



# The **PRETORIA CENTRE**

of the

## Astronomical Society of Southern Africa

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

### NEWSLETTER JUNE 2012

#### Next meeting

**Venue:** The auditorium behind the main building at Christian Brothers College, (CBC), Mount Edmund, Pretoria Road, Silverton, Pretoria.

**Date and time:** Wednesday 27 June at 19h15.

#### Programme:

- **Beginner's Corner:** "The making of Crux 2 - a 10" Dobsonian" by Danie Barnardo.
- **What's Up?** by Fred Oosthuizen.
- 10 minute break — library will be open.
- **Main talk: "Water in the solar system" by Michael Poll.**
- Socializing over tea/coffee and biscuits.

The chairperson at the meeting will be Bosman Olivier.

**Next observing evening:** Friday 22 June at the Pretoria Centre Observatory, which is also situated at CBC. Turn left immediately after entering the main gate and follow the road. Arrive from sunset onwards.

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### Chairman's report of the meeting on 23 May 2012

Proceedings started at 19:15 with the Chairperson welcoming all present. A special word of welcome was extended to visitors, of which there were a few in the audience. Visitors were urged to provide their e-mail addresses on the presentation list. Pat Kühn told those members who ordered fleece jackets that they are available and can be collected during the leg break.

The first speaker was Percy Jacobs, our Observation Officer. He outlined tips for viewing as well as dwelling on etiquette tips at viewing evenings and star parties. He also stressed proper preparation for viewing and concluded with an overview of the number of observations of ASSA 100 objects recorded by club members. The current leader is George Dehlen with 73 observations.

Johan Smit elaborated on the viewing opportunities during June and concluded that 52 of the ASSA 100 objects can be seen in June. He also elaborated on the transit of Venus, which will unfortunately not be visible from our location, but will be covered in depth on many websites. He also elaborated on the birthdays of several prominent astronomers during June.

After the leg break, Sheldon Herbst, our guest speaker for the night, gave a talk on Neutron Stars and Pulsars. Sheldon is a M. Sc student at the Applied Mathematics Department of WITS university and already has two Hons degrees to his credit. He is attached to the Applied Mathematics Department at WITS.

He started his talk with a short definition of a Neutron Star, stating that it is the result of the core collapse of a super-giant star after the outer layers have been blown off in a massive Supernova explosion. The Neutron Star is the remains of the core of such a star in which atoms have been compressed to such an extent that protons and electrons merge to form neutrons, hence the name Neutron Star. These stars are so dense that a teaspoonful has the mass of one of Mars's moons, Phobos. These stars have solar masses up to a maximum of about three solar masses. These stars combine the mass of 1.5 to 3 Solar masses into a body 20 to 30 km in diameter. Larger masses than this upper limit result in the formation of a Black Hole. Because of the extreme mass, these stars also have extreme gravitational attraction and very powerful magnetic fields and a surface temperature of millions of degrees Kelvin. A spectacular example of a Neutron Star is the Crab Nebula, also known as M1, in the Constellation of Taurus,

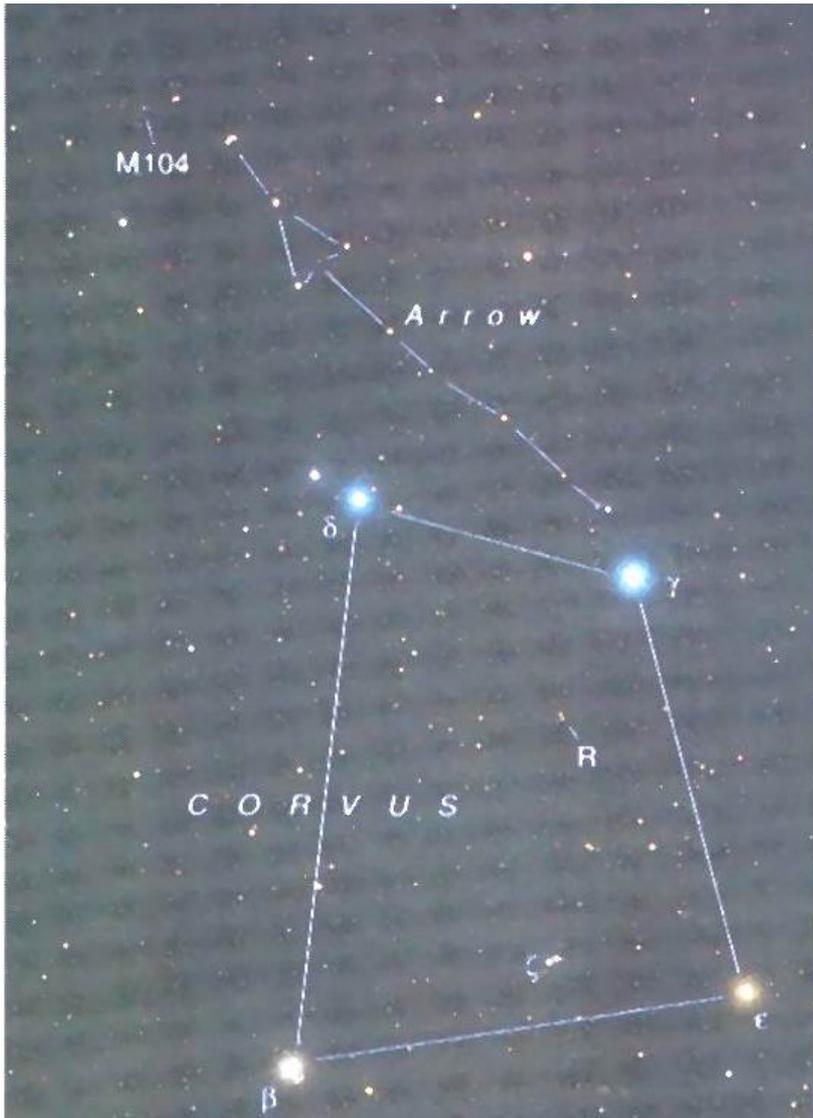
A result of the extremely large gravity and small, dense star is a rapid and very regular spinning of the star – up to 700 revolutions per second. This spinning is so regular and precise that these stars are the most accurate clocks in the universe. A result of the extreme heat, magnetism and density is the emission of very powerful radio waves emitted at an angle to the axis of spin on either side of the star. These radio waves led to an early deduction that they originate from intelligent civilizations, hence they were known as LGM's or Little Green Men, but the true origin of these radio signals has since been established as originating from these rapidly-revolving Neutron Stars and were dubbed Pulsars due to the regular nature of these radio signals.

Sheldon then elaborated on the history of the research into and discovery of Neutron Stars and Pulsars. He also dwelt on the very complicated mathematical equations used to model these stars as well as other astronomical phenomena and also elaborated on the existence and discovery of dark energy, which forms a substantial part of the Universe.

Sheldon ended his talk with a few videos illustrating models of Pulsars and their spinning and also played a few sounds of Pulsars as picked up by radio telescopes.

This was truly a spectacular and thought-provoking talk and brought everybody under the impression of the enormous forces that are present in the Universe as well as the extremely complicated mathematics that are used by astronomers to model astronomical bodies and the Universe in general. A very healthy series of questions from the audience and subsequent discussions followed, which was carried on during the coffee/tea break after the meeting.  $\Omega$





clusters. For comparison with other telescopes around we re-examined amongst other things, the Jewel Box and NGC 3532, and we also had views of Omega Centauri (NGC 5139) and Messier 7 (NGC 6475) in Scorpius. Later on Bosman and his friend Johan were looking for M104 (NGC 4594 - The Sombrero). It was neck achingly high in the sky by this time, but we located Corvus, and then telescopically found the "signposts" for the galaxy, including the "Arrowhead" and the "Stargate" asterisms. (The Stargate asterism is one equilateral triangle of stars inside another). However the galaxy will have to wait for next month! Note that, although Corvus is the start-off point for finding M104, the galaxy is actually just over the border in Virgo. A Sky and Telescope finder chart for M104 is attached to this report. In this image, the Stargate Asterism is the blob at the end of the Arrow. Ω

### Call for astrophotos

Members who do astrophotography are invited to send me their photographs to be considered for placement on the back page.

### Errata

In the May 2012 newsletter, the web link to **Project Icarus**, the last item in the "Noteworthy items", was cut off. The web link is:

<http://news.discovery.com/space/project-icarus-target-exoplanet-star-110207.html>

### ScopeX 2012

**Where:** National Military History Museum, Johannesburg (aka War Museum, next to the Zoo).

**Date:** Saturday 21 July 2012 .

**Time:** 9 am to 9 pm. (Star Party from 6 pm onward.)

**Museum Entrance Fee:** R22 adults, R11 senior citizens and children up to 18.

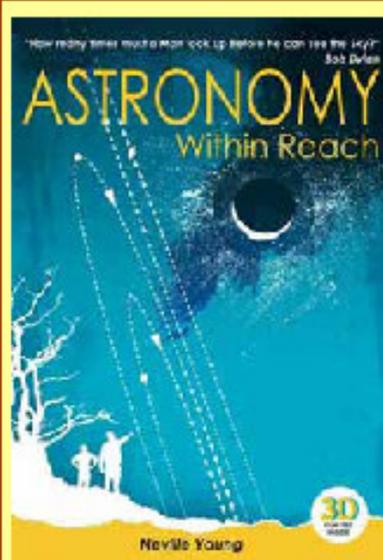
**Website:** <http://www.scopex.co.za/>

Neville will present this book at the meeting on 27 June and offer copies for sale there.



**New on the Market!**  
 In full colour with 208 pages of information, photographs and diagrams.

This book has been written by Neville Young, an amateur astronomer and the creator of the Starwaders concept of teaching astronomy using models. These models are clearly explained on the Starwaders website.  
[www.starwaders.com](http://www.starwaders.com)



Written for the layman in a relaxed style, the book shows how anyone, using only their eyes or binoculars, can actively participate in astronomy.

For instance, the book explains how to see Venus in daylight and how to watch the moons of Jupiter change position during the course of an evening.

*Astronomy Within Reach* and *Sterrekunde Binne Bereik* are also ideally suited for scholars and educators, being a resource not only for teaching astronomy, but also for learning about general scientific principles such as ellipses. Learn too why the names of the days of the week are all derived from astronomy.

See how the stars vary greatly in distance from us by viewing star fields with the supplied 3D glasses, to understand more about the vast distances between the objects in space.

- Understand why we see the planets where and when we do.
- More than 200 colour photographs and diagrams
- Understand scale by imagining a miniature Solar System where the Sun is on Nelson Mandela bridge in Johannesburg and the planets are proportionally placed all the way to way to Neptune on Church Square in Pretoria.
- Why is the sky blue and why are there 366 days in a year?

Available from the author—see contact details below—or at the usual outlets.  
**Price R250.00**

**Contact Details:**  
**Websites:** [www.astronomy-within-reach.co.za](http://www.astronomy-within-reach.co.za) or [www.sterrekunde-binne-bereik.co.za](http://www.sterrekunde-binne-bereik.co.za)  
**Email:** [jen@starwaders.co.za](mailto:jen@starwaders.co.za)

## Summary of "What's Up?" to be presented on 27 June - by Fred Oosthuizen

### MOON PHASES:

FULL on the 4<sup>th</sup> - 1st QUARTER on the 11<sup>th</sup> - NEW on the 19<sup>th</sup> - 3rd QUARTER on the 26<sup>th</sup> July.

### PLANETS

During the early hours of the morning at the beginning of the month JUPITER and VENUS will be in Taurus very close to ALDEBARAN and will remain there through out the month forming a very neat triangular asterism low in the Eastern horizon.

In the early evening SATURN will be near SPICA in Virgo, MARS midway between REGULAS in Leo and MERCURY midway between REGULAS and Gemini. Towards months end MARS will have moved much closer to SATURN forming a very nice threesome with Spica. Mercury will no longer be visible as it will be too close to the Sun

### STARS and CONSTELLATIONS

At the beginning of the month during the early hours of the morning from Rigel in ORION low in the eastern horizon, ERIDANUS (The River) can be seen snaking its way across the sky towards the bright Star Achernar. Continue on that line to the next brightest Star Fomalhaut. You will then pass the constellation PHOENIX and end up at SCULPTOR and CAPRICORNUS (The Sea Goat) in the West.

To North is PEGASUS (The Flying Horse) and deep in the South the 2<sup>nd</sup> brightest Star in the sky, CANOPUS in CARINA, and onto PUPPIS with its many open Clusters.

During the early evening the winter constellation SCORPIUS can be seen in the central western sky dominated by the red giant star ANTARES. To the west of Scorpius lies the ancient constellations LUPUS (The Wolf) and NORMA which have several fairly bright open clusters.

North lies LIBRA (The Scales) and SPICA in VIRGO with its multitude of galaxies. East of Scorpius is SAGITTARIUS (The Archer) with its wealth of clusters and nebulae. North is OPHIUCHUS (The Serpent Holder) and HERCULES. South lies PAVA (The Peacock).

For those well layered people who can brave the cold winter nights the rewards are quite spectacular, the atmosphere at this time of the year is crisp and clear and the viewing great. There are many bright open and closed clusters, beautiful nebulae and well-defined galaxies. Notably, M4, M6 (The Butterfly Cluster), M7 and M80 in Scorpius, M30 in Capricornus, M15 in Pegasus and the Andromeda Galaxy M31 nearby.

M46, M47 and M9 in Puppis. The galaxies M49, M58, M59, M60, M61, M90 and M87, a giant elliptical galaxy with its powerful radio source Virgo A and the celebrated Sombrero Galaxy M104, all in VIRGO, and many more objects of interest.

See also

SKY and TELESCOPE:- Interactive Sky Charts

World Wide Telescope.

Toshimi taki Star Maps.

Google Sky.



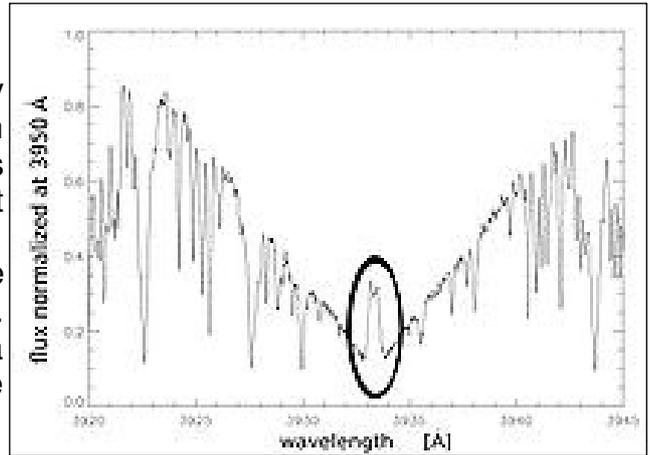
## Basics: The Wilson-Bappu K-line method of determining distances to stars by Pierre Lourens

The spectrum of a star is full of dark absorption lines. These originate in the photosphere of the star. A partial spectrum of the Sun, which is a star of spectral type G2, is shown in the figure on the right.



Many dark absorption lines are visible.

In cool stars, the H and K doublet of singly ionized calcium are among the strongest absorption lines. This doublet are the leftmost two dark lines marked **Ca** in the figure. The K absorption line is at a wavelength of 3933.7 Angströms. It has a narrow, faint emission line, which originates higher up in the chromosphere of the star, in the centre of the line. To illustrate this, the K line spectrum of KW 326, a dwarf star in the open cluster named Praesepe (The Beehive), is shown in the figure on the right.



In 1957, Olin Wilson and Manali Bappu reported on the remarkable correlation between the measured width of the aforementioned emission line of a star and the luminosity of the same star. The correlation was independent of spectral type and applicable to stars of spectral type G, K and M. The wider the emission line, the greater the luminosity. It is given by

$$M_V = 33.2 - 18.0 \log_{10} W_0$$

$M_V$  is the absolute visual magnitude of a star.

$W_0$  is the width of the emission line in the spectrum of the same star.

The plot is shown in the figure on the right. Of course, this is for stars of known distance, for which the luminosity, and hence  $M_V$ , is known. Consider the following formula for a star:

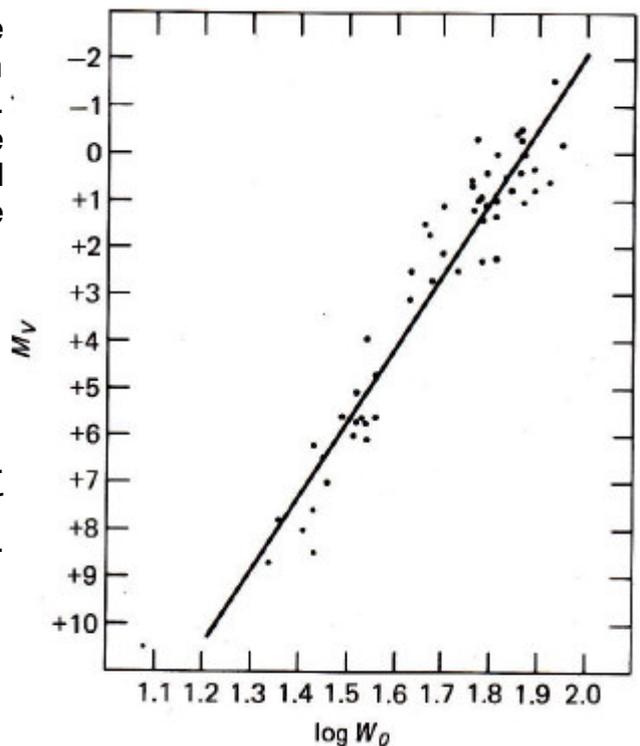
$$I_V = L_V / (4\pi d^2)$$

$I_V$  is the intensity of light in the visual region received here on Earth.

$L_V$  is the visual luminosity.

$d$  is the (unknown) distance of the star from Earth.

If  $I_V$  is measured here on Earth and  $L_V$  is found somehow,  $d$  can be calculated. This is basically what is done. In practice, however, astronomers find the unknown distance to a star of spectral type G, K or M as follows. The apparent visual magnitude  $m_V$ , (which is a measure of  $I_V$ ), is measured. The width of the aforementioned emission line in the spectrum of the star, namely  $W_0$ , is measured, then  $M_V$  (which is a measure of  $L_V$ ), is read off from the graph. The distance  $d$  is then calculated by using the formula (with  $d$  in parsecs)



$$m_V - M_V = -5 + 5 \log_{10} d$$



### Feature of the month: Type Ia supernovae

The image at left shows an artist's impression of a binary star system. A white dwarf star accretes material via an accretion disk from a companion red giant star. If the white dwarf's mass exceeds 1.38 solar masses, it will collapse and explode as a type Ia supernova. Such a supernova can be seen across billions of light-years.

This category of supernovae produces consistent peak luminosity (about 5 billion times the luminosity of the Sun) because of the uniform mass of white dwarfs that explode via the accretion mechanism. This allows these explosions to be used as "standard candles" to measure the distance to their host galaxies. They played a key role in the discovery of the accelerating expansion of the Universe.

The image (made by the HST) at left shows SN 1994D, a supernova of type Ia. It is visible as the bright spot in the bottom left of this image. It occurred in the outskirts of galaxy NGC 4526, centered in the image.

Read more about type Ia supernovae at [http://en.wikipedia.org/wiki/Type\\_Ia\\_supernova](http://en.wikipedia.org/wiki/Type_Ia_supernova)

### Meet some committee members of the Pretoria Centre of the ASSA



**These are not wanted posters for outlaws, although they might seem so at first sight.** They are photographs of committee members. Left to right: Rynhardt van Rooyen, Danie Barnardo and Percy Jacobs.

**SKA website:** <http://www.skatelescope.org/>

### Noteworthy items

- **Successful first-time berthing of a commercial spacecraft, SpaceX's Dragon, to the ISS.** [http://www.nasa.gov/home/hqnews/2012/may/HQ\\_M12-097\\_Bolden\\_SpaceX\\_Call\\_to\\_ISS.html](http://www.nasa.gov/home/hqnews/2012/may/HQ_M12-097_Bolden_SpaceX_Call_to_ISS.html)
- **NASA receives widespread concepts for future Mars missions.** [http://www.nasa.gov/home/hqnews/2012/may/HQ\\_12-169\\_Mars\\_Concept\\_Group.html](http://www.nasa.gov/home/hqnews/2012/may/HQ_12-169_Mars_Concept_Group.html)
- **Black hole caught red-handed in a stellar homicide.** Yet another star is ripped apart by a black hole. [http://www.nasa.gov/home/hqnews/2012/may/HQ\\_12-144\\_GALAX\\_Black\\_Hole\\_Swallows\\_Star.html](http://www.nasa.gov/home/hqnews/2012/may/HQ_12-144_GALAX_Black_Hole_Swallows_Star.html)
- **Fledgling stars flicker in the heart of Orion.** Read about embryonic stars in this popular target for amateur astronomers. [http://www.esa.int/esaCP/SEMxRL4Y1ZG\\_index\\_0.html](http://www.esa.int/esaCP/SEMxRL4Y1ZG_index_0.html)
- **JUICE is Europe's next large science mission.** Jupiter's icy moons are the focus of Europe's next large science mission, the **Jupiter Icy moons Explorer – JUICE**. [http://www.esa.int/esaSC/SEM9I4QWJ1H\\_index\\_0.html](http://www.esa.int/esaSC/SEM9I4QWJ1H_index_0.html)
- **What's the Moon made of? Earth, most likely.** It's an accepted hypothesis that Earth's moon was created during an ancient, violent collision between our infant planet and a Mars-sized world. You can be fairly sure that when you're looking up at the Moon you're seeing a piece of Earth, the cratered remnants of a collision that took place billions of years ago. <http://www.universetoday.com/94543/whats-the-moon-made-of-earth-most-likely/>
- **NASA'S HST shows Milky Way is destined for head-on collision.** NASA astronomers can now predict with certainty the next major cosmic event to affect our galaxy, Sun, and solar system: the titanic collision of our Milky Way galaxy with the neighboring Andromeda galaxy. [http://www.nasa.gov/home/hqnews/2012/may/HQ\\_12-159\\_M31\\_Milky\\_Way\\_Collision.html](http://www.nasa.gov/home/hqnews/2012/may/HQ_12-159_M31_Milky_Way_Collision.html)
- **A new count of potentially hazardous asteroids.** Observations from NASA's orbiting observatory WISE have led to the best assessment yet of our solar system's population of potentially hazardous asteroids. [http://science.nasa.gov/science-news/science-at-nasa/2012/16may\\_pha/](http://science.nasa.gov/science-news/science-at-nasa/2012/16may_pha/)
- **Amateur astronomers boost asteroid hunt.** Yet again young amateur astronomers are helping scientists with real science. <http://news.discovery.com/space/amateur-asteroids-esa-faulkes-hunt-120531.html#mkcpqn=emnws1>
- **NASA lunar spacecraft completes prime mission ahead of schedule.** The GRAIL mission to study the moon has completed its prime mission earlier than expected. The mission team is now preparing for extended science operations starting Aug. 30 and continuing through Dec. 3, 2012. [http://www.nasa.gov/home/hqnews/2012/may/HQ\\_12-175\\_GRAIL.html](http://www.nasa.gov/home/hqnews/2012/may/HQ_12-175_GRAIL.html)
- **Nea Kameni volcano movement captured by Envisat.** Monitoring volcanoes is yet another use of artificial satellites. [http://www.esa.int/esaEO/SEMEQUYWD2H\\_index\\_0.html](http://www.esa.int/esaEO/SEMEQUYWD2H_index_0.html)
- **No intelligent aliens discovered in Gliese 581.** But this is just the beginning of SETI searches directed at planets within the habitable zones of their parent stars. <http://news.discovery.com/space/no-intelligent-aliens-in-gleise-581-are-home-120602.html#mkcpqn=emnws1>
- **The Venus transit and hunting for alien worlds.** Soon we'll see exoplanetary transits that look exactly like the historic Venus transit of 5 - 6 June 2012, says an astronomer. <http://news.discovery.com/space/venus-transit-earth-like-words-120608.html#mkcpqn=emnws1>

### Images and videoclips

- **ISS soars over Aurora Australis.** Watch a videoclip. <http://news.discovery.com/space/space-station-soars-over-aurora-110920.html>
- **Proba-2 catches solar eclipse.** ESA's space weather microsatellite Proba-2 saw it. Watch a videoclip. [http://www.esa.int/esaCP/SEMhJTYWD2H\\_index\\_0.html](http://www.esa.int/esaCP/SEMhJTYWD2H_index_0.html)

(continued)

- **Dawn's virtual flight over Vesta.** See a movie. This movie uses data from NASA's Dawn spacecraft to simulate the view from the spacecraft flying over the surface of the giant asteroid Vesta. <http://www.nasa.gov/multimedia/podcasting/jpl-vesta20120510.html>
- **Image of the Cygnus-X star nursery captured by ESA's Herschel observatory.** Have a look. [http://www.esa.int/esaCP/SEMXXKITWT1H\\_index\\_0.html](http://www.esa.int/esaCP/SEMXXKITWT1H_index_0.html)
- **Blowing bubbles in the Carina Nebula.** A stunning image made by ESA's Herschel observatory. [http://www.esa.int/esaSC/SEMBCE2XN2H\\_index\\_0.html](http://www.esa.int/esaSC/SEMBCE2XN2H_index_0.html)
- **Venus transit photograph from the ISS.** See what the transit looked like without Earth's meddling atmosphere in the way. <http://news.discovery.com/space/how-did-the-venus-transit-look-from-space-120607.html#mkcpgn=emnws1>
- **Peering into the dusty heart of Centaurus A.** <http://news.discovery.com/space/peering-into-the-dusty-heart-of-centaurus-a-120608.html#mkcpgn=emnws1>
- **How hard is it to land Curiosity on Mars?** See a podcast. <http://www.nasa.gov/multimedia/podcasting/jpl-mars20120607.html>

### Astronomy starter packs

**Rynhardt van Rooyen will offer some of these for sale at the meeting on 27 June.**

#### Contents:

- Starter CD with information and pictures on astronomy, spaceflight and sky watching. The CD contains printable sky maps for each season as well as free sky map and astronomy software.
- Handheld celestial planisphere.
- Red transparency filter for night vision use in flashlights.

#### Features:

- Ideal for beginners wishing to learn more about astronomy.
- Suitable for children requiring information and pictures for school projects.
- A handy educational resource for teachers and science facilitators.
- A step by step guide on how to start with stargazing outdoors. A valuable astronomy source for parents to share with their children.
- Language; English.
- Customized for use in Southern Africa.



**Transit of Venus 5 - 6 June 2012**

This photograph of the transit was taken by Kosma Koronaios, chairman of the Soutpansberg Astronomy Club. Place: Louis Trichardt. Date: 6 June 2012. Time: 06:44:31. Venus can be seen just grazing the solar limb at the 10 o'clock position. The next transit of Venus will be on 11 December 2117, when we shall all be gone..... (Photograph placed with his kind permission.)



**Pretoria Centre committee**

Chairman	Johan Smit	072 806 2939 [ Mobile ]	
Vice Chairman	Danie Barnardo	084 588 6668 [ Mobile ]	
Secretary	Tony Viljoen	072 247 6648 [ Mobile ]	012 654 5783 [ H ]
Newsletter Editor	Pierre Lourens	072 207 1403 [ Mobile ]	012 654 6366 [ H ]
Treasurer and			
Membership Secretary	Rynhardt van Rooyen	082 325 8745 [ Mobile ]	
Member	Michael Poll	074 473 4785 [ Mobile ]	
Librarian	Danie Barnardo	084 588 6668 [ Mobile ]	
Curator of Instruments	Johan Smit	072 806 2939 [ Mobile ]	
Public Relations Officer	Fred Oosthuizen	072 373 2865 [ Mobile ]	
Observing Director	Percy Jacobs	082 498 4680 [ Mobile ]	
Member	Bosman Olivier	082 883 1869 [ Mobile ]	
Member	Pat Kühn	082 895 5686 [ Mobile ]	
Member	Johan Hartmann	083 276 1323 [ Mobile ]	
Member	Hubrecht Ribbens	082 448 0633 [ Mo-	

