



The PRETORIA CENTRE

of the

Astronomical Society of Southern Africa

www.pretoria-astronomy.co.za

NEWSLETTER JANUARY 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 25 January at 19h15.

Programme:

- **Beginner's Corner:** "The colour of stars" by Johan Smit.
- **What's Up:** by Danie Barnardo.
- 10 minute break — library will be open.
- **Main talk: "3D photography"**
by **Michael Robins**
- Socializing over tea/coffee and biscuits.

The chairperson at the meeting will be Percy Jacobs.

Next observing evening: Friday 20 January 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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Last month's meeting - by Danie Barnardo

The members and some visitors were welcomed to the last meeting of 2011.

Michael Poll presented the Beginners Corner, relating the life cycle of stars in his usual interesting fashion. The presentation showed that he put a lot of research into the subject and he entertained the meeting with very interesting illustrations explaining the different types of stars and the influence that the mass of a star has on its life history. He ended the presentation with an explanation of Sun and Moon eclipses.

Johan Smit presented the outlook for observing during December 2011 and January 2012 in his usual entertaining way. He provided a useful list of objects from the Bennet catalogue that will be visible during this period. A summary of his talk appears in the November 2011 issue of the Pretoria Centre Newsletter.

During the break the library was open and was visited by quite a number of interested members. It is noteworthy that the library is becoming more and more popular and members are using it to great effect to increase their knowledge and pursuing their interests.

Before the main talk, Pat Kühn gauged the interest of members in good quality fleece jackets with the Centre's emblem for winter nights. The interest proved to be quite good and Pat concluded that he will ask for orders at the first meeting in the New Year, when he will have prizes available.

The main talk was presented by Barbara Cunow, a member of the Pretoria Centre and our own professional astronomer. She gave a very thorough account of her endeavours during many years and her final success in photographing all 88 constellations – a very noteworthy achievement indeed! The title of her talk was: "*Astrophotography: My DSLR, my tripod and me*".

As indicated by the title of the talk, all her photographs were taken using only a Digital Single Lens Reflex (DSLR) camera on a tripod. No tracking system was used and therefore she could use only a maximum exposure of about 10 seconds. Moreover, most of her pictures were taken in Erasmuskloof in Pretoria, with associated rather bad light pollution. However, she pointed out that the star signal were the same in Pretoria than in Sutherland – it is only the light pollution that makes the difference. Which means that, with the right techniques, a good photograph can be obtained in a high light-polluted area. A large number of high-quality photographs substantiated her claim. Of course, she could not see all 88 constellations from Pretoria – the Northern constellations were imaged from her parent's home in Germany.

The bulk of her talk was spent to explain how she overcame this problem – basically it boils down to taking lots of exposures of the same subject, stacking these images and subtracting a sky image from this. The crucial element of this solution is to obtain a good sky image for subtraction. She uses the free software product "*Regim*" to achieve her final results. *Regim* was written by Andreas Rörig, a German amateur astronomer and it can be downloaded from http://www.andreasroerig.de/regim/regim_e.htm.

To create the sky image, she uses *Photoshop* and a simple and as put it "crude" method that works very well. The "*Gaussian Blur*" and "*Median*" functions are used for images without large extended objects and for images with large extended objects the "*Gaussian Blur*" function is used more than once until the extended object disappears. The resulting sky image is then subtracted from the stacked images to create the final image. She also indicated that she does not use dark images, since stacking takes care of the noise generated by the camera's sensor. To conclude, Barbara showed us quite a selection of her photographs and gave the technical specification of her equipment:

Focal length: 18-55 mm

Exposure times of individual images: 10s

Series of 10 or 20 images, sometimes 30

Total exposure times: 100 ... 300 seconds

High ISO numbers: mostly 1600 or 3200

Use a diffuser filter (A820 from Cokin) for creating "bigger" stars

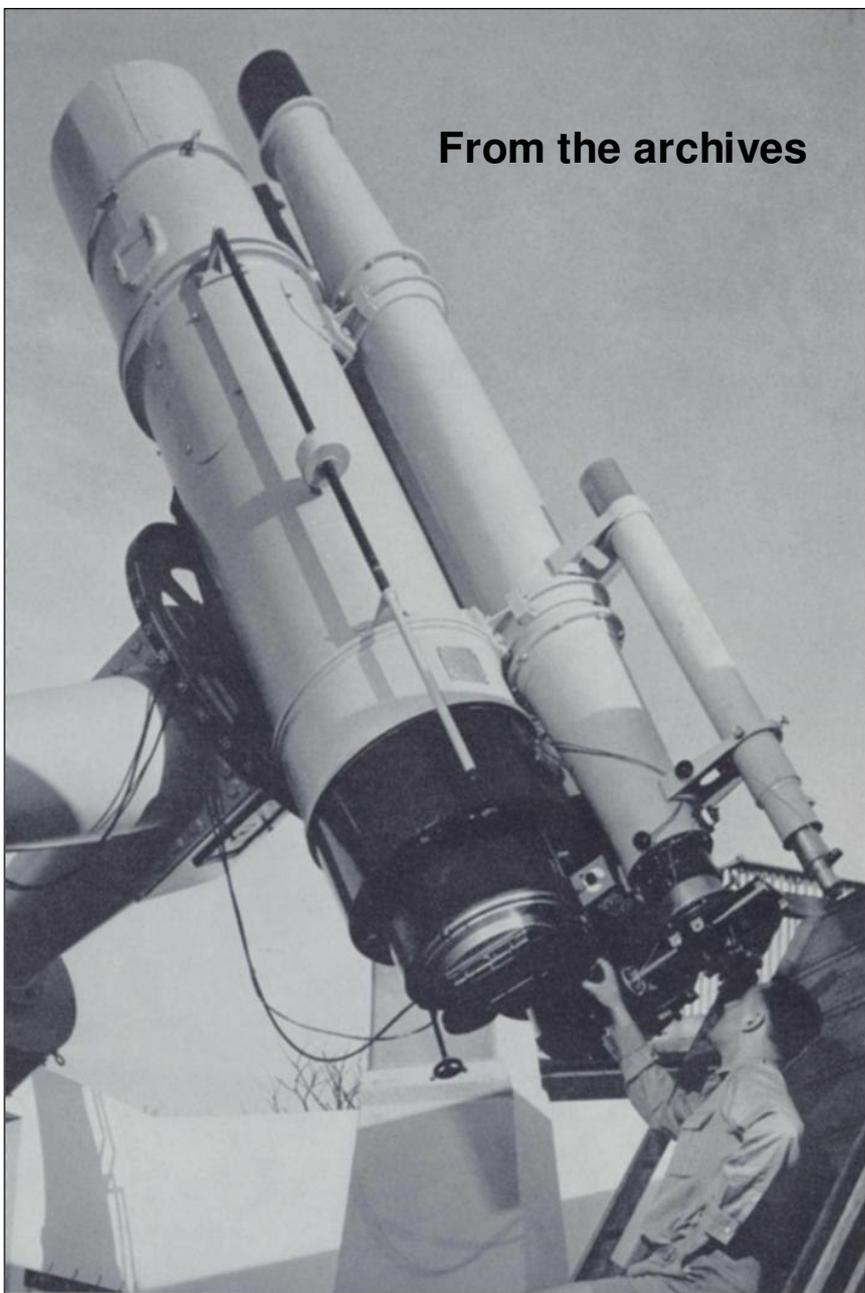
DSLR has been modified to show emission nebulae.

The latter point was explained and boils down to the removal of the standard red-limiting filter fitted to all DSLR cameras and replacing it with a filter that permits the red light from reaching the camera's sensor. She summarized her achievements as follows:

- Faintest objects recorded: 9 to 10 mag
- Bright and large clusters, nebulae and galaxies: structures visible
- Faint and small objects: small fuzzy patches with no structure
- All planets are point sources.
- Constellations: Images of all 88 constellations
- Messier objects: Images of all objects except for M74 and M76
- NGC and IC objects: Images of many of the brightest objects
- Planets: Images of all seven planets (from Mercury to Neptune)

A remarkable achievement from light-polluted observing sites (especially the Pretoria site)!

Members were wished peace and clear skies during the holiday season and discussions continued over coffee/tea and biscuits.



From the archives

A mystery solved

How can a world without an atmosphere have an ionosphere? Somehow the Moon has done it. But first, what *is* an ionosphere?

Every terrestrial planet with an atmosphere has one. High above the planet's rocky surface where the atmosphere meets the vacuum of space, ultraviolet rays from the Sun ionize atoms and/or molecules in the atmosphere. This creates a layer of ionized gas - a neutral mixture of ionized atoms and/or molecules (positively charged) and free electrons (negatively charged). In physics, this is called a plasma. When it is found at the top of a planet's atmosphere, it is called an ionosphere.

The idea of an airless Moon having an ionosphere didn't make much sense, but the evidence for the existence of an ionosphere seemed compelling.

The mystery has finally been solved. Full story at

http://science.nasa.gov/science-news/science-at-nasa/2011/14nov_lunarionosphere/

A video version of this story is available at

<http://www.youtube.com/watch?v=zSrP4MacFE>

J. Wolterbeek looks through the 8-inch guiding telescope of the famous Rockefeller twin photographic refractor. The mounting is by Grubb Parsons, and is carried on two piers. The two 16-inch objectives are by Zeiss, but only one of the main tubes is readily visible in this Leiden Observatory photograph.

Last month's observing evening - by Johan Smit

A cloudy sky awaited those who arrived early, Johan, Percy, Rudolph and Danie. We were soon joined by Anton and we decided to wait and see if anyone else would arrive. I had a few phone calls during the week enquiring about our viewing evenings and these people promised to visit us.

And they did. While we talked and showed them around, the sky started opening and we showed them Jupiter. Mercury was also pointed out just before it disappeared in the West. As the evening went on the sky opened up more and more and we took everyone on a binocular tour of the summer sky, with the Pleiades and Hyades featuring prominently. My binocular mounting again proved its usefulness and convinced many that a binocular is a good observing tool.

We eventually had 9 telescopes and a binocular stand spread across the viewing field with groups of visitors at each station. Some observers were doing official recording for their participation in our observing challenge. I urge more observers to join, because we were donated a small Meade reflector that will be awarded to the most active observer. Now, that is a challenge worth observing for!!!!

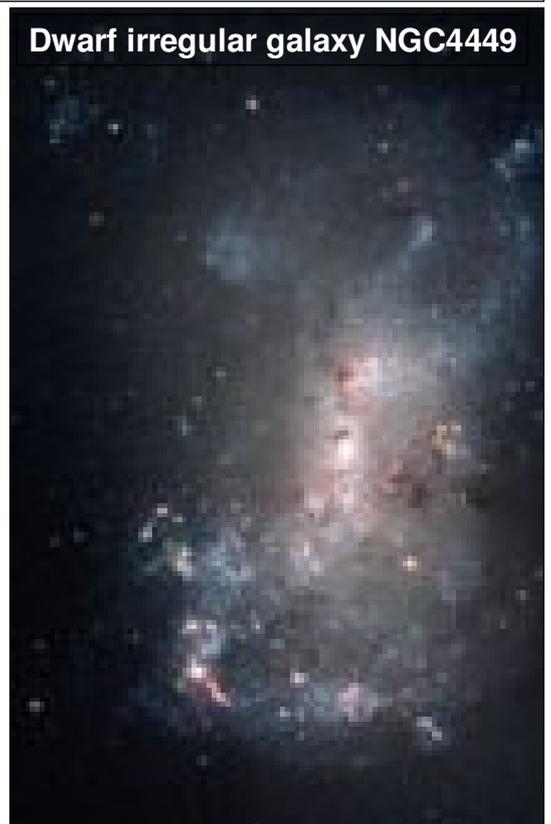
Amongst the visitors were people that saw us on the TV programme Passella and came to see the "TV stars". One of them was oom Willie van Rensburg who brought his whole family along, including Piet Bennett (no relation of Jack Bennett) along. Piet is from Warmbaths (Bela Bela) and manages the Shekina camp inside the greater Mabula nature reserve.

During the evening many new friendships were formed and Piet Bennett extended an invite to ASSA Pretoria to visit the Shekina camp in the future. We will gladly accept his invite and we plan to arrange a dark sky weekend there, sometime in the winter of 2012.

At about 23:00 the sky closed up again and we wished each other well for Christmas and the New Year and went home satisfied.

This experience again confirmed that one must never give up on an evening until proven well wrong. Again, an evening that did not look good at sunset turned out to very good. And such imperfect evenings normally provide more opportunity for social interaction. And we do astronomy not just for our own pleasure. We also like to share it with others.

So, next time you wonder whether to attend an observing evening or not---do not wonder--just do it and you will not regret the decision.



For sale: observatory contents of the late Tony Hilton

The following e-mail message was received from Kay Hilton:

My late husband, Tony Hilton, passed away in 2009. Tony's interest in astronomy started in the early 1970's in Zimbabwe (Rhodesia) where he was Chairman of the Salisbury (now Harare) Centre for many years, before moving to Durban. During the early 80's he was Chairman of the Durban Centre, and then joined the Johannesburg Centre in 1986 and was elected Chairman in 1990 and 1991. He also served on the ASSA Council as Director of the Computing Section in 1997.

I now find myself in a position whereby I need to dispose of his observatory equipment, most of which is in excellent, if not mint condition, as he had revamped and upgraded all his equipment within 2 years of his passing. He prided himself in keeping all of his instruments and equipment in top working order and condition.

- **Complete planetary imaging system (based on recommendations made in Martin Mobberley's "Lunar and Planetary Webcam User's Guide"):**

Celestron C91/4s-GT with XLT including head and tripod

Dovetail base for finderscope

William Optics Megrez 80mm APO refractor finderscope

William Optics mounting O-rings

Red Dot star pointer

- **Camera:**

Celestron NexImage CCD solar system imager

- **Accessories Included:**

Eyepiece

Meade Pictor 216XT CCD camera and autoguider

Celestron Powertank

Cables and sundry items

"Lunar and Planetary Webcam User's Guide" by Martin Mobberley.

All the above is on offer for R30 000 onco.

There are also **various eyepieces, filters, adapters, books and various other items which complement the above system** (such as custom made piers), but which are too numerous to list here. A full listing of all his observatory contents can be supplied, or visit www.toad.co.za/astro Should you know anyone who would be interested in acquiring any of the above, please contact me or my son, John on John@toad.co.za

Kind regards

Kay Hilton

Another telescope for sale

Orion Skyview Pro 8EQ

Equatorial Reflector Telescope

Parabolic Primary Optics

Diameter 203mm, F.L 1000mm, f/4.9

Deon Bam 082 825 0189

NASA Science: Big Questions

NASA has defined a set of space and Earth Science questions that can best be addressed using the Agency's unique capabilities. NASA works with the broader scientific community, considers national initiatives, and the results of decade-long surveys by the National Research Council in defining these questions. <http://science.nasa.gov/big-questions/>

Sam Harris, philosopher and neuroscientist, has the following to say about consciousness in his book "The End of Faith":

".....[consciousness] is an absolute mystery—rivalled only by the mystery, famously articulated by the philosopher Schelling, that there should be anything at all in this Universe rather than nothing."

Meet some fellow members of the Pretoria Centre of the ASSA



Left to right: Diethelm Schmieder, Harald Pauler, Neville Young. Neville was once our chairman.

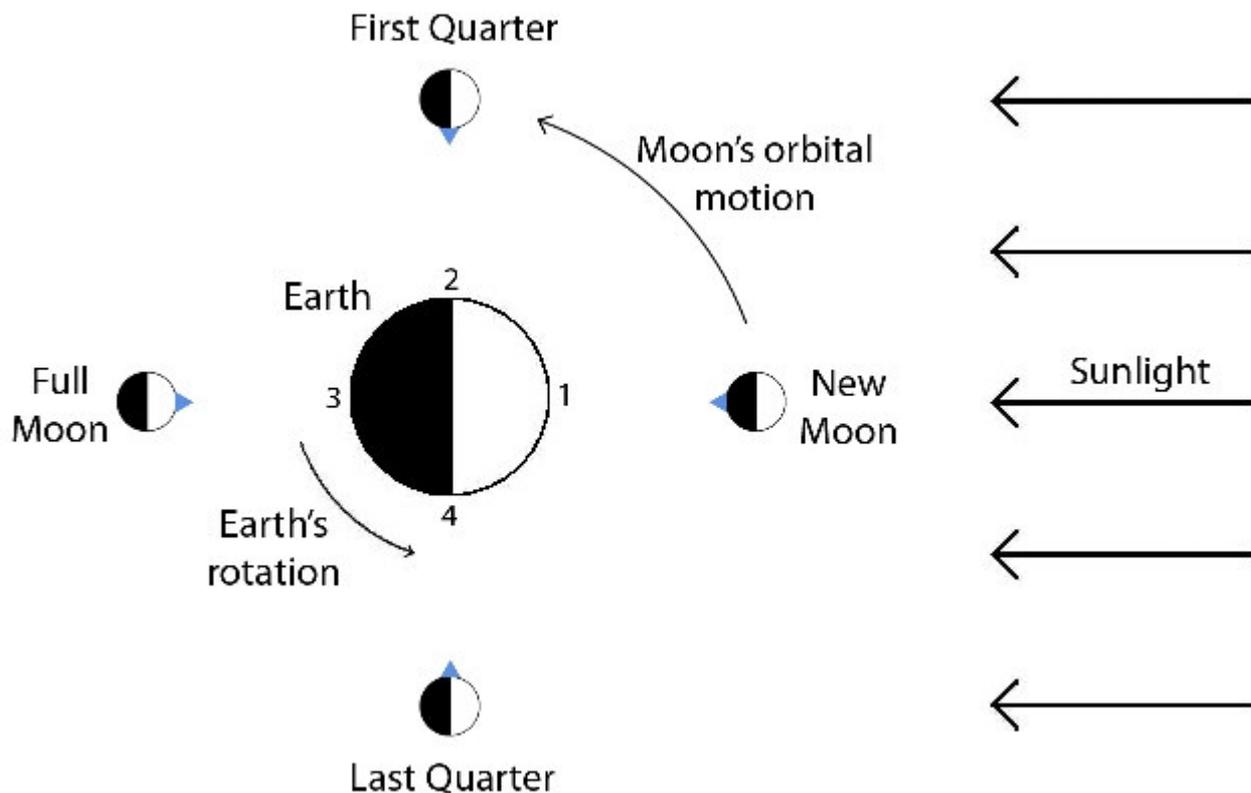
Tidbits

- **Draconid meteor.** This video clip caught the moment when a Draconid meteor exploded in Earth's atmosphere. http://www.esa.int/esaSC/SEM8DPGURTG_index_0.html
- **Top 10 reasons why the world won't end in 2012.** Some of the more popular doomsday theories are considered and each is debunked in turn. <http://news.discovery.com/space/ray-villard-doomsday-theories.html>
- **Space station commander captures unprecedented views of comet.** The ISS commander captured spectacular imagery of comet Lovejoy, viewed from about 386 km above Earth. http://www.nasa.gov/home/hqnews/2011/dec/HQ_M11-255_ISS_Lovejoy.html
- **Movies from SOHO and SDO of comet Lovejoy's fiery ordeal at its perihelion.** http://science.nasa.gov/science-news/science-at-nasa/2011/16dec_cometlovejoy/
- **2011: Top stories from the best year ever for NASA planetary science!** <http://www.universetoday.com/92166/2011-top-stories-from-the-best-year-ever-for-nasa-planetary-science/>
- **Most anticipated space missions of 2012.** <http://news.discovery.com/space/space-missions-2012-120102.html#mkcpqn=emnws1>

Reminder about MNASSA

MNASSA (Monthly Notes of the Astronomical Society of Southern Africa) is, from the August 2011 issue, not printed any more, but only available online. **MNASSA** can now be downloaded from the **MNASSA** Download Page at <http://www.mnassa.org.za/>. As always, download choices are between a slightly smaller eBook quality pdf or a better, print quality version. It is also available in booklet form (print quality) if you want to print and bind your own paper copy. Also included on the website is an Index for Vol. 70 (2011) which traditionally appears in the December issue.

Astronomical basics: Moon phases - by Barbara Cunow



We all know that the Moon goes through a full cycle of phases as it orbits the Earth. Like the Earth, the Moon is illuminated by the Sun, and the regions on the Moon's surface facing the Sun receive sunlight and appear bright, whereas the regions facing away from the Sun are in darkness. Because the Moon is round, it is always half of the Moon that is illuminated, whereas the other half is dark.

When the Moon orbits the Earth, we see different parts of the sunlit half of the Moon. When the Moon is between us and the Sun, we look at the unilluminated side of the Moon, i.e., we have New Moon and the Moon cannot be seen. When the Moon is opposite to the Sun as seen from the Earth, our line of sight is parallel to the direction of illumination, and we see the whole sunlit side of the Moon, i.e., we have Full Moon. When we see the Moon illuminated from the side, the Moon appears to be half full, a phase that is called First Quarter or Last Quarter. A full cycle of phases lasts 29.53 days.

The figure illustrates the situation. It shows the Earth and the Moon, and how they are illuminated by the Sun. It also shows that the phase of the Moon and the time of day when the Moon is above the horizon are related. A person at position 1 on the Earth's surface experiences noon, for a person at position 2 the Sun is setting, a person at position 3 has midnight, and for a person at position 4 the Sun rises. When the Moon is new, it rises at sunrise and sets at sunset, and is close to the Sun in the sky. At First Quarter, the Moon rises at noon and sets at midnight, and is highest in the sky at sunset. At Full Moon, the Moon rises at sunset and sets at sunrise, and at Last Quarter, the Moon rises at midnight and sets at noon. So when the Moon is visible in the early evening, it is waxing, when it is visible in the early morning, it is waning.

It is often thought that the Moon can be seen at night only. This is not true. Except for a few days around New Moon, it is bright enough to be visible during the day. When it

is waning, it is above the horizon in the morning, when it is waxing, we can see it in the afternoon. The best times to look out for the Moon during the day is around First Quarter and Last Quarter. When both the Moon and the Sun are visible, it is easy to confirm that the Sun really is the light source that illuminates the Moon. The bright side of the Moon always points at the Sun.

We always look at the same side of the Moon, no matter where the Moon is in its orbit around the Earth. This causes the impression that the Moon does not rotate. However, the opposite is true. The Moon does rotate, but in such a way that the rotational and the orbital periods are exactly the same. The figure shows how it works. The triangle represents a surface feature on the Moon that is visible from the Earth. Because we always look at the same side, the triangle must always face the Earth, i.e., the Moon must rotate. If the Moon did not rotate, the triangle would always point in the same direction in space and we would see different regions of the Moon as the Moon moves around Earth.

The fact that the Moon rotates around its axis means that there is day and night on the Moon like we have it on Earth. A day on the Moon, i.e., a full day-night cycle, lasts 29.53 Earth days. When we observe the waxing Moon we look at the morning side where the Sun rises, when we look at the waning Moon we see the evening side. For regions close to the terminator (the dividing line between daylight and darkness), the Sun is very low in the lunar sky, and the surface features cast long shadows which make the landscape appear three-dimensional. If one observes the same region over several days when the Moon is waxing, it can be seen how the shadows shorten as the Sun gets higher in the lunar sky. When the Moon is waning, one can see how the shadows get longer until the Sun sets.

The Jack Bennett Award - by Michael Poll

At the November 2011 meeting of the Pretoria Centre, Danie Barnardo was named as the deserving recipient of the Jack Bennett Award for the year ending June 2011. The Award is presented annually in memory of Jack Bennett, a founder member of the Centre, and it is presented to the member of the Centre who is considered to have done most for the Centre or for astronomy during the year.

Readers may be interested in the accompanying picture, which is of the plaques that are on the tripod of the Bennett telescope, and upon which the names of all the previous recipients are listed.



News items

- **Mission accomplished: cave crew “returns to Earth”.** Take five astronauts and instead of sending them into space for training, take them underground.
http://www.esa.int/esaCP/SEMBNGFURTG_index_0.html
- **Herschel detects abundant water in planet-forming disc.** Evidence has been found of water vapour emanating from ice on dust grains in the protoplanetary disc (protoplanetary disc) around a young star, revealing a hidden ice reservoir the size of thousands of Earth’s oceans.
(“Water, water, everywhere, nor any drop to drink.” - from the poem *The Rime of the Ancient Mariner* (= *The Rhyme of the Ancient Mariner*) written by Samuel Taylor Coleridge, 1798.)
http://www.esa.int/esaCP/SEMXXSWFURTG_index_0.html
- **Youngest planet picture: gas giant seen in throes of creation.** A new image of a Jupiter-like world swaddled in gas and dust is a direct image of what may be the youngest planet yet seen.
<http://news.nationalgeographic.com/news/2011/10/111021-youngest-planet-picture-gas-giant-kraus-space-science/>
- **Comet storm in nearby solar system.** NASA's Spitzer Space Telescope has detected signs of icy bodies raining down in an alien solar system, the Eta Corvi system.
http://www.nasa.gov/mission_pages/spitzer/news/spitzer20111019.html
- **Most common stars more life-friendly than thought.** Small and cool they may be, but red dwarfs, the most common kind of stars, are more likely to support life than we thought. See also the back page of this newsletter.
<http://www.newscientist.com/article/mg21228374.400-most-common-stars-are-more-lifefriendly-than-thought.html>
- **Asteroid has huge mountain.** The asteroid Vesta hosts a mountain three times as high as Mount Everest, seen in a new picture from NASA's spacecraft Dawn.
<http://news.nationalgeographic.com/news/2011/10/111012-asteroid-vesta-mountain-everest-nasa-dawn-space-science/>
- **Asteroid Lutetia: postcard from the past.** Spacecraft Rosetta flew past asteroid Lutetia on 10 July 2010. Speed: 54 000 km/h. Closest distance: 3170 km. The data has now been analyzed. The results are unexpected.
http://www.esa.int/esaCP/SEMG93HURTG_index_0.html
- **Amateur sky watchers help space hazards team.** Amateur astronomers discovered asteroid 2011 SF108, which is an NEA.
http://www.esa.int/esaCP/SEMURW6UXSG_index_0.html
- **CryoSat.** Satellite CryoSat is using radar altimetry to make precise measurements of the Arctic ice cover and of the vast ice sheets that blanket Greenland and Antarctica. Read some news items.
<http://www.esa.int/SPECIALS/Cryosat/index.html>
- **Antarctic expedition checks CryoSat down under.** A team of scientists brave the Antarctic to validate data from ESA's CryoSat mission.
http://www.esa.int/esaEO/SEMHXD5XPVG_index_0.html
- **Uranus has a bright new spot.** The spot is likely a tall methane cloud that reaches high enough for us to see sunlight reflected by its icy particles.
<http://news.nationalgeographic.com/news/2011/11/111021-uranus-planet-new-spot-storm-methane-gemini-space-science/>
- **International consensus on joint space exploration.** A conference highlighted the importance of space exploration and its direct benefit to humankind.
(“We shall not cease from exploration, and the end of all our exploring will be to arrive where we started and know the place for the first time.” - T. S. Eliot.)
http://www.esa.int/esaCP/SEM90KTWLUG_index_0.html
- **A global discussion: directions for space science research.**
http://www.esa.int/esaCP/SEM095HURTG_index_0.html
- **Space and its benefits for citizens and society: A top priority for Europe.**
http://www.esa.int/esaCP/SEM5UKTWLUG_index_0.html

(continued on next page)

- **Vega moves closer to its first liftoff.** The new rocket is moving full speed ahead towards its maiden flight at the end of January. http://www.esa.int/esaCP/SEMS0T7XZVG_index_0.html
- **Two record-breaking black hole behemoths spotted.** Both weigh in at over 9 billion solar masses. <http://news.discovery.com/space/two-record-breaking-black-hole-monsters-discovered-111206.html>
- **NASA'S twin GRAIL spacecraft reunite In lunar orbit.** http://www.nasa.gov/home/hqnews/2012/jan/HQ_12-001_GRAIL_Lunar_Orbit.html
- **First four exoplanets of 2012 spotted.** After only four days into the New Year, the first four exoplanets of 2012 had been spotted orbiting four distant stars. It means a planet a day - a good start for 2012. <http://news.discovery.com/space/first-four-exoplanets-of-2012-discovered-120104.html#mkcpgn=emnws1>
- **Milky Way crammed with 100 billion alien worlds.** Last year's estimate was 50 billion. Now the estimate is 100 billion. <http://news.discovery.com/space/milky-way-stuffed-with-100-billion-alien-worlds-120110.html#mkcpgn=emnws1>

Summary of "What's Up" to be presented on 25 January - by Danie Barnardo

Phases of the Moon

Full Moon – 7 February
 Last Quarter – 14 February
 New Moon – 22 February

Best observing time

Best observing time this month is from about 15 to 26 February (our viewing evening is on Friday 17 February). Note that there is no First Quarter moon this month, while March 2012 will have two First Quarters.

Planets & Solar System

Mercury: is at the opposite side of the solar system and invisible because it is close to the sun. It can be briefly seen at month end low in the west (difficult).

Venus: takes its place as the brilliant evening star in Pices all month and sets well after sunset.

Mars: is located in Leo all month and is visible for the whole night.

Jupiter: is located in the west in Aries and is visible together with Venus.

Saturn: is situated in Virgo and rises soon after nightfall. It is visible high in the northern sky after midnight.

Uranus: may be seen in the early evening and is 0.3° north of Venus at 04:00 on the 10th.

Neptune: is very near to the sun and mostly invisible.

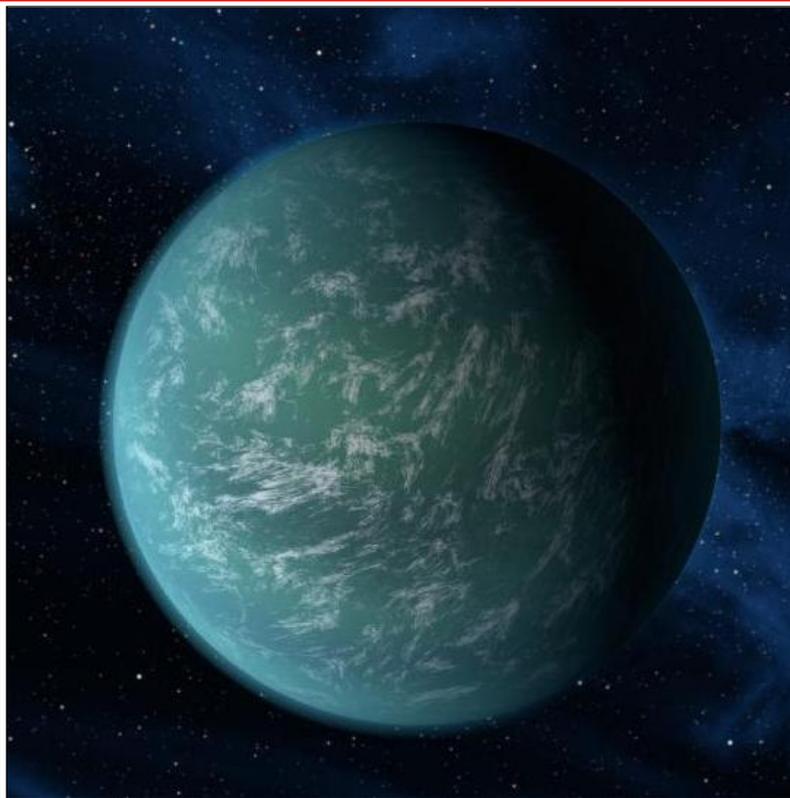
Jupiter, Venus and the **Moon** show some interesting groupings at month end in the evening sky.

Constellations visible in February

The summer constellations **Orion, Canis Major** and **Taurus** rule the night sky during this month, with its numerous interesting deep-sky object, double stars and clusters. The **Large and Small Magellanic Clouds** are favourable for viewing most of the night, while the magnificent starfields of **Puppis, Vela and Carina** are visible all night. **Crux** rises steadily during the month with its familiar objects. Truly a very impressive array of deep-sky object are visible and we are spoilt by the dazzling southern skies display, the only problem being the frequent cloud cover forecasted by the Weather Bureau!

Highlights in February

Over fifty of the ASSA 100 objects is visible during the month and the other highlight is the "dance of the planets" (Jupiter and Venus), which form interesting groupings with the moon after sunset in the western evening sky on 26, 27 and 28 February.



**Feature of the month:
An almost Earth orbiting an al-
most Sun**

The Kepler mission's science team announced its latest finding at a press conference on Monday, Dec. 5, 2011. The team announced the confirmation of Kepler-22b, its first planet found in the "habitable zone," the region where liquid water could exist on a planet's surface. The planet has about 2.4 times the radius of Earth, orbits around a star similar to the Sun and is located 600 light-years away. **It's the closest match to Earth that has been found.**

Whether Kepler-22b actually contains water or life is currently unknown. A SETI project, however, will begin monitoring Kepler-22b for signs of intelligence.

Above is an artist's depiction of the planet.

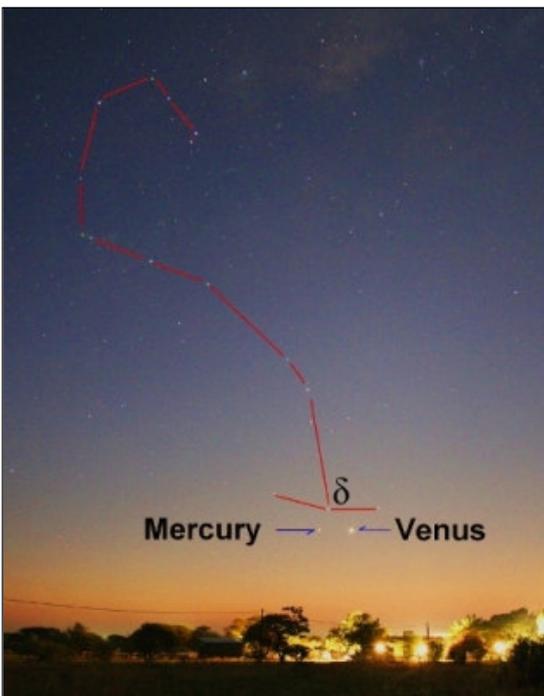
<http://apod.nasa.gov/apod/ap111207.html>

http://science.nasa.gov/science-news/science-at-nasa/2011/05dec_firstplanet/

The search for similar planets is continuing.

<http://news.discovery.com/space/big-question-for-2012-earth-20-111220.html#mkcpgn=emnws1>

Astrophotos

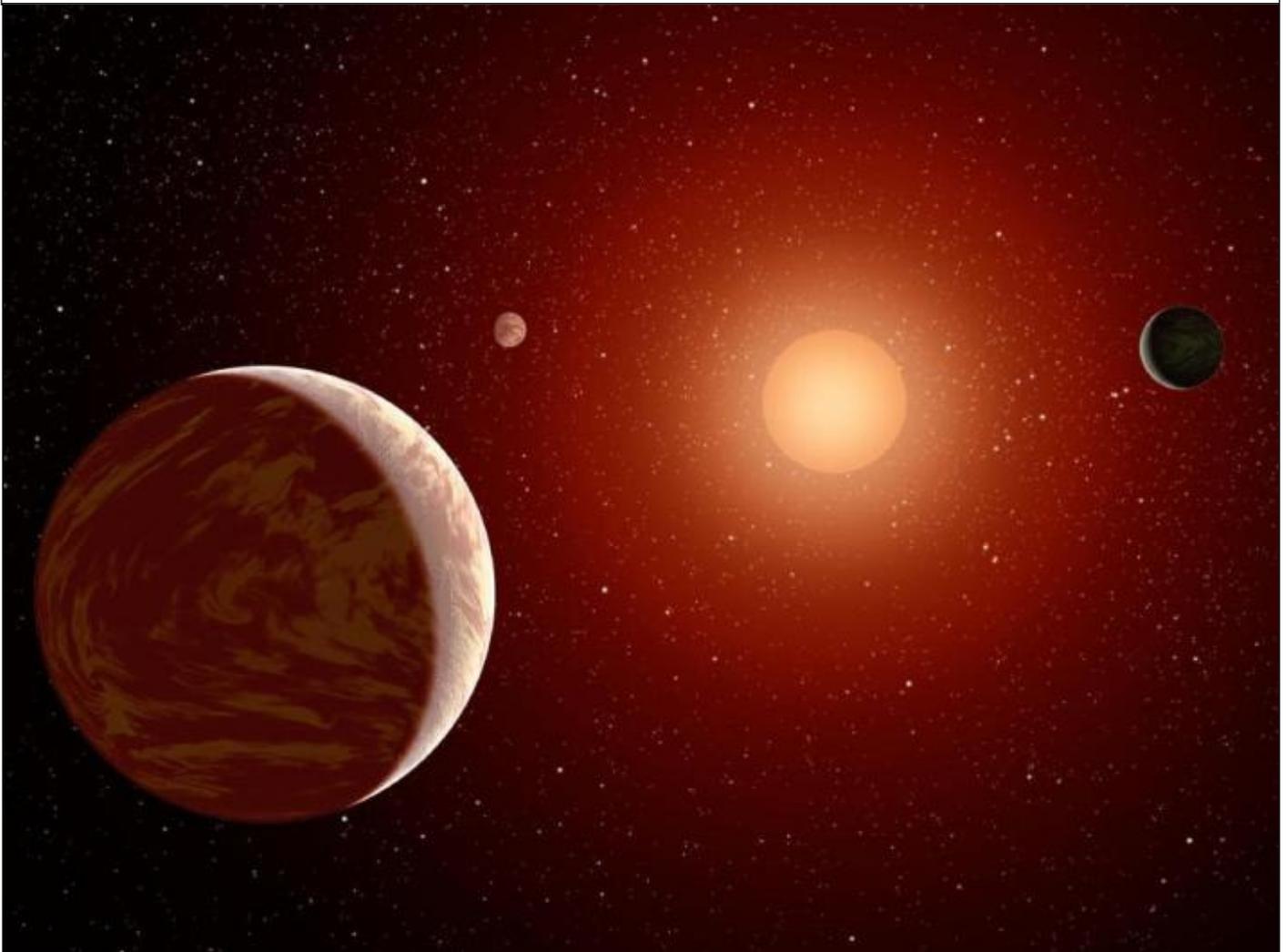


See more astrophotos on his website at <http://www.astronomical.co.za/gallery.htm>

Two astrophotos taken by Kostas Coronaios, chairman of the Soutpansberg Astronomy Club. **Left:** Mercury, Venus and δ Scorpii, all at the tail of Scorpius (red lines). Photo taken on 3 November 2011 at 19h14. **Right:** Mercury, Venus and the moon. Photo taken on 26 November 2011 at 19h12. Photos placed in this newsletter with his kind permission.

Planets under a red sun

This artist's illustration shows a young, red dwarf star surrounded by three planets. Such stars are dimmer and smaller than yellow stars like our Sun, which makes them ideal targets for astronomers wishing to take images of planets outside our solar system, called exoplanets. See also the fifth item of “**News items**”.



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 [Mobile]	

