



The PRETORIA CENTRE

of the

Astronomical Society of Southern Africa

www.pretoria-astronomy.co.za

NEWSLETTER JANUARY 2014

Next meeting

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

Date and time: Wednesday 22 January at 19h15.

Programme:

- **Beginner's Corner:** "Spectroscopy" by Percy Jacobs.
- **What's Up?** by Percy Jacobs.
- 10 minute break — library will be open.
- **Main talk: "Periscope making" by Kobus Viljoen.**
- Socializing over tea/coffee and biscuits.

The chairperson at the meeting will be Danie Barnardo.

Next observing evening

Friday 17 January 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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Pretoria Centre observing evening report Friday 22 November 2013 by Michael Poll

Quite a clear evening early on, the sky quite transparent, but come clouds came over later. We did get a look at quite a few objects, particularly in our northern sky. However, first off we looked at Venus, which was showing its crescent phase, having been at greatest elongation, and therefore half phase, on November 1st.

In the early evenings of November we get our best view of the Square of Pegasus, and nearby constellations, for example Andromeda, Aries and Triangulum (i.e the *northern* triangle). We noted the fact that the western side of the Square points to the bright star Fomalhaut, and the eastern side points to Beta Ceti, also known as Diphda and Deneb Kaitos. These latter stars pass almost overhead at our latitude.

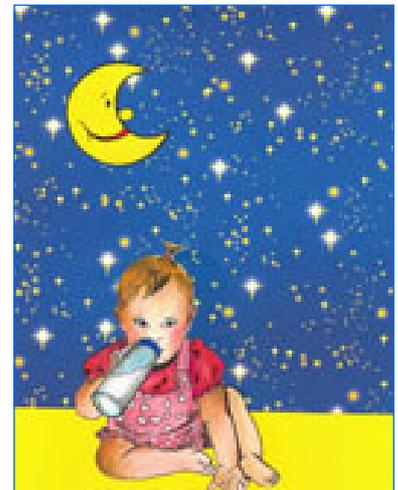
The Andromeda Galaxy (M31, NGC 224) was quite easy, but we also managed to spot one of the satellite galaxies of Andromeda in Michael's 6-inch reflector – the sky was that clear. Not quite sure which satellite galaxy it was – M32 (NGC 221) or M110 (NGC 205)? Much lower down in the north east we could see Gamma Andromedae, which is a lovely pair of stars, not quite equal in brightness and of contrasting colours. This star is probably too low down for observers further south of Pretoria, but for northern hemisphere observers it is a showpiece double.

Also seen in these northern parts was the very pretty globular cluster M15 (NGC7078), in Pegasus, which lies in an equally pretty star field. The cluster is on a line drawn from Theta to Epsilon Pegasi, and then the line is continued the same distance further on from Epsilon. Epsilon Pegasi is also known as Enif, which means “nose” and it represents the nose of the flying horse, Pegasus.

Still in the north, we looked at Aries, and in particular, Gamma Arietis, which is a nice easy double. The two components are of equal brightness. Michael calls them “The Owl's Eyes”. In the north west we noted the Pleiades well up, the sight of these stars tells us that Orion and his retinue were not far behind, and in fact later on we looked at M32, the nebula in Orion's Sword.

In the south, the bright stars Alpha Pavonis, Achernar and Canopus were pointed out, and telescopically we looked one of our very favourites, the globular cluster 47 Tucanae.

The next observing evening is on Friday January 17th. Ω



Chairman's Report for the monthly meeting of 27 November 2013 by Bosman Olivier

Attendance was good and included several visitors, who received the customary warm welcome. 2014 Sky guides were made available to paid up members by Rynhardt.

What's Up? was presented by Michael Poll and included an overview for both the months of December and January. Sunspot activity is low presently, with the current cycle reported to be the weakest for many years. Venus is particularly high in altitude, due to the orientation of the ecliptic at the moment, and the fact that Venus is at its furthest Southerly declination. Also interesting is the fact that for our location, the milky way runs around close to the horizon at the present time. Michael also highlighted several formations and objects making for interesting viewing during the coming two months.

The first talk of the evening was "The Hertzsprung-Russel diagram", presented by Johan Smit. Commonly known as the H-R Diagram, this extremely useful graphical representation of the relationship between Spectral type and Absolute magnitude of stars was developed between 1910-1913. Johan explained that the spectral type of the star can also be seen as a proxy for Temperature, Colour or Wavelength. Absolute magnitude is in turn a measure of luminosity. The most important vital statistic of a star is its mass, since this affects all its other characteristics, including its lifespan. When various stars are plotted on the H-R diagram, it is found that all stars which are in the stable portion of their evolution lie in a well defined band called the Main Sequence, with large bright stars toward the upper left and smaller cooler types toward the bottom right. Stars that deviate from this sequence are in the final stages of their evolution. Johan gave an interesting interpretation of the open and globular clusters in terms of the H-R diagram and ended with a computer animation of the trajectory of stars along the diagram during their lifetime.

We were fortunate to have Dr Henry Throop give a fascinating main talk entitled "**NASA's New Horizons Mission to Pluto**". Henry is well known to the Pretoria Centre and apart from his many activities, awards and accolades; he has been working with NASA on the New Horizons mission since 2003. He is currently also a Senior Lecturer at the University of Pretoria. Although Pluto was discovered in 1930, not a lot is known about it, apart from being far (40AU), cold (-250deg C), small (2300 km diameter) and old (4.5 billion yrs). It is comprised of ice and rock and has a very thin atmosphere. It is conjectured that the surface is rather flat and featureless with very little weather, although probably heavily marked with impact craters. It is considered interesting to study because the surface is the oldest in the solar system. Up to now no clear images of its surface have been possible.

However, all this will change as NASA's New Horizons Mission, launched in 2006, is scheduled to fly by Pluto in 2015 at a distance of some 10 000 km. It is equipped with an 8" aperture telescope and an array of sensors, including visual, IR and UV imagers, as well as a dust counter and solar wind meter. The mission was launched from Cape Kennedy aboard an Atlas V Rocket. Some interesting statistics are: rocket weight 575000 kg and spacecraft weight 487kg to propel an instrument weighing just 20 kg! The fastest spacecraft to date, it reached moon distance in just 4 hrs, compared to the 96 hrs of the Apollo II. The mission flew past Jupiter in 2007 and the IR camera captured images of volcanoes on Jupiter's moon Io. Using gravity assist the spacecraft will slingshot on at speeds of 40 000 km/hr, to reach Pluto by July 2015. The image resolution will exceed that of Hubble while still 6 months from Pluto improving further during the approach. Most of the data will be collected in the space of 1 week as it encounters Pluto. Radio signals will take 4 hrs to reach Earth and all data will be transmitted over a period of 2 months. The spacecraft will continue to reach the Kuiper belt by 2016 or 2017.

For those wishing to know more, here is a useful link: http://en.wikipedia.org/wiki/New_Horizons Ω

Summary of "What's Up?" for February 2014 to be presented on Wednesday 22 January - by Percy Jacobs

Phases of the Moon

Dark Sky:

1st & 2nd week of Feb (1st to 8th Feb & 21st to 28th Feb)

Viewing evening – Friday 21st Feb – moon rises at 22:50 – nice Dark Sky viewing

New Moon – not in month of Feb

First Quarter – 6th Feb – sets at 23:30

Full Moon – 15th Feb

Last Quarter – 22nd Feb – rises at 23:30

Planets

Mercury – 1st half of Feb - seen just after sunset in the West at about 10° above horizon

2nd half of Feb – seen just before sunrise in the East at about 15° above horizon

Venus – seen in the morning a few hrs before sun rise in the East

Mars – rises about 3hrs after sunset, in the East, and brightens throughout the month

Jupiter – seen in the North East, at about 40° above horizon, and sets at about 01:30

Saturn – rises at about midnight, in the East for the month

Uranus & Neptune – sets early in the evening in the West

Events

General

Days are getting shorter as the Sun moves northwards

Saturn occults the Moon on the 21st, at about 23:05, but too low on horizon for us to view the reappearance

Using your Sky Guide, take a look at the "real time" occultations & transits of Jupiter's Moons

α Centaurids – peak on 7th Feb – approx. 5/hr – from 22:00 onwards in "Centaurus" – north east at approx. 40° above horizon

Constellations – shall be discussed in more detail at meeting

South - Centaurus - "The Centaur – half horse half man"

Vela - "Sail of the Ship"

Carina - "Keel of the Ship"

Crux - "Southern Cross"

East - Crater - "The Cup"

Corvus - "The Crow"

Leo - "The Lion"

Hydra - "The Serpent or Water Snake"

North - Gemini - "The Twins"

Auriga - "The Charioteer"

Tauris - "The Bull"

Canis Major - "Orion's Hunting Dog" Ω

Monthly Observing Challenge - by Percy Jacobs

Observations to be emailed to Percy Jacobs at percymj@iafrica.com) by no later than the 21st Feb. Observations must be submitted on the official Observation Recording Sheet available on the Web Site or from Percy Jacobs. Photo's may be attached to Observing sheet. Submitted Observations shall be shown at the Feb monthly meeting. A R100 Voucher, to spend at Eridanus Optics, shall be awarded to the best observation submitted.

Observing Target: The occultation or transit of any one of Jupiter's moons

- Record the duration
- Record the direction
- Record which of Jupiter's Moons
- Record date & time
- Record any other interesting detail noted Ω

“ASSA Top 100” Observers

1	George Dehlen	100
2	Percy Jacobs	100
3	Louis Kloke	100
4	Michael Moller	100
5	Michael Poll	40
6	Craig Kloke	23
7	Pat Kühn	22
8	Grant Thompson	20
9	Andre de la Ponte	6
10	Graham Low	4
11	Bosman Olivier	2
12	Albie Lombard	1

Total: 518 observations so far



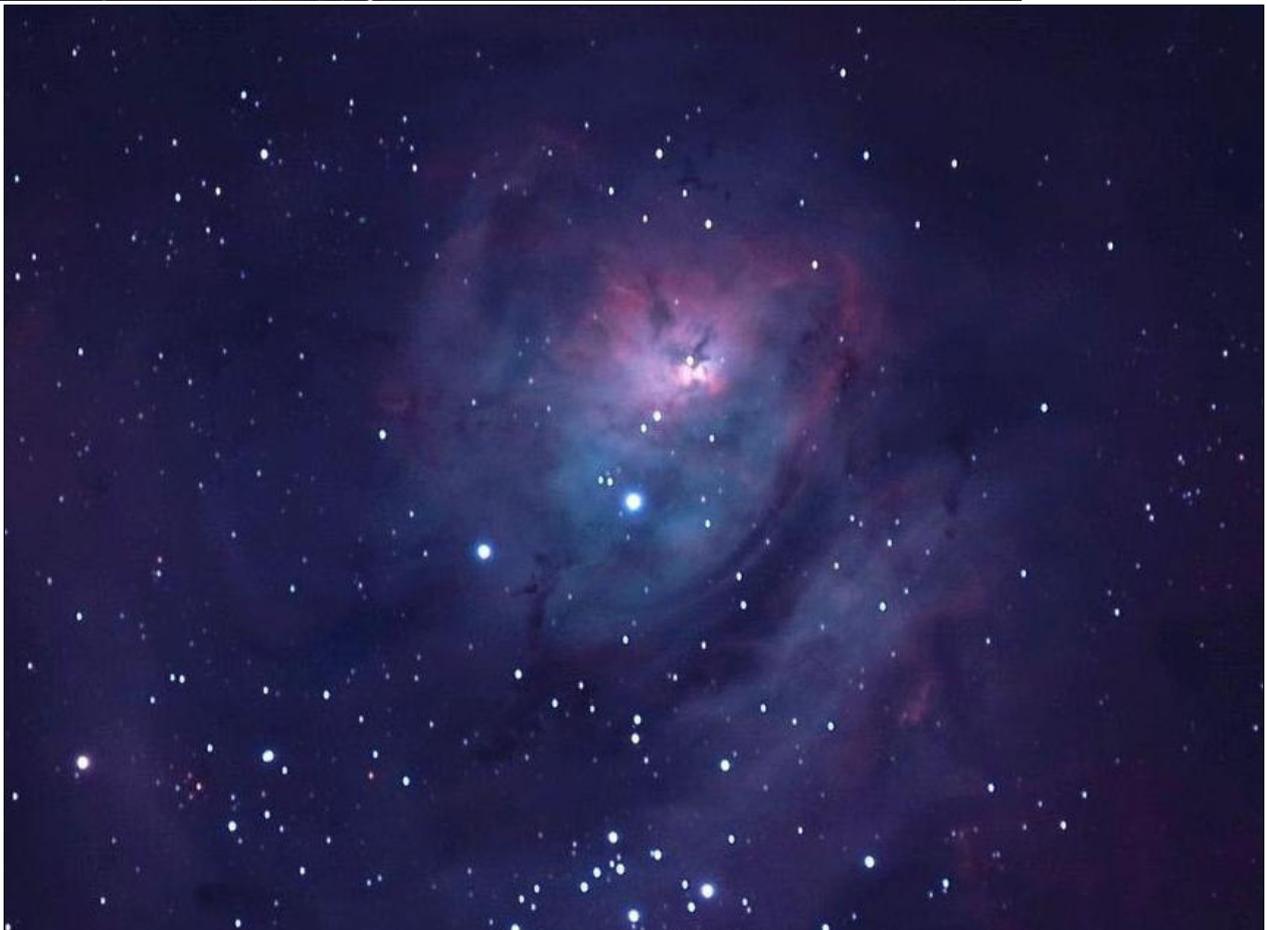
The picture shows a “Mars box of delights” that has been engineered to house the most scientifically valuable cargo imaginable: samples brought back from Mars. But a Mars sample-return mission is still many years in the future and will most likely be international in nature. http://www.esa.int/Our_Activities/Space_Engineering/Martian_box_of_delights Ω

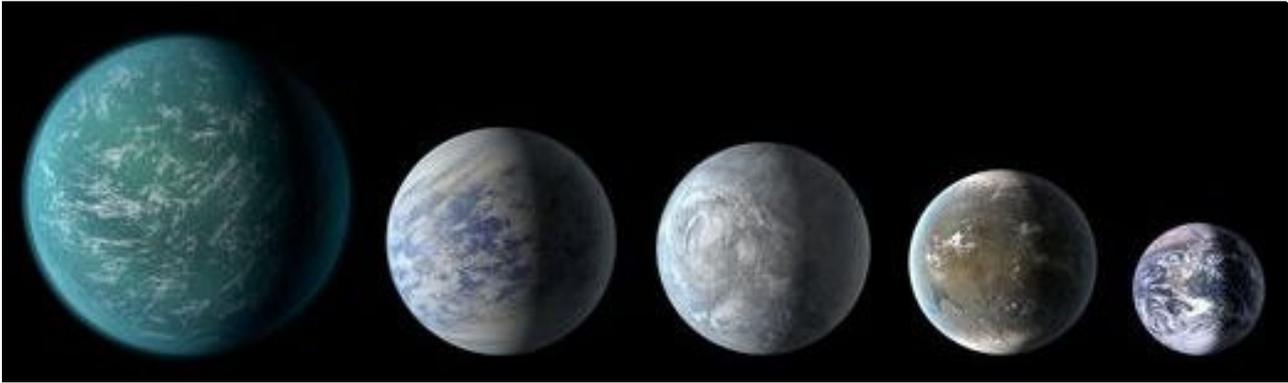


Left: A photograph of the **Lagoon Nebula** (aka **M8** and **NGC 6523**). It is located in the southern constellation Sagittarius and is estimated to be between 4000 and 6000 light years away. It is about 110X50 light years in size. http://en.wikipedia.org/wiki/Lagoon_Nebula

Bottom: A photograph of the central part of the nebula with greater magnification.

Photographs taken by Johan Moolman.





Earth-like worlds "very common". Astronomers estimate that 22 percent of Sun-like stars may be orbited by small, rocky planets that reside within so-called habitable zones, where they receive Earth-like levels of sunlight. Shown are the relative sizes of all such planets discovered to date alongside Earth. Left to right: Kepler-22b, Kepler-69c, Kepler-62e, Kepler-62f and Earth (except for Earth, these are artists' renditions). Ω

<http://news.nationalgeographic.com/news/2013/131104-nasa-kepler-earth-habitable-exoplanets/>

Video clips and photos

When ice meets fire. Comet ISON's nail-biting encounter with the Sun on 27 - 30 Nov 2013. See video clips recorded from SOHO. http://spaceinvideos.esa.int/Videos/2013/11/ISON_inbound

The star photographers who captured the night sky. See prize-winning astrophotos. <http://www.newscientist.com/gallery/apoty2010>

Virtual tour. Make a virtual journey from the centre to the outskirts of the Milky Way. http://spaceinvideos.esa.int/Videos/2013/11/Guide_to_our_Galaxy

Phobos 360. See a 360° view of Phobos, one of the moons of Mars, in this video clip. http://spaceinvideos.esa.int/Videos/2013/12/Phobos_360

Virtual tour. Do a 3D virtual tour of the International Space Station. <http://www.youtube.com/watch?v=bOSHE4fXbCA>

HST watches super star create holiday light show. The luminous Cepheid variable star RS Puppis is swaddled in a gossamer cocoon of reflective dust illuminated by the star as it rhythmically brightens and dims over a six-week cycle. See a video clip of the light echoes from the cocoon of dust. <http://hubblesite.org/newscenter/archive/releases/2013/51/>

Mars 360. See the Martian north pole from all angles in this new movie from ESA's Mars Express. http://spaceinvideos.esa.int/Videos/2013/12/Mars_360_the_north_pole

Cosmic hotshots from Keck Observatory: photos.

<http://news.discovery.com/space/astronomy/cosmic-hotshots-keck-week-130312.htm>

NASA's Cassini spacecraft obtains best views of Saturn hexagon. See colourful movies recorded from NASA's Cassini spacecraft. These are the highest-resolution views of the unique six-sided jet stream at Saturn's north pole known as "the hexagon."

<http://www.jpl.nasa.gov/news/news.php?release=2013-350>

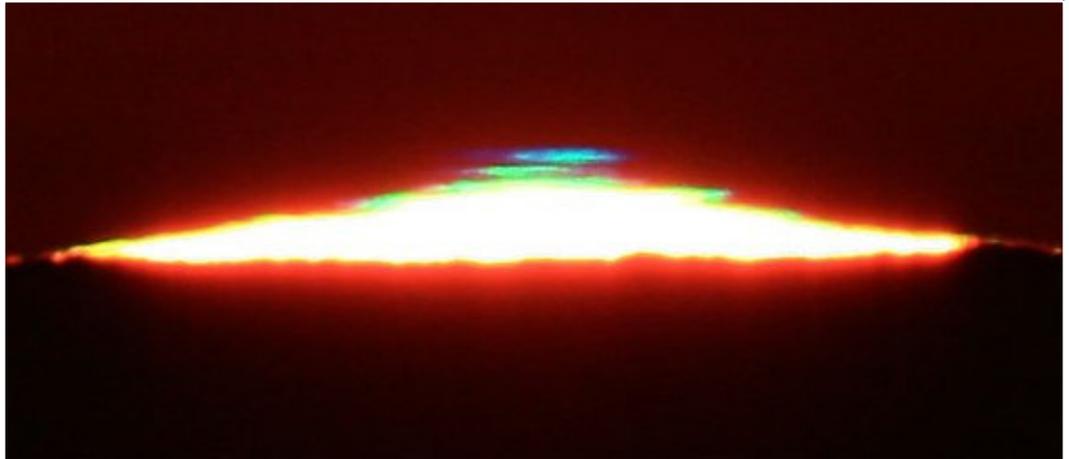
Basics: The green flash - by Pierre Lourens

This is a phenomenon purely due to the fact that the amount of atmospheric refraction of sunlight depends on the wavelength of the light being refracted. It is normally seen for a few seconds as the last remnant of the setting / rising Sun vanishes / appears below / above the horizon. During the last / first seconds of visibility, the colour of the Sun is suddenly a vivid green.

The duration of the phenomenon increases with increasing latitude, i.e., as the angle of descent of the Sun decreases, and it can even last for minutes in the polar regions.

A green flash is more likely to be seen in stable, clear air, when more of the light from the setting sun reaches the observer without being scattered by particles in the atmosphere. It is seen most frequently during the summer months when the sky is very clear and the horizon well defined over the sea. Cool weather and the absence of a red sky tend to favour production of the flash. The image shows green and blue flashes. See a movie at <http://apod.nasa.gov/apod/ap070129.html>

It is a considerable challenge to record an image of it with a camera. I invite those members who are astrophotographers to try and do it and send the image to me for the newsletter. For instructions on how to do it, see



<http://www.wikihow.com/See-the-Green-Flash> Ω

NOTICE BOARD

2014 highlights in astronomy.

<http://assa.sao.ac.za/>

ESA highlights 2013.

http://www.esa.int/esatv/Videos/2013/12/Highlights_2013

Collimating system for binoculars.

Johan Smit is developing a system to collimate the two tubes of a pair of binoculars. To do it on his system will be a two-step procedure. In the first step, the two tubes will be collimated approximately. In the second step, the fine adjustment will be done to obtain very accurate collimation.

When he has perfected his system and the procedure, he will give us a talk about it at one of our monthly meetings.

NASA highlights 2013.

<http://www.nasa.gov/content/this-year-nasa-december-20-2013/>

Our chairman, Bosman Olivier, is in hospital. You can enquire about his well-being and wish him well at 082 883 1869.

Noteworthy items

Solar system

- **Six-tailed asteroid.** This HST set of images reveals a never-before-seen set of six comet-like tails radiating from a body in the asteroid belt. <http://www.nasa.gov/press/2013/november/nasas-hubble-sees-asteroid-spouting-six-comet-like-tails/>
- **Rosetta.** On 20 January, after 957 days of hibernation in deep space, ESA's comet-chasing Rosetta spacecraft is set to wake up automatically en route to the destination it has been travelling towards for nearly a decade. http://www.esa.int/Our_Activities/Space_Science/Rosetta/Background_briefing_Rosetta_wake_up_and_year_ahead
- **HST sees evidence of water vapor venting off Jovian moon Europa.** <http://www.nasa.gov/press/2013/december/hubble-space-telescope-sees-evidence-of-water-vapor-venting-off-jovian-moon/>

Exoplanets

- **HST traces subtle signals of water on hazy worlds.** Using the powerful eye of NASA's Hubble Space Telescope, two teams of scientists have found faint signatures of water in the atmospheres of five exoplanets. <http://www.nasa.gov/press/2013/december/hubble-traces-subtle-signals-of-water-on-hazy-worlds/>
- **Seven-planet solar system found.** The system bears some similarities to our own, but all seven planets orbit much closer to their host star. <http://www.bbc.co.uk/news/science-environment-24642603>

Our Galaxy

- **Black hole boasts heavyweight jets.** Astronomers discovered highly ionized nuclei of two heavy elements, iron and nickel, in the polar jets of a stellar-mass black hole. http://www.esa.int/Our_Activities/Space_Science/Black_hole_boasts_heavyweight_jets
- **Evidence of jet in Milky Way's black hole.** Astronomers have found strong evidence that Sagittarius A* (Sgr A*), the supermassive black hole at the center of the Milky Way, is producing a jet of high-energy particles. They found it in results from the Chandra X-ray Observatory and the Very Large Array radio telescope. <http://www.nasa.gov/press/2013/november/nasas-chandra-helps-confirm-evidence-of-jet-in-milky-ways-black-hole/>
- **Gaia enters its operational orbit.** The spacecraft Gaia was finally launched in late December 2013 and is now in its operational orbit around Lagrangian point L2, 1.5 million km from Earth. http://www.esa.int/Our_Activities/Space_Science/Gaia/Gaia_enters_its_operational_orbit

Space technology

- **NASA developing legs for space station's Robonaut 2.** NASA engineers are developing climbing legs for the International Space Station's robotic crew member Robonaut 2 (R2), marking another milestone in space humanoid robotics. <http://www.nasa.gov/press/2013/december/nasa-developing-legs-for-space-stations-robot-2/>
- **Gaia's technology.** New video highlights the engineering innovations enabling the precision stellar mapping of ESA's Gaia mission. http://www.esa.int/esatv/Videos/2013/11/Gaia_technology

Cosmology

- **Most distant gravitational lens helps weigh galaxies and deepens a galactic mystery.** The most distant gravitational lens yet has been found. It provides a rare opportunity to directly measure the mass of an even more distant galaxy. But these lenses should be rare. So why have astronomers found so many? <http://hubblesite.org/newscenter/archive/releases/2013/48/>
- **NASA's great observatories begin deepest ever probe of the Universe.** NASA's Hubble

(UV through IR (115 - 2500 nanometers)), Spitzer (IR) and Chandra (X-ray region) space telescopes are teaming up to look deeper into the Universe than ever before. Exploiting a natural phenomenon known as gravitational lensing, they should be able to uncover galaxies that are as much as 100 times fainter than what these three great observatories typically can see.

<http://www.nasa.gov/press/2013/october/nasas-great-observatories-begin-deepest-ever-probe-of-the-universe/>

- **Astronomers discover the most distant galaxy yet.** It is 13.1 billion light-years from Earth. This is a lower limit to the size of the observable Universe.

<http://news.nationalgeographic.com/news/astronomers-discover-the-most-distant-galaxy-yet/>

Exobiology

- **The first aliens we discover may be purple.** In our quest to discover strange new life on strange new worlds, a group of astronomers has modeled potential alien worlds using Earth's biological history as a framework. <http://news.discovery.com/space/alien-life-exoplanets/the-first-aliens-we-discover-may-be-purple-131114.htm>

Applications of artificial satellites

- **Mapping the world's largest coral reef.** Scientists have used satellite observations to create a set of high-resolution 3D maps of the entire Great Barrier Reef – a critical step towards identifying, managing and protecting what lies beneath the waters. http://www.esa.int/Our_Activities/Observing_the_Earth/Copernicus/Mapping_the_world_s_largest_coral_reef
- **Proba-V data ready for use.** The Proba-V miniaturized satellite is designed to map land cover and vegetation growth across the entire planet every two days at a resolution of 330 m. "We are anticipating that with the data from Proba-V the user community will be able to answer questions related to the state of global vegetation and its dynamic changes in a seasonal context," said the Proba-V Mission Manager.

http://www.esa.int/Our_Activities/Observing_the_Earth/Proba-V/Proba-V_data_ready_for_use

Feature of the month: IC1101 - by Pierre Lourens



IC1101 is a supergiant elliptical galaxy at the centre of the galaxy cluster Abell 2029. The galaxy has a diameter of approximately **6 million light years** (60 times that of the Milky Way), which makes it the largest known galaxy. It contains a mass (mostly elusive dark matter) equal to that of 100 trillion (10^{14}) stars. See an excellent video clip at

<http://www.youtube.com/watch?v=UE8yHySiJ4A> Ω

Truck driver builds world's largest amateur telescope using 900 pound mirror originally meant for Cold War spy satellite. The primary mirror is 70 inches in diameter, the black metal structure itself stands about 35 feet tall, supporting a secondary mirror that is 29 inches in diameter. http://www.dailymail.co.uk/news/article-2487485/Utah-truckdriver-builds-worlds-largest-amateur-telescope.html?ITO=1490&ns_mchannel=rss&ns_campaign=1490 Ω

Partial eclipse 3rd Nov 2013
Louis Trichardt SA

Photograph taken by Kos Coronaios, chairman of the Soutpansberg Astronomy Club. Placed with his kind permission.



Kos Coronaios

Pretoria Centre committee

Chairman	Bosman Olivier	082 883 1869
Vice Chairman	Pat Kühn	082 895 5686
Secretary	Michelle Ferreira	073 173 0168
Newsletter Editor	Pierre Lourens	072 207 1403
Treasurer and Membership Secretary	Rynhardt van Rooyen	082 325 8745
Assistant Treasurer	Michelle Ferreira	073 173 0168
Librarian	Danie Barnardo	084 588 6668
Assistant Librarian	Pat Kühn	082 895 5686
Curator of Instruments	Johan Smit	072 806 2939
Public Relations Officer	Fred Oosthuizen	072 373 2865
Observing Coordinator	Percy Jacobs	082 498 4680
Webmaster	Danie Barnardo	084 588 6668
Member	Michael Poll	074 473 4785
Member	Tony Viljoen	072 247 6648

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.