South African satellite launch likely to be held back yet another month



It looks as if the launch of South Africa's R26-million Sumbandila microsatellite (SumbandilaSat) will now take place on or around September 14 or September 15, and not on or around August 20, as previously hoped. The new likely launch dates have not, it seems, been officially communicated to the South African Department of Science and Technology yet.

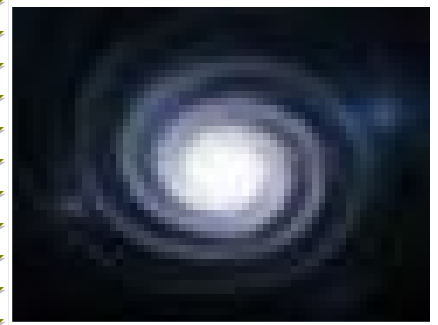
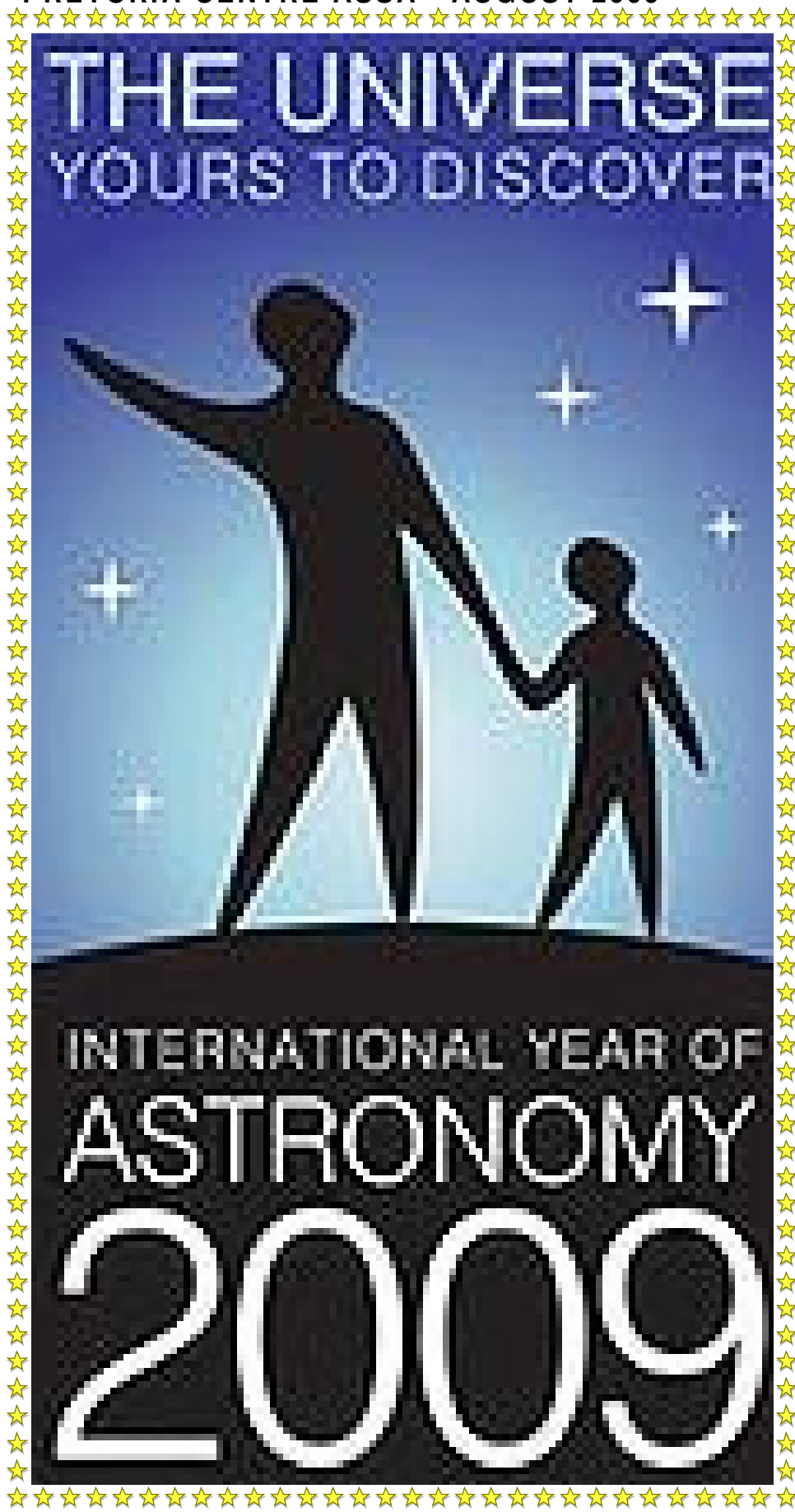
The problem is that SumbandilaSat will only be the secondary payload on the Soyuz launch rocket – the primary payload will be a Russian Meteor M meteorological satellite.

Although both SumbandilaSat and the Soyuz satellite launch vehicle (not to be confused with the Soyuz manned space ship) are now at the launch centre – the Russian-leased and operated Baikonur Cosmodrome in Kazakhstan – the Meteor M has been running late, for reasons unknown. Apparently, the Meteor M successfully passed its vibration tests some time ago, and should now be ready for shipping to the Cosmodrome.

“Sumbandila” is a Venda word which means “lead the way”.

The image shows SumbandilaSat.

<http://www.engineeringnews.co.za/article/south-african-satellite-launch-likely-to-be-held-back-yet-another-month-2009-07-20>



*"Not only are we in the Universe, the Universe is in us" - Dr. Neil deGrasse Tyson 2006*

**Web links to IYA2009:** [astronomy2009.org](http://astronomy2009.org) [astronomy2009.org.za](http://astronomy2009.org.za)

### First dish of KAT-7 erected

The first dish for South Africa's prototype KAT-7 radio telescope array has been mounted on its pedestal in the Northern Cape, roughly 100 km west of the small town of Carnarvon. KAT stands for Karoo Array Telescope, while the numeral 7 indicates the number of dishes which will form the instrument. The KAT-7 dishes are each 12 m in diameter, manufactured from composites, and mounted on a simple steel framework. Hitherto, all radio telescope dishes have been made entirely from metal. The use of composites is an attempt to significantly reduce the cost of the dishes.



The image shows the first KAT dish being lifted into place.

<http://www.engineeringnews.co.za/article/first-dish-of-karoo-array-telescope-erected-2009-07-20>



The image (made by another rover named Spirit) shows Opportunity atop Victoria crater.

### Victoria crater unveils more of Mars' geologic past

After thoroughly investigating Victoria crater on Mars for two years, the instruments aboard the rover Opportunity reveal more evidence of our neighbouring red planet's windy, wet and wild past. Opportunity's two-year exploration of Victoria Crater - 800 meters wide and 76 meters deep - yielded a treasury of information about the planet's geological history and supported previous findings indicating that water once flowed on the planet's surface. Detailed analysis of the Victoria data will occupy researchers for years to come.

The image (made by another rover

### The Apollo moon project

The July 2009 edition of [Popular Mechanics](#) includes two articles on this topic.

### Johannesburg Planetarium

- Next repeat of the "Introduction to Astronomy" series starts Monday September 21st 2009.
- They are looking for an astronomy educator, with maths / science teaching experience, able to communicate in Northern Sotho and Zulu.

More info on the above: [www.planetarium.co.za](http://www.planetarium.co.za)



## Rocky planet births are common, dead stars suggest

The materials needed to create rocky planets are common in the Universe, according to new information from the planetary graveyards around dead stars. Astronomer Michael Jura of the University of California, Los Angeles, found a pattern in the debris around some of the brightest known white dwarfs — the small dense remains of dead Sun-like stars.

His study reveals chemical similarities suggesting that, when the white dwarfs were younger, they could have hosted terrestrial worlds akin to Earth, Venus, Mercury, or Mars. If you ground up our asteroids and rocky planets, you would get the

same type of dust that are seen in these star systems. For example, the systems all contain glassy silicates similar to a mineral called olivine that is common in Earth's crust.

In an artist's conception, a rocky asteroid breaks up due to differing gravitational attraction on its near and far sides when it comes too close to a white dwarf.

[http://news.nationalgeographic.com/news/2009/01/090106-rocky-exoplanets\\_2.html](http://news.nationalgeographic.com/news/2009/01/090106-rocky-exoplanets_2.html)

## Jupiter sports new 'bruise' from impact

Something has smashed into Jupiter, leaving behind a black spot in the planet's atmosphere, scientists confirmed on 20 July. This is only the second time such an impact has been observed. The first was almost exactly 15 years ago, when more than 20 fragments of [comet Shoemaker-Levy 9](#) collided with the gas giant.

"This has all the hallmarks of an impact event, very similar to Shoemaker-Levy 9," said an astronomer. The impact was discovered by amateur astronomer Anthony Wesley in Murrumbateman, Australia at about 1330 GMT on 19 July. Wesley noticed a black spot in Jupiter's south polar region – but he very nearly stopped observing before he saw it.

An infrared image taken at the Keck II telescope in Hawaii reveals a bright spot where the impact occurred. An image of Earth is superimposed on the image to show how the diameter of the impact site compares with the size of Earth. The spot looks black at visible wavelengths.

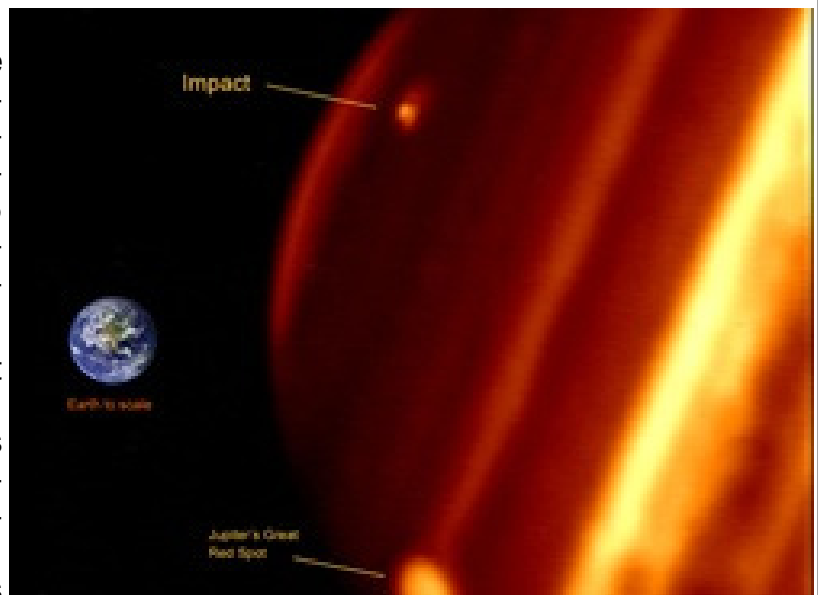
<http://www.newscientist.com/article/dn17491-jupiter-sports-new-bruise-from-impact.html>

<http://www.astronomy.com/asy/default.aspx?c=a&id=8490>

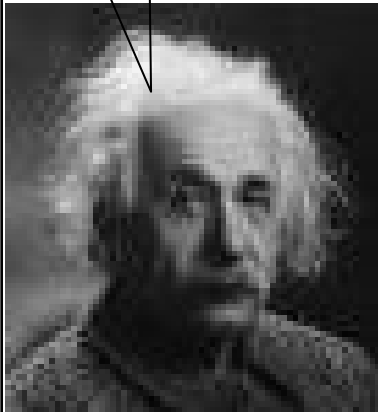
See a movie showing the spot rotating with Jupiter at

<http://www.spaceweather.com/archive.php?view=1&day=21&month=07&year=2009>

This was brought to my attention by Danie Barnardo and Gareth Gregory, two our committee members.



$$E = mc^2$$



## Scientists now expect to find gravitational waves

A \$205 million upgrade will allow a laser-wielding observatory to monitor tens of thousands of galaxies for mysterious gravitational waves.

Leading investigators are confident that the Advanced LIGO (Laser Interferometer Gravitational-wave Observatories) Project will be able for the first time to detect gravitational waves from neutron stars and black holes, as predicted by Einstein's theory of general relativity.

Gravitational waves are ripples thought to occur in the fabric of space-time that result from interstellar collisions, explosions, or the dramatic movement of large and extremely dense objects such as neutron stars. Those ripples can then pass through the space-time that Earth occupies, causing a slight distortion which Advanced LIGO is meant to

pick up. <http://www.livescience.com/space/business/technology/080409-tw-ligo-advanced.html>



**SKA SOUTH AFRICA**  
SQUARE KILOMETRE ARRAY

## The South African Square Kilometre Array project

Call for applications for Postgraduate Bursaries for 2010 NOW OPEN.

The SA SKA Project supports students who wish to pursue postgraduate research in astronomy or fields of engineering appropriate to radio telescopes.

CLOSING DATE FOR APPLICATIONS: 31 August 2009.

Application forms are available at

<http://www.ska.ac.za/>

South African and Australia are the only two countries remaining on the shortlist to site this mega radio telescope. A final decision on the site is expected by 2010 and construction should start in 2014.

## The SKA: does it fall within South Africa's reach but may exceed our grasp?

This will be the largest astronomical array telescope ever built, consisting of some 4500 radio telescopes connected with a supercomputer. According to Australia's Minister of Science, "winning the bid for SKA is like winning the Olympic site bid every day for 50 years."

When South Africa first put forward our tender for the SKA, many questioned how South Africa could possibly compete with astronomy heavy-weights the likes of Australia and the other three countries. Though we have some of the clearest skies in the world, do we have the intellectual know-how and infrastructure to accomplish a mammoth task such as the construction of SKA? According to Dr. Adrian Tiplady, motivational speaker at this year's 11th NSTF Awards, "The answer is a resounding...**yes!**" [Read his complete speech](#) on the NSTF Awards Web site.

This year is the International Year of Astronomy. The proposed SKA core site, in the Northern Cape, has one of the best radio frequency environments in the world. The Department of Science and Technology promulgated the Astronomy Geographic Advantage Act, which allows for the establishment of an astronomy reserve in the Northern Cape Province.

## SECOND KAROO STAR PARTY

The ASSA Pretoria Centre wants to hold its second National Karoo Star Party during the weekend of 6 to 9 August 2010 about 20 km north of Britstown in the Karoo, right next to the N12 at the Kambro Padstal. The reason for this locality, apart from the fabulous Karoo skies, is that it is almost exactly halfway between Gauteng and the Cape Town area, so we can all drive the same distance to the site. The first event of this type was held during April 2009 and proved to be a big success. The Karoo lived up to its reputation and provided magnificent views to those lucky enough to be present.

More information from:

- Johan Smit, cellphone: 0728062939, e-mail: [JohanS@firsttech.co.za](mailto:JohanS@firsttech.co.za)
- Danie Barnardo, cellphone: 0845886668, e-mail: [daniebar@telkomsa.net](mailto:daniebar@telkomsa.net)

To book, please contact Wilma Strauss, the Manager of Kambro, directly at 083 305 6668 or at e-mail: [kambro@worldonline.co.za](mailto:kambro@worldonline.co.za)

## Invitation to joint star gazing event

The following invitation was sent to us by Simon Donally:

Once again we are arranging a joint star gazing event on August 22 between ESSA (Explorer Society of SA) and ASSA (Astronomical Society), and once again it happens to be in the depths of winter. The venue is a secluded but easily accessible farm in the Magaliesberg which belongs to Paul Marais and Vanessa and is a short drive from Jo'burg or Pretoria. It has some unusual examples of sustainable energy solutions – namely a Lister engine (first invented in 1929) and a wind turbine, to name a few.

The evening starts with a "bring & braai", followed by star gazing. Fires for the "bring & braai" will be organized and ready from 16h00 onwards and there may even be a couple of bottles of red wine to kick off the evening too. If you would like to explore the farm in the daylight hours you are welcome to arrive from 11h00 onwards and to bring a picnic with you.

Should you decide to join us, please bring your own crockery, cutlery and a wine glass plus R10 to cover the incidental expenses for this initiative. You are welcome to overnight on Paul and Vanessa's farm but you need to bring your own tent - and breakfast! Anyone who brings a telescope will be exempt from this fee.

In keeping with the spirit of the last event we would appreciate it if some of the people from ASSA who plan to join us, bring along a telescope and in return we will arrange the venue, a braai and maybe even a tour of some green energy initiatives. Anyone bringing a telescope with them will be exempt from this fee.

If any of you are interested in participating, please **contact Simon at:** [donalys2@yahoo.fr](mailto:donalys2@yahoo.fr)

## Sterre-tot-Middernag op Sutherland

Jurg Wagener hou elke maand om en by nuwemaan 'n sterrekyk-sessie wat hy "Sterre-tot-Middernag" noem. 'n Lesing word aangebied voor die sterrekyk deur die teleskope in alle erns begin. Hier is 'n lekker geleentheid om Sutherland en sy pragtige naghemel saam met kundiges van nader te leer ken.

**Datums: September 18/19, Oktober 16/17, November 13/14 & Desember 18/19**

<http://www.sutherlandinfo.co.za/starstomidnight.htm>

Kontak Jurg by sel 082 556 9589, e-pos [info@sutherlandinfo.co.za](mailto:info@sutherlandinfo.co.za)

### Cartwheel galaxy

A rare and spectacular head-on collision between two galaxies appears in this Hubble telescope picture of the Cartwheel galaxy, located 500 million light-years from Earth in the southern constellation Sculptor.

The striking ring-like feature is a direct result of a smaller intruder galaxy — possibly one of two objects to the right of the ring — that careened through the core [close-up image at lower left] of the host galaxy. Like a rock tossed into a lake, the collision sent a ripple of energy into space, plowing gas and dust in front of it. Expanding at 100 kilometers/second, this cosmic tsunami leaves in its wake a firestorm of new star creation. Hubble resolves bright blue knots that are gigantic clusters of newborn stars [close-up image at upper left] and immense loops and bubbles blown into space by exploding stars (called supernovae) going off like a string of firecrackers.



### PRETORIA CENTRE COMMITTEE

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