# The PRETORIA CENTRE

of the

## Astronomical Society of Southern Africa

www.pretoria-astronomy.co.za

## NEWSLETTER JANUARY 2016

### 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 January at 19h15.
**Programme:**

- **Beginner's Corner:**."String scopes" by Bosman Olivier and Danie Barnardo.
- **What's Up?** by Johan Smit
- ########## 10 minute break. Library will be open. ##########
- **Main talk: TBA to members by e-mail.**
- Socializing over tea/coffee and biscuits.

The chairperson at the meeting will be Fred Oosthuizen.

### Next observing evening

Friday 22 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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## Summary of "What's Up?" to be presented on 27 January 2016 - by Johan Smit

01 Feb 2016. Last Quarter Moon
08 Feb 2016. New Moon.
15 Feb 2016. First Quarter.
22 Feb 2016. Full Moon.
Dark sky time: last week in January and first week in February.
Use this time to visit the summer sky, especially the southern parts of the Milky Way around Eta Carinae.
The Magellanic clouds are also high up early in the evening. If you get to a dark place, make a point to look out for our neighboring galaxies.

**Special events:**

29 Jan 2016. Moon occults Eta Virginis. About 03:00. Start looking from 02:00.

This is the month to identify all the planets.
Nearly all the planets are visible early in the morning. Start planning now to get up early in February.

30 Jan 2016: Mercury and Pluto 30.7' apart, i.e. half a degree.
Nearly all planets are visible early in the morning.

**Groupings:**

03 Feb 2016: Moon and Saturn, 3.8 degrees apart.
06 Feb 2016: Moon around Venus, Mercury and Pluto. All about 4 to 5 degrees from the Moon. Venus and Pluto about 1 degree apart.
10 Feb 2016: Moon to Neptune 2 degrees. Challenging, only 2 days after New Moon.
12 Feb 2016: Moon to Uranus 1.6 degrees.
13 Feb 2016: Mercury and Venus 4 degrees apart.
16 Feb 2016: Moon near Aldebaran.
22 Feb 2016: Moon near Jupiter. 22h42: double shadow event, Io and Europa. Start looking earlier.
29 Feb 2016: Moon near Mars (about 4 degrees).

**Special celebration:**

Feb 15 2016: Galileo Day
The best way to celebrate Galileo Day is with a traditional feast. Invite your friends all round, cook up a meal and drink a toast to the man himself.

Given Galileo's area of work it is also highly appropriate to do star gazing on this night. **Ω**

# NOTICE BOARD

- Dr Ian Glass has written a book on the history of the Royal Observatory in Cape Town, its buildings, achievements, conservation, heritage and setting between the Liesbeek and Black rivers. It is called *The Royal Observatory at the Cape of Good Hope.* It has 138 illustrations. Price: R150.00.
- In the centenary year of the South African identification of Proxima Centauri as our nearest star, the updated book by Dr Ian Glass is available for R80.00.

These books can be ordered directly from him at glass.ian@gmail.com

Be on the lookout in bookshops for "**The world's greatest telescopes - 50 giant telescopes explored**" - a special issue of Astronomy Magazine. You can read an abstract of it at https://myscienceshop.com/products/magazines/special-issues/as5base The-Worlds-Greatest-Telescopes

## Chairman's Report for the meeting of 25 November 2015 by Pierre Lourens

Under **Beginner's Corner**, Michael Moller spoke about his Dobsonian go-to project. He had ordered a go-to Dobsonian telescope from a manufacturer in the northern hemisphere. To his dismay he discovered that it could not be used in the southern hemisphere (SH). So he decided to change it so that it can be used in the SH. Using mathematics and his knowledge of electronics, he succeeded in changing it so that it can be used in the SH.

Next was Percy Jacobs with **What's Up?** He elaborated on the summary of his talk, which appeared in the November 2015 newsletter.

Next was Michael Poll with the main talk. It recounted a once in a lifetime visit by himself and his wife Jennifer to the island of St Helena in the southern Atlantic ocean. The round trip from Cape Town took 19 days, including seven nights and eight days on the island. The fact that famous astronomers such as Edmund Halley and Nevil Maskelyne have visited the island gave the presentation an astronomical background.

The presentation was very extensive and he discussed the geography, geology, history, politics, economy and the flora and fauna of the island. In 1676, Halley visited St Helena and set up his observatory with a 7.3-metre-long telescope. The 680-metre high hill there is named for him and is called Halley's Mount.

The airport (still being built at the time of Michael's visit) and the sites of Halley's and Maskelyne's observatories were also discussed and photographs of them were shown. These observatories were built there because at that time, St Helena was the southernmost British colony, and these two astronomers wanted to make observations of the southern sky.

The evening culminated with informal socialising over the customary cups of tea or coffee and biscuits, organised by Michael Poll. **Ω**

## Report of observing evening on November 20th 2015 - by Michael Poll

It was clear skies and sunshine all afternoon, but as we started arriving for our observing evening, clouds started rolling in from the west, and by the time it was dark we were clouded out. About a dozen of us came, including a couple of families with children. In spite of the cloud, we had interesting discussions.

While the cloud was still a bit transparent, we got some looks at the 9 day old Moon, which meant that we could see some regions that are not so often seen at our observing evenings. Michael took the chance to identify some craters in and around Mare Imbrium and elsewhere.

The numbers given are the feature numbering of the Moon Map published in Sky and Telescope. (See the moon map on the next page.) The biographical notes are from the Hamlyn "Atlas of the Moon" by Antonin Rukl, edited by Dr. T W Rackham. (1991).

**Mare Imbrium and surrounds**

**19 Plato:**
427 – 347 BC Greek philosopher, pupil of Socrates. Taught that the Earth is moving.
Crater 71 km diameter

**42 Archimedes:**
287 -212 BC Greek mathematician and physicist of Syracuse. Discovered principle of hydrostatic equilibrium.
A flooded crater with terraced walls. 83 km diameter, 2150 m deep

**43 Aristillus:**
c 280 BC one of earliest astronomers from Greek school in Alexandria
Ray crater 55 km diameter, 3650 m deep. Group of 3 peaks 900 m high on crater floor

**44 Autolycus:**
c330 BC Greek astronomer and mathematician. Crater 39 km diameter, 3430 m deep

**59 Lambert:**
Johann H Lambert 1728 – 1777. German mathematician and astronomer.
Crater with terraced walls, 30 km diameter, 2690 m deep.

**60 Timocharis:**
c280 BC Greek astronomer of the Alexandrian school. Crater 34 km diameter, 3110 m deep

**66 Pytheas:**
Pytheas of Massalia c 350 BC Greek navigator who sailed far to the north of Britain. First Greek to associate tides with the Moon.
Crater with sharp rim and hilly floor. 20 km diameter, 2530 m deep

**72 Eratosthenes:** 275-195 BC Greek mathematician, geographer & astronomer.
Crater diameter 58 km, 3570 m deep.

**82 Copernicus:** Polish astronomer. Crater 93 km diameter, 3760 km deep.
Terraced walls, group of central peaks up to 1200 m high

**Other craters:**

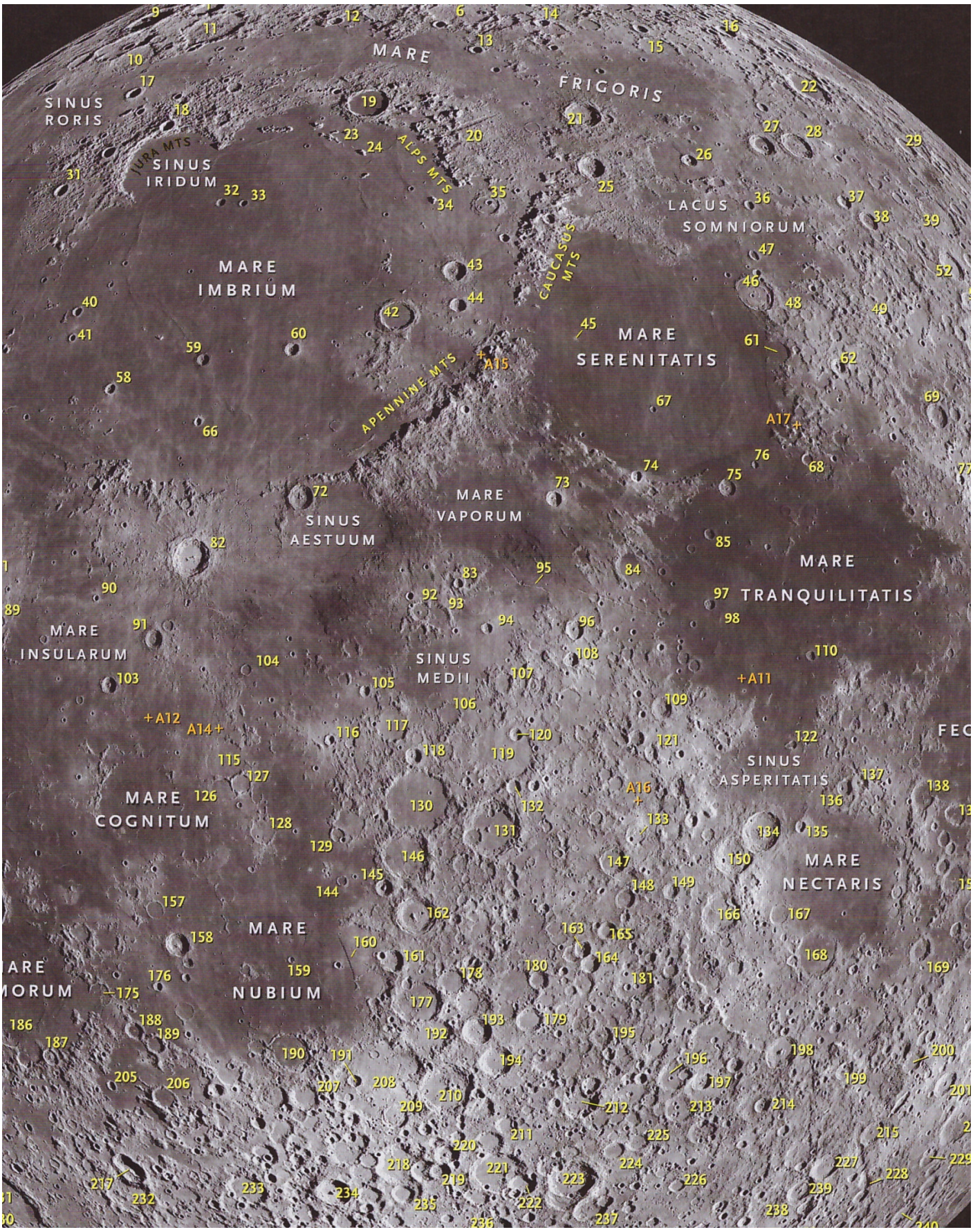
**130 Ptolemaeus:** Claudius Ptolemaeus 90 – 160 AD. Author of the Almagest. Proposed geocentric model of universe. Prominent walled plain with numerous pits & depressions on floor, 153 km diameter, 2400 m deep

**146 Alphonsus:** Alfonso X, King of Castile. 1221 – 1284 Astronomer. Author of Alphonsine Tables. Ring mountain with central peak. Rilles and crater pits on floor. Floor is impact site of Ranger 9 spacecraft

**145 Alpetragius:** Nu red-din al Betrugi 12th century Arabian astronomer. Attempted to improve Ptolemaic system. Crater with central massif. 40 km diameter, 3900 m deep.

**162 Arzachel** Al Zarkala 1028 – 1087 AD. Arabian astronomer from Muslim Spain. Author of Toledo Tables. Prominent crater with terraced clefts on floor. 97 km diameter, 3610 m deep.

**137 Capella: (is near Mare Nectaris).**
Martianus Capella 5th century AD. Carthaginian lawyer. Theorised that Mercury and Venus orbit the sun, and that the sun and the rest of the planets orbit the Earth. Crater 49 km diameter. **Ω**


MARE FRIGORIS
SINUS RORIS
JURA MTS
SINUS IRIDUM
ALPS MTS
LACUS SOMNIORUM
CAUCASUS MTS
MARE IMBRIUM
MARE SERENITATIS
APENNINE MTS
A15
A17
MARE VAPORUM
SINUS AESTUUM
MARE TRANQUILITATIS
MARE INSULARUM
SINUS MEDII
+A11
+A12
A14+
SINUS ASPERITATIS
A16
MARE COGNITUM
MARE NECTARIS
MARE NUBIUM

**Moon map**

## NGC 4945: the edge-on galaxy - by Magda Streicher (magdalena@mweb.co.za)

We are visiting the stunning constellation Centaurus, which appears to be suspended from the Milky Way and is extremely rich in a multitude of stars and objects.

Galaxies remain among the most veiled and mysterious of objects, which makes anything but an inadequate comprehension of them nearly impossible. The soft, hazy nebulas in various shapes therefore remain a favourite.

Centaurus is the home of the beautiful, spiral, edge-on galaxy NGC 4945 which, in terms of shape, may possibly reflect our own galaxy. Only a pair of binoculars and an ideal, dark nightsky are necessary to observe with ease this galaxy, which was dicovered by James Dunlop of Paramatta, New South Wales.

The galaxy is also known as Tweezers Galaxy, but I have not yet been able to find the origin of this name, perhaps some feedback?.

NGC 4945 is a highly active Seyfert galaxy with a nucleus housing a super black hole. Scientists suspect that a ring of massive stars is revolving around the hole, which is hidden behind a thick layer of gas and dust.

Professor E.J. Hartung first produced a comprehensive and highly respected guide for southern observers in 1968 which was revised and expanded by David Malin and David Frew in *Hartung's Astronomical objects for Southern Telescopes*, 1995. Hartung (not a professional astronomer, but a lecturer in chemistry at the University of Melbourne, Australia) spent most of his life in and around Melbourne indulging in astronomy, which was his passion. He describes NGC 4945 as a long, narrow, luminous haze about 15'x1'.5 in a 40PA that makes a fine contrast in a beautiful star field. It is fairly uniform in brightness, except towards the fading ends.

John Herschel called it a beautiful long nebula, about 10' long and 2' wide, with a very slight compression towards the centre. He notes faint stars on the surface of the galaxy as merely points of light.

NGC 4945 is also known as Bennett 57. My humble observation reveals a pencil-like galaxy elongated in a NE-SW direction and gradually getting brighter towards the middle, with a few foreground stars embedded. The southern part of the galaxy is not as bright when viewed in contrast with the more outstanding northern part (290x). It looks mottled in parts with higher power. In a fine star field towards the west runs a chain of small stars that appear to skip away from the galaxy, which is underlined with the 4.8-magnitude star Xi1 Centauri to the southwest.

Believe me: NGC 4945 remains a favourite in my astronomy book – a challenging observation every time. **Ω**

| Object | Other names | Type | RA | DEC | MAG | SIZE |
|---|---|---|---|---|---|---|
| NGC 4945 | Tweezers | Galaxy | 13.05.4 | -49°28 | 8.8 | 20'x4.4' |

# Astronomy-related articles on the Internet

## Solar system

- **Gigantic ice cloud spotted on Saturn's moon Titan.** NASA's Cassini spacecraft has detected a massive, never-before-seen icy cloud at the south pole of Titan, which is now experiencing winter. Also see an animation. http://www.scientificamerican.com/article/gigantic-ice-cloud-spotted-on-saturn-moon-titan/
- **The weakest solar cycle in 100 years.** The Sun is acting weird. It typically puts on a pageant of magnetic activity every 11 years, but this time it overslept. When it finally woke up (a year late), it gave the weakest performance in 100 years. http://www.skyandtelescope.com/astronomy-news/the-weakest-solar-cycle-in-100-years/
- **New Horizons: sharpest images of Pluto's surface.** http://www.bbc.com/news/science-environment-35013190
- **Pluto's big moon Charon reveals a colourful and violent history.** http://pluto.jhuapl.edu/News-Center/News-Article.php?page=20151001
- **Prometheus up close.** NASA's Cassini spacecraft spied details on the pockmarked surface of Saturn's moon Prometheus. http://www.nasa.gov/image-feature/jpl/pia17207/prometheus-up-close
- **A series of articles about Enceladus, one of the moons of Saturn.** http://www.nasa.gov/subject/3159/enceladus/
- **Japan's Akatsuki spacecraft reaches Venus - at last.** http://www.skyandtelescope.com/astronomy-news/japans-akatsuki-spacecraft-reaches-venus-at-last-1204201544/

## Exoplanets

- **Scientists spot the closest Earth-sized exoplanet yet.** Scientists have discovered an exoplanet named GJ 1132b, which is Earth-sized and rocky, orbiting a small star located just 39 light-years from Earth. But you wouldn't want to live there. http://www.astronomy.com/news/2015/11/scientists-spot-the-closest-earth-sized-exoplanet-yet
- **Oxygen not definitive evidence of life on habitable extra solar planets?** A novel hypothesis, namely that it could be possible for planets to have large quantities of abiotic (i. e. non-biologically produced) oxygen, has been proposed. http://www.nao.ac.jp/en/news/science/2015/20150910-abc.html

## Extragalactic astronomy

- **Watch a black hole eat dinner.** S5 0716+71, a bright blazar currently in a feeding frenzy, invites you over for dinner the next clear night. http://www.skyandtelescope.com/observing/watch-a-black-hole-eat-dinner111820151811/

## Applications of Earth-orbiting artificial satellites

- **New satellite to measure plant health.** ESA plans to track the health of the world's vegetation by detecting and measuring the faint glow that plants give off as they convert sunlight and the atmosphere's carbon dioxide into energy. http://www.esa.int/Our_Activities/Observing_the_Earth/New_satellite_to_measure_plant_health

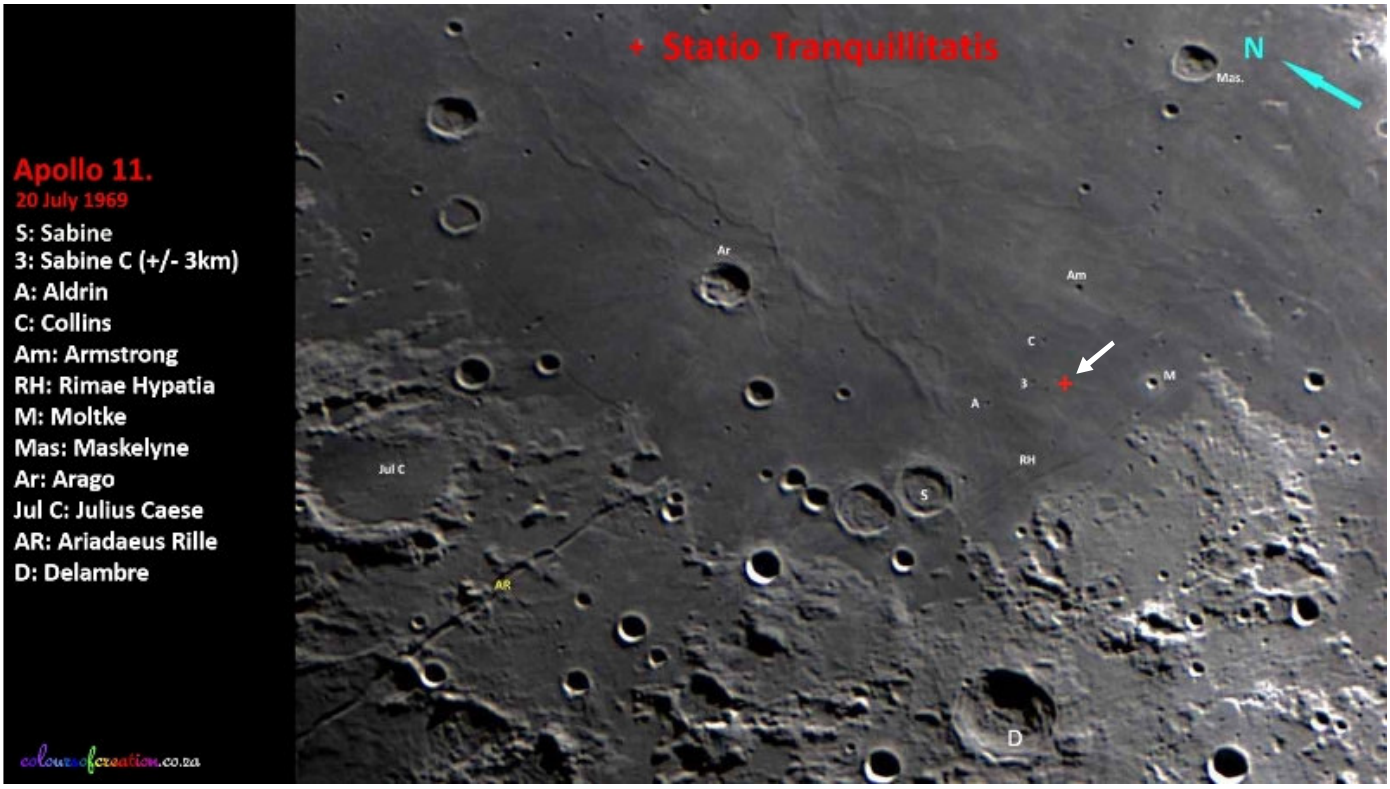
## Physics

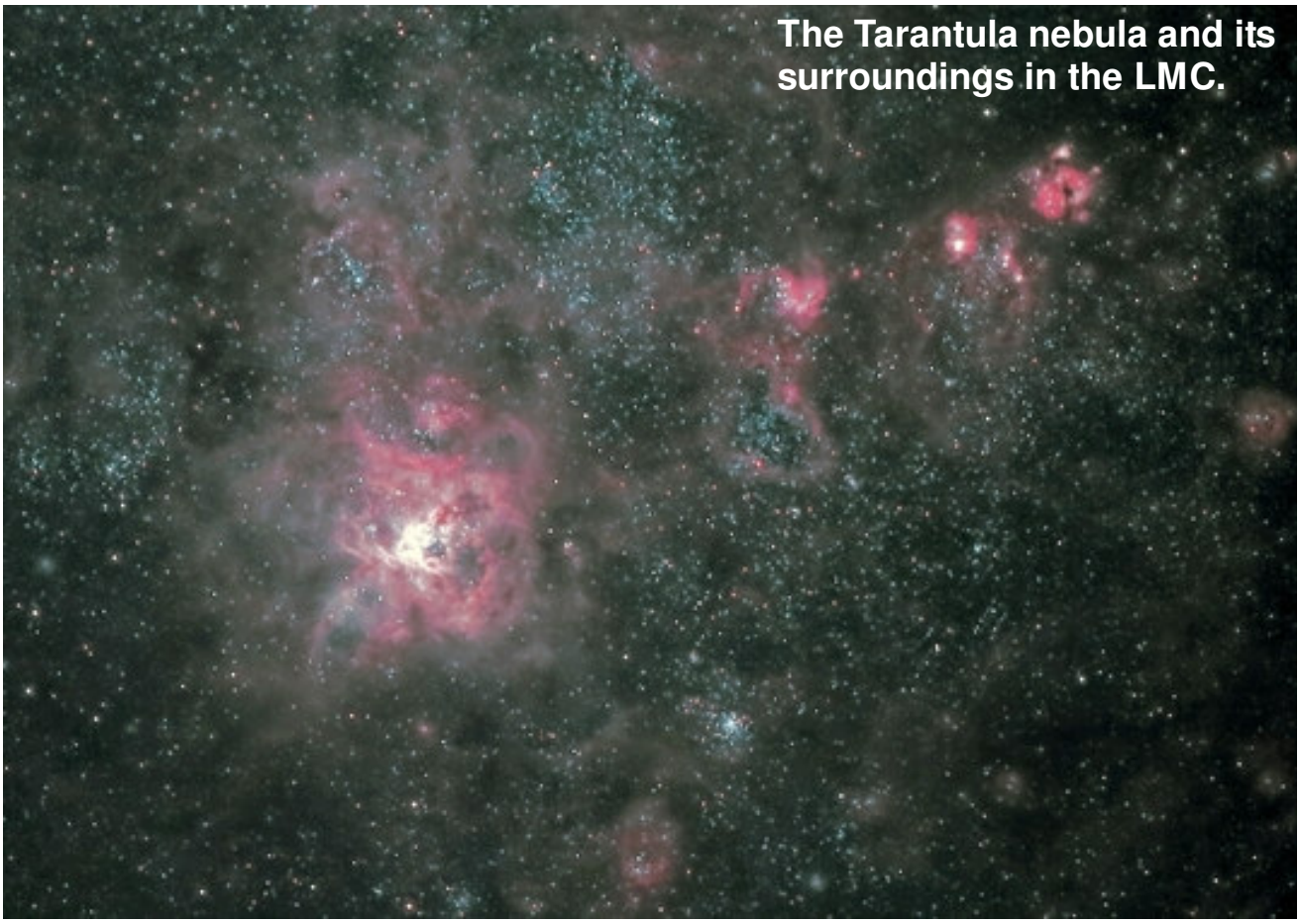
- **Hunt for gravitational waves to resume after massive upgrade.** The purpose of the Laser Interferometer Gravitational-Wave Observatory (LIGO) was to try and detect gravitational waves predicted by the general theory of relativity to exist. There was no success. LIGO was then upgraded and the upgraded version, known as Advanced LIGO, has a better chance of detecting them. http://www.nature.com/news/hunt-for-gravitational-waves-to-resume-after-massive-upgrade-1.18359

**The rarely photographed green flash.** This photograph of the green flash atop the Sun's limb was taken by Johan Moolman during the transit of Venus on 6 June 2012. Venus was in line with the Sun's limb at that moment and is circled in blue. This is an exceptional photograph.

**Johan Moolman's contact details: moolman@lancet.co.za 082 653 5505**

**Apollo 11 landing site on the moon.** Photograph taken by Johan Moolman.





The Tarantula nebula and its surroundings in the LMC.

The Pleiades. Photographs taken by Johan Moolman.

# Basics: The Cassegrain reflector telescope - by Pierre Lourens

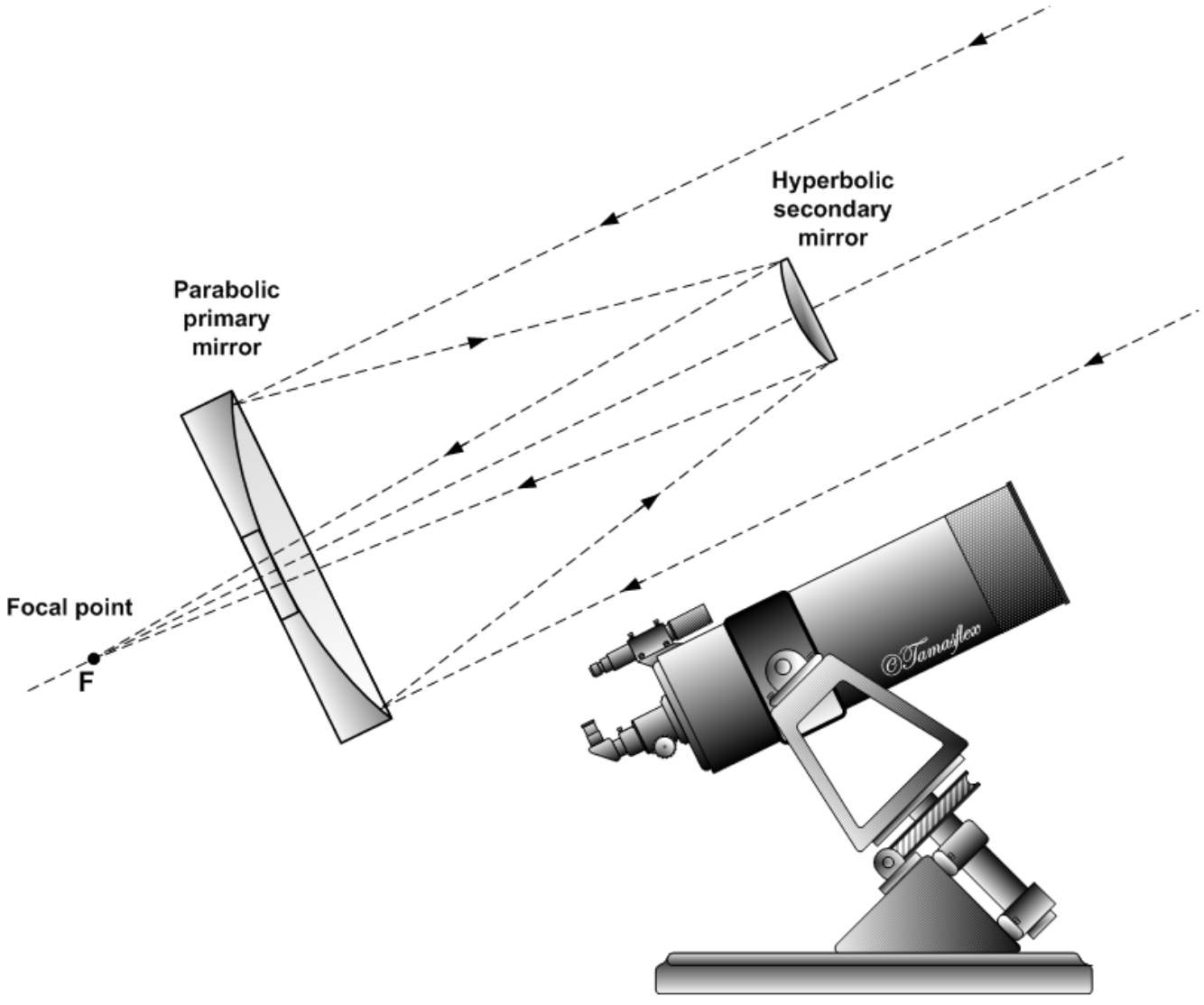
This is a type of reflector telescope with a concave parabolic primary mirror and a convex hyperbolic secondary mirror. The Cassegrain reflector is named after a published reflecting telescope design that appeared in the April 25, 1672 *Journal des savants* which has been attributed to Laurent Cassegrain. This was the second successful mirror-based telescope after Isaac Newton's Newtonian.

In the "classic" Cassegrain reflector, the concave primary mirror collects light from the sky, reflects it up to the convex secondary mirror. This in turn reflects the light back down through a circular hole in the centre of the primary mirror to the so-called "Cassegrain focus" below the primary mirror.

The optical design with a concave and convex mirror tends to cancel the aberrations such as coma of the individual mirrors. The arrangement of mirrors gives an accessible position of the focus which is conveniently on the optical axis and at the rear of the telescope. This is convenient for installing equipment such as spectrometers, CCD cameras and photometers at the focus.

It is the most common type of reflector telescope of substantial size, i.e. 60 cm aperture and bigger.

There are also a considerable number of variations of this "classic" design. **Ω**



## Feature of the month: An incredible super massive black hole in action - by Pierre Lourens

There is a super massive black hole at the heart of the supergiant galaxy Hercules A, situated about 2100 million light-years away. The black hole has a mass of some 2.5 **billion** solar masses.

A black hole attracts matter around it, and this matter spirals in towards the black hole via an accretion disk. Two jets of high-speed charged particles are spewed out along the spin axis of the black hole in opposite directions. These particles lose energy as they collide with particles in the intergalactic medium, eventually slowing down and spreading out to form cloud-like lobes. As the particles collide, they emit electromagnetic waves with wavelengths in the radio region of the spectrum. Each jet of the black hole in Hercules A is about 1.5 million light-years in length, fifteen times the diameter of the Milky Way galaxy.

The Earth-orbiting Hubble Space Telescope was used to obtain an optical image of the galaxy, and the Karl G. Jansky Very Large Array radio observatory was used to obtain a radio image of the jets and lobes. The two images were combined to produce a stunning combined image.

It makes a nice screen saver for your computer screen, to stare at in wonder again and again. **Ω**

http://www.esa.int/spaceinimages/Images/2015/11/A_supermassive_black_hole_in_action

## Astronomy-related images and video clips on the Internet

- **Video clips about spaceflight.** https://www.youtube.com/watch?time_continue=2628&v=O5bTbVbe4e4
- **SpaceX rocket in historic upright landing.** See a video clip. http://www.bbc.com/news/science-environment-35157782
- **See 4 video clips about astronomy.** http://www.astronomy.com/
- **ESA Eduronews: The future of planet Earth.** See a video clip. http://www.esa.int/spaceinvideos/Videos/2015/12/ESA_Euronews_The_future_of_planet_Earth
- **Possible ice volcano on Pluto.** Highest-resolution colour image of an enormous possible cryovolcano spotted on the surface of Pluto by the New Horizons spacecraft in July 2015. http://www.nasa.gov/feature/possible-ice-volcano-on-pluto-has-the-wright-stuff

### Pretoria Centre committee

| | | |
|---|---|---|
| Chairman | Johan Smit | 082 883 1869 |
| Vice Chairman | Michael Poll | 074 473 4785 |
| Secretary | Tony Viljoen | 072 247 6648 |
| Newsletter Editor | Pierre Lourens | 072 207 1403 |
| Events | Michael Moller | 082 789 8968 |
| 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 |
| Member | Bosman Olivier | 082 883 1869 |

**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.**