



The **PRETORIA CENTRE**

of the
Astronomical Society of Southern Africa

www.pretoria-astronomy.co.za

NEWSLETTER MAY 2015

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 May at 19h15.

Programme:

- **Beginner's Corner:** "The Rhus Keeti telescope" by Pierre Lourens.
- **What's Up?** by Percy Jacobs.
- 10 minute break — library will be open.
- **Main talk: "Bigger and bigger...." by Prof Ansie Harding.***
- Socializing over tea/coffee and biscuits.

The chairperson at the meeting will be Johan Smit.

* She is a professor of mathematics at UP. Expect a talk with mathematical content.

Next observing evening

Friday 22 May from sunset onwards at the Pretoria Centre Observatory, which is also situated at CBC. Turn left immediately after entering the main gate and follow the road.

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NOTICE BOARD

**Free State Winter Star Party
A Star Party in the warm heart of Central South Africa
12 – 16 June 2015**

On the farm Gansvlei close to Brandfort (13 km)
GPS Coordinates: 28°47'48.63"S 26°28'25.66"E

Highlights at the FS Star Party

- Observing and Astrophotography
- Deep-sky **Marathon**
- A visit to **Boyden Observatory** (Museum and old telescopes)
- A show in the **Digital Planetarium** on Naval Hill.
- 3 Astro Guest Speakers

http://assabfn.blogspot.com/p/blog-page_6.html

The Naval Hill Digital Planetarium in the heart of Bloemfontein

<http://www.ufs.ac.za/templates/news-archive-item?news=3935&cat=1>



**Summary of "What's Up?" to be presented on 27 May 2015
- by Percy Jacobs**

Phases of the Moon

- Dark Sky – 10th June to 20th June.
- First Quarter – 24th June – rises 00:00.
- Full Moon – 2nd June – rises 17.43.
- Last Quarter – 9th June – rises 00:00.
- New Moon – 16th June.

Planets

- Mercury (top of Taurus) – seen in the morning before sunrise in the East – 10:06:15, 06:15, 8° above horizon.
- Venus (below Cancer) – seen just after sunset in the West – 10:06:15, 17:45, 31° above horizon.
- Mars – cannot be seen – in line with the Sun.
- Jupiter (above Cancer) – seen after sunset in the West – 10:06:15, 20:20, 17° above horizon.





★ Saturn (top of Scorpius) – seen in the East – 10:06:15, 20:00, 50° above horizon
 ★ Uranus (Pisces) & Neptune (Aquarius) – seen in the East – 11:06:15, 03:10, Uranus
 ★ 11° & Neptune 50° above horizon. However, going to be a challenge considering
 ★ the last qrt moon in the same location.

★ **Events**

★ Groupings
 ★ 19th June – just after sunset - Crescent Moon, Venus & Jupiter, all in a
 ★ straight line rising above the horizon.

★ During the month of June, Venus & Jupiter, are seen as 2 bright “evening
 ★ stars” just after sunset in the west.

★ Winter Solstice – 21st June - marks the shortest day and the longest night of the
 ★ year.

★ Meteor Showers
 ★ θ Ophiuchids – 13th June – 20:00 to 05:30 - ~5/hr – favourable.
 ★ June Lyrids – 16th June – 23:30 to 02:00 - ~5/hr – favourable.

★ Seeing Jupiter & Venus at Noon during the day – 20th June.

★ Venus 5° away from the Moon, and Jupiter 8° away from the moon. Use binoculars.

★ NB - Do not look directly or in the general direction of the Sun with binoculars.

★ **Constellations – shall be discussed in more detail at meeting**

★ South

- ★ Southern Cross.
- ★ Pavo – the Peacock.
- ★ Centaurus – the Centaur.
- ★ Carina – the Ship’s Keel.
- ★ Vela – the Sail.

★ East

- ★ Scorpius – the Scorpion.
- ★ Ophiuchus – the Serpent Bearer.
- ★ Libra- the Weighing Scales.
- ★ Sagittarius – the Archer.

★ North

- ★ Virgo – the Virgin.
- ★ Bootes – the Herdsman.
- ★ Hercules – Roman hero. (Originally “Heracles”, one of the five sons (with human
 ★ mothers) of the Greek supreme god Zeus, residing on Mount Olympus.)
- ★ Leo – the Lion.

★ **Enjoy the month of viewing – clear skies are here.**

★ **Editor’s note:** This last remark of Percy reminds me of the song:

**Happy days are here again,
 the skies above are clear again
 let’s sing a song of cheer again,
 happy days are here again!**

★ Sing this song in your mind when you do sky watching this winter. Ω



Report for Observing Evening on April 17th 2015 - by Michael Poll & Johan Smit

Not many of us there – about a dozen people, four or five telescopes and Michael Moller's 25x100 binoculars. Perhaps people were put off by the fact that there had been total overcast grey cloud all day, which looked pretty static. Nevertheless, within a short space of time, it all cleared away at 6.00 pm, giving us one of the clearest nights we have had in while, so people missed out! One visitor was a Costaki, a youngster who showed great interest, and who told us that he is doing a project about light pollution.

Johan Smit helped John Maynier setting up his new telescope. John got a good deal on an 8 inch F5 Newtonian on a decent equatorial mount with a right ascension clock drive. It is the best compromise between a full go-to and manual mount. One will get used to using an equatorial mount! Hopefully starting under guidance at our practical evenings will speed up the learning process. In assisting John to find a telescope Johan, too, found a telescope and mount suitable for his astrophotography goals. It also is an 8 inch F5 on an equatorial mount which is sturdy enough for photography. Johan had to forsake his principle of building his own telescopes and not buying, but he paid for this one! Johan says that he is happy with the purchase and it may become one of his favourite viewing telescopes, especially after seeing how well it performed with his 50mm eyepiece. The combination of telescope and eyepiece provides 20 times magnification (less than the 25 x 100 mm binoculars!). Johan says that this combination will be a great tool for his enjoyment of viewing open clusters, and will provide another way to enjoy large areas of sky. Indeed, the whole Sword of Orion fitted into the field of view. As well as the well known Nebula (M42), the field also highlighted the almost totally neglected nebulosity of NGC1977 and the open cluster NGC 1981. These latter objects comprise the northern part of the Sword. These are fine objects in their own right, but how often do we highlight them?

Venus and Jupiter were our early targets. Venus is now showing a distinct gibbous phase. Jupiter's equatorial cloud belts were easily seen. There were only three moons on view - Europa was the missing one, it was being eclipsed by Jupiter. The other three moons were to the west of the planet, quite close in.

The April observing evening would be the last time we see Orion and its retinue for this viewing season, although we will still catch Canis Major in May. Aldebaran was low in the north west, just above Venus

In the north we pointed out the zodiacal constellations of Taurus, Gemini, Cancer, Leo and Virgo, including Spica, the brightest star in Virgo. We noted that Jupiter is now in Cancer. We revisited the double star Castor. In the south we pointed out the crosses – the Southern Cross, the Diamond Cross and the False Cross. We looked at the Jewel Box cluster (NGC 4755) with various instruments, including Michael M's binoculars, Omega Centauri (NGC 5139) with Johan's telescope, and IC 2602 (the Southern Pleiades) in Carina.

We also looked at Alpha Centauri. The two bright components of Alpha (Alpha A and Alpha B) have been closing up for the past few years, but can still be separated (in a 6 inch telescope on this occasion).

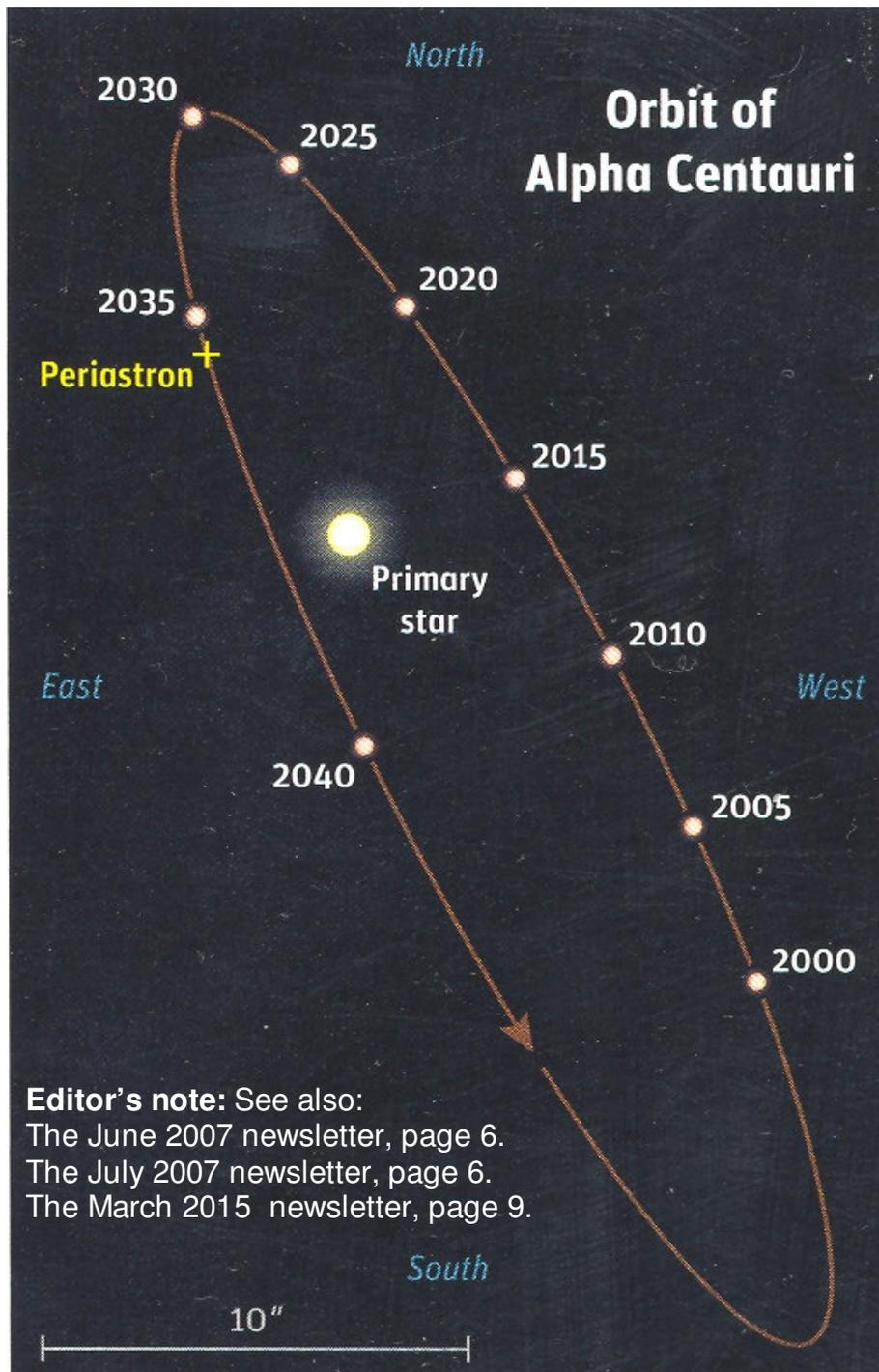
The period of Alpha Centauri B about Alpha Centauri A is 79.9 years. As viewed from Earth, A and B were last at their closest in 1957, and were at their widest in 1980, so have been closing ever since then. From our viewpoint, they have been closing to a close approach in late 2015, after which they will open up again until 2029. Thereafter they start closing again until November 2037, when they are at their closest possible as viewed from Earth.

When A and B are at their widest the stars are 21.8" (seconds of arc) apart, which is about half the average apparent diameter of Jupiter. By 2005 the separation was down to 10", and a minimum separation of 4.0" occurs late in 2015. From then onwards they open up again to 10.4" in mid 2029, and then they close up again until 2037, when they are at their minimum possible separation as viewed from Earth – at this time they will be 1.7" apart. Note that periastron (when they are closest together in space, which occurs in June 2035), does not coincide with the 2037 closest approach as viewed from Earth. (*See Diagram. Ref Sky & Telescope October 2005*).

George pointed out to Kostaki, in connection with light pollution, that Epsilon Crucis, (the “fifth star” in the Southern Cross, was magnitude 3.5 – we could just see it at this time. (The light pollution at our observing site is worst towards the south). We compared this with the four brightest stars of Corvus, which range from magnitudes 2.6 (Gamma) to 4.2 (Alpha). Beta Corvi is magnitude 2.7 and Delta is magnitude 3.0. The stars of Corvus were higher up, in the east, where the sky is a little darker at our observing site, and were fairly easy to see.

After about 9.00 a heavy dew came down, but we did get a quick look at a just-rising bit of sky that will be better placed next month – the head of Scorpius was in the south east, and there was Saturn, lying close to Beta Scorpii. Saturn’s rings are now very wide open - it is six years since they were edge on in 2009. The gap between the rings on each side of the planet was easily seen. In the telescope we showed Beta Scorpii, which is a show piece double of unequal components, and we compared the separation with that of Alpha Librae which is a very wide double. After packing up and then chatting for a while we left at 9.45 pm.

The next observing evening is on May 22nd 2015. Ω



Trumpler 14 - by Magda Streicher

Open clusters can truly be spectacular in their different shapes and sizes and at times can be overlooked in favour of more famous deep sky objects. Smaller open clusters with fewer stars can display a unique character, and in a way tells us a story due to the shape it displays. To my eye, some of the smaller clusters can be very pleasing to study. I would like to share a very unique little cluster in the constellation Carina with you. Carina, the ship's keel, is not only part of the Milky Way, but also consists of a crowd of deep sky objects and most of all, a collection of outstanding clusters.

In 1869 the evidence for the presence of a layer of obscuring material through the central plane of the Galaxy seemed overwhelming. The plotting of more than 4,000 irresolvable nebulae by John Herschel and Richard Proctor later proved to be spiral nebulae. Herber D. Curtis (1872-1942) argued in the 1920 'Great Debate' that spiral nebulae that were seen edge-on had at least a peripheral band of dark matter, and that such a band in our own Galaxy would explain why the spiral nebulae appeared to avoid the Milky Way. The observations that finally convinced astronomers were the result of patient work done by staff member Robert J. Trumpler (1886-1956) in 1930 at the Lick Observatory. (Cambridge Illustrated History Michael Hoskin).

Trumpler had for many years concentrated on the study of hundreds of open star clusters which are rather narrowly confined to the plane of the Milky Way, and of which the Hyades and the Pleiades are the nearest examples. He first grouped them into types characterized by the similar structures and similar shapes of their H-R diagrams. Trumpler knew that the dimensions of individual clusters must be quite small when compared with their distances from us. Clusters were placed in groups according to the degree of concentration and brightness. Trumpler 14 was specifically indicates a cluster with little concentration and stars of medium range brightness. It is also noted at 'p', which indicates a poor cluster with less than fifty stars. I just love the cluster



Trumpler 14 embedded like a embryo in the flimsy arms of the Great Carina Nebula just 12' NW of Eta Carinae. First impressions show the cluster hanging in the soft northern nebulosity of the Carina nebula. Its faint stars appear in curly strings which intervene with one another. The northern part seems to be brighter with a half moon, which protects the faint inner group of stars extending into the southern part of the cluster. Towards the western end of the cluster a bright pair of stars stakes a prominent place giving this dainty little cluster an elongated W-W impression. It is worthwhile taking another look at small fanciful clusters, which will leave a delightful impression. Ω

OBJECT	TYPE	RA	DEC	MAG	SIZE
Trumpler 14	Open Cluster	10h 43.9m	-59° 33'	5.5	5'

Basics: The ages of star clusters - by Pierre Lourens

The stars in a cluster are formed when dense clouds of gas and dust contract under gravity. The stars in it are formed at about the same time. They have a range of masses and therefore evolve differently.

Astronomers do computer calculations using mathematical models of the structure and evolution of stars and generate theoretical H-R diagrams for star clusters of different ages. For a cluster of zero age, the points representing stars lie on a curve that stretches from top left to bottom right in the diagram. This curve is termed the ZAMS (Zero Age Main Sequence).

They then determine the luminosities and temperatures of the stars in a cluster by observation. Their luminosities are plotted against their temperatures in a Hertzsprung-Russel (H-R) diagram.

As the the stars in the cluster age, they evolve. The stars whose representative points lie at the top left in the H-R diagram change first and become red giants. Their points move to the right in the diagram. As stars in the cluster age further, they evolve further. Stars of which the points lie lower down the ZAMS, start to become red giants too, and their points also move to the right. Go to the website at https://www.e-education.psu.edu/astro801/content/l7_p6.html By advancing the time in the figure there, you will see how the H-R diagram of a cluster of stars changes as the stars age and evolve. (You will also find more details about the topic of this article there.)

The position of the turnoff point from the ZAMS is a measure of the age of the cluster. Astronomers use the technique of **main sequence turn-off fitting** to estimate the age of star clusters. The theoretical H-R diagram that fits the observational H-R diagram best, yields the age of the cluster. The ages of a large number of star clusters in the Galaxy have been determined in this way.

Table 1. Open star clusters		
Catalogue designation of star cluster	Constellation	Age in millions of years
NGC 3324	Carina	5
NGC 3293	Carina	10
IC 2602	Carina	25
IC 2391	Vela	50
NGC 2516	Carina	100
IC 4756	Serpens	500
M 44	Cancer	750
NGC 2660	Vela	1000
M 67	Cancer	2500
NGC 2362 / τ Canis Majoris	Canis Major	8.2
NGC 2467	Puppis	12.7
NGC 4755 / Jewel Box	Crux	16.3
Mel 20 / α Persei	Perseus	71
NGC 6087	Norma	94
M45 / Pleiades	Taurus	135
M11 / NGC 6705	Scutum	200
NGC 6791	Lyra	4315

The open star clusters are found near the plane of the Galaxy. In **table 1** the ages of some open clusters are given. They are much younger than the globular clusters, which are found in an approximately spherical halo surrounding the Galaxy. The average age of the globular clusters in the Galaxy is about 11.5 billion years. In **table 2** on the next page the ages of some globular clusters are given.

The determination of the ages of stars is a great human achievement. Ω

Table 2. Globular clusters

Catalogue designation of star cluster	Constellation	Age in billions of years
NGC 4147	Coma Berenices	11.2 ± 0.8
NGC 5024	Coma Berenices	12.5 ± 1.3
NGC 5053	Coma Berenices	11.5 ± 1.1
NGC 5272	Canes Venatici	12.2 ± 1.1
NGC 5466	Bootes	13.4 ± 0.9
NGC 5904	Serpens	9.4 ± 0.1
NGC 6205	Hercules	12.7 ± 0.2
NGC 6341	Hercules	13.4 ± 0.9
NGC 7078	Pegasus	11.2 ± 0.9
NGC 7089	Aquarius	12.6 ± 0.3
Pal 5	Serpens	11.5 ± 0.7
IC 4499	Apus	12.0 ± 0.75

Sunrise

Sunrise seen from a semi desert on a planet around a star of spectral type G2. The planet is the third one from the star. The planet has a spin period of 24 hours and its orbital period is approximately 365¼ spin periods long. Two members of an intelligent species that has evolved on the planet, are barely visible just below the horizon in the centre. Static life forms attached to the soil, are dotted all over.

Photograph taken by Johan Moolman at the Karoo Star Party held at the Kambro padstal near Britstown in 2014. Ω



Noteworthy astronomy-related articles on the Internet

Solar system

- **Rosetta's comet really "blows up" in latest images.**
http://www.universetoday.com/118901/rosettas-comet-really-blows-up-in-latest-images/#at_pco=cod-1.0&at_si=552260ed5e17d0be&at_ab=per-12&at_pos=2&at_tot=8

Exoplanets

- **Kepler's Universe: more planets in our galaxy than stars.** Astronomers estimate that the Milky Way contains up to 400 billion stars and thanks to the Kepler mission, we can now estimate that every star in our galaxy has on average 1.6 planets in orbit around it. See a very interesting video clip. http://www.universetoday.com/109551/keplers-universe-more-planets-in-our-galaxy-than-stars/#at_pco=cod-1.0&at_si=552261e1a4954d59&at_ab=per-12&at_pos=1&at_tot=8

Applications of Earth-orbiting artificial satellites

- **Satellites make a load of difference to bridge safety.** When extreme weather comes our way, real-time information from space can help us to decide if closing a bridge is the right thing to do. http://www.esa.int/Our_Activities/Telecommunications_Integrated_Applications/Satellites_make_a_load_of_difference_to_bridge_safety
- **Nepal earthquake on the radar.** On 25 April, a 7.8-magnitude earthquake struck Nepal, claiming over 5000 lives and affecting millions of people. Satellite images are being used to support emergency aid organisations, while geo-scientists are using satellite measurements to analyse the effects of the earthquake on the land. http://www.esa.int/Our_Activities/Observing_the_Earth/Copernicus/Sentinel-1/Nepal_earthquake_on_the_radar

Extragalactic astronomy

- **Hubble finds giant halo around the Andromeda galaxy.** If you could see the huge bubble of hot, diffuse plasma surrounding the Andromeda galaxy, it would appear 100 times the angular diameter of the full Moon! The gargantuan halo is estimated to contain half the mass of the stars in the Andromeda galaxy itself. <http://hubblesite.org/newscenter/archive/releases/2015/15/>
- **Astronomers set a new galaxy distance record.** An international team of astronomers has discovered an exceptionally luminous galaxy more than 13 billion light-years away from Earth using the combined data from NASA's HST and Spitzer space telescopes, and the Keck I 10-meter telescope. These observations confirmed it to be the most distant galaxy ever measured, setting a new record. <http://hubblesite.org/newscenter/archive/releases/2015/22/>
- **Our Sun came late to the Milky Way's star-birth party.** Our Sun missed the stellar "baby boom" that erupted in our young Milky Way galaxy 10 billion years ago. But our Sun was a late "boomer," arising 5 billion years later, when star birth had plunged to a trickle. <http://hubblesite.org/newscenter/archive/releases/2015/11/>

Cosmology

- **Goodbye Big Bang, hello Black Hole? A new theory of the Universe's creation.**
http://www.universetoday.com/104863/goodbye-big-bang-hello-hyper-black-hole-a-new-theory-on-universes-creation/#at_pco=cod-1.0&at_si=55225da6925acc21&at_ab=per-12&at_pos=5&at_tot=8
- **How can space travel faster than the speed of light?**
http://www.universetoday.com/119068/how-can-space-travel-faster-than-the-speed-of-light/#at_pco=cod-1.0&at_si=55225f0d8c58a818&at_ab=per-12&at_pos=3&at_tot=8

Star trails around the SCP (**Southern Celestial Pole**). The SCP lies in the dim constellation Octans, the Octant. The Earth's spin axis points towards the SCP. The star named Sigma Octantis is identified as the South Star. Its current declination is $-88^{\circ} 57' 23''$, which means that it is currently just over one degree away from the SCP. Its counterpart in the Northern Hemisphere is Polaris, the current North Star. Sigma Octantis has an apparent magnitude of +5.42, which makes it barely visible to the naked eye, and therefore not useful for navigational purposes. This is unlike the much brighter Polaris, which has apparent magnitude +1.97 (variable). Recall that the elevation angle of the Celestial Pole = the latitude of the observer. This time exposure was made by Johan Moolman at the Karoo Star Party held at the Kambro padstal near Britstown in 2014. Ω



Pretoria Centre committee

★ Chairman	Bosman Olivier	082 883 1869
★ Vice Chairman	Pat Kühn	082 895 5686
★ Secretary	Tony Viljoen	072 247 6648
★ Newsletter Editor	Pierre Lourens	072 207 1403
★ Member	Michael Poll	074 473 4785
★ Librarian and		
★ Webmaster	Danie Barnardo	084 588 6668
★ Curator of Instruments	Johan Smit	072 806 2939
★ Public Relations Officer	Fred Oosthuizen	072 373 2865
★ Observing Coordinator	Percy Jacobs	082 498 4680
★ Treasurer and		
★ Membership Secretary	Michelle Ferreira	073 173 0168

Old newsletters: All old newsletters from January 2004 onward are on our website. They contain a record of our Centre's activities as well as astronomical information.

Database: Members are reminded that a database of the books in our library is to be found on our website. The database was created by Danie Barnardo, one of our committee members.