



NEWSLETTER OCTOBER 2017

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 October at 19h15.

Programme:

- **Beginner’s Corner:** “The equation of time” by Michael Poll.*
- **What’s Up?** by Michael Poll.

----- **10-minute break — library will be open.** -----

- **Main talk:** “Relativity theory” by Dr Sheldon Herbst.
- Socializing over tea/coffee and biscuits.

The chairperson at the meeting will be Michael Moller.

* See page 4 for a summary of his talk.

NEXT OBSERVING EVENING

Friday 20 October 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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Report of Observing evening on September 22nd 2017

– by Michael Poll & Johan Smit

A cloud free but a hazy dusty sky, and we had 20+ attendees, including a small dog (Canis Minor?) and seven telescopes. The attendees included a group led by Debbie Lubbe, who contacted Johan via an e-mail, after seeing our web site. She brought her friends too in response to Johan's invite to attend the viewing evening. Hopefully we have gained some more regulars!

We had a 2½ day old Moon in the west, forming a nice picture with Jupiter slightly to the south. The crescent was a bit small to do much identification of features, we could not even see much of Mare Crisium, but with the low sun angle on the Moon we noted long shadows on the floors of some craters. We had quick looks at Jupiter - although low down in the haze, we saw cloud belts and moons, and Bosman saw the great red spot with his 10" telescope. This will be the last observing evening the we will see Jupiter for this viewing season – it is in conjunction with the sun on October 26th. Many visitors had a good look at Saturn which has its rings wide open and was very high up.

We revisited the "new" doubles in Lyra which had been observed last month, partly for the benefit of those who were not present previously. Vega is at the apex of a small equilateral triangle comprising Vega, Epsilon (ϵ) and Zeta (ζ). Epsilon (the Double Double) is well known, but Zeta is also a fine double star – the components are magnitudes 4.4 and 5.7. On a line extended from Vega through Zeta is Delta (δ) Lyrae, which also comprises two widely separated stars of contrasting colours. Another double visited in the evening was Alpha Centauri, now possibly slightly easier to split after the close approach of A and B in 2015.

In Scorpius we showed Messier 7 as a good example of an open cluster. We then looked at some globular clusters. NGC 6641 is near the star G Scorpii. The cluster and the star lie about halfway between the two bright stars in the "sting" (Shaula and Lesath which are Lambda (λ) and Upsilon (υ) Scorpii respectively) and Messier 7, but not quite on the same line. NGC 6641 is not particularly bright, but its proximity to the star makes it an interesting catch. Two other globulars observed were M22 and M28 near Lambda (λ) Sagittarii. Lambda represents the top of the "lid" of the "teapot" asterism. M22 appears as a large globular, very grainy and probably resolved. It is in pretty field with a star at each end of an imaginary diameter drawn across it. M28 is very much fainter and smaller, but is much closer to Lambda than is M22.

A really good sighting was made by Jannes Venter, a new member who joined recently, and hopefully will become one of the regulars. With an 8" Meade SCT he teased out the companion of Antares – the first sighting for a number of us. To see the companion Jannes used a ridiculously high magnification, about 500 times, which exceeded the theoretical limit of the telescope, but it put the companion out of the glare and of the diffraction rings around Antares. To see objects like this one has to trade image quality for brute force! In this case it worked. Johan said that he would not call the companion green, it looked more blue-green, or turquoise to him. Michael saw it as green, but he has always been told that it is green! Ω

Astronomy- related articles on the Internet

1. **Asteroid Florence.** This asteroid has a diameter of 4.5 km, 2 moons and passed Earth at only 18 times the Earth-moon distance. <http://earthsky.org/astronomy-essentials/asteroid-1981-et3-3122-florence-pass-earth-2017-binoculars>
2. **Alien seekers report 15 more fast radio bursts.** The mystery around FRB121102 deepens. http://earthsky.org/space/fast-radio-bursts-repeating-frb-121102-breakthrough-listen?mc_cid=fb824c8c9b&mc_eid=febfe10e42
3. **Hurricane Maria damages parts of Puerto Rico's Arecibo Observatory.** https://www.space.com/38242-arecibo-observatory-hurricane-maria-damage.html?utm_source=notification
4. **Fomalhaut.** How to see this star located in the southern constellation Piscis Austrinus. Also a word about Fomalhaut b, the first planet beyond our solar system visible to the eye in photographic images. <http://earthsky.org/brightest-stars/solitary-fomalhaut-guards-the-southern-sky>
5. **Failed doomsday predictions.** Such predictions are still being made. The problem is that many people do take them seriously. <https://www.livescience.com/60499-ancient-theories-fuel-doomsday-predictions.html>
6. **2 monster black holes spotted at galaxy's heart.** Spiral galaxy NGC 7674 has two supermassive black holes at its centre. It is only the second known system of this kind. https://www.space.com/38215-binary-supermassive-black-holes-spiral-galaxy.html?utm_source=sdsc-newsletter&utm_medium=email&utm_campaign=20170925-sdc
7. **7 ways to prove the Earth is round (without launching a satellite).** https://www.livescience.com/60544-ways-to-prove-earth-is-round.html?utm_source=notification
8. **Bus-size asteroid zooms by Earth in close (but harmless) encounter.** This 8-meter diameter rock zipped past Earth at only 23% of the Earth-moon distance. https://www.space.com/38333-asteroid-2017-sx17-buzzes-earth-in-flyby.html?utm_source=notification
9. **LIGO architects win Nobel prize in physics.** Theoretically predicted gravitational waves were detected for the first time in September 2015 with the Laser Interferometer Gravitational-Wave Observatory (LIGO). <https://www.quantamagazine.org/ligos-rainer-weiss-kip-thorne-and-barry-barish-win-physics-nobel-20171003/>
10. **Gravitational waves detected for fourth time.** <https://futurism.com/scientists-detect-new-gravitational-waves-from-a-black-hole-collision/>

Outline of “The equation of time” to be presented under “Beginner’s Corner” at the meeting of October 25th 2017 - by Michael Poll

The Sun does not cross an observer’s meridian at exactly 24 hour intervals. In fact, the Sun can cross the meridian up to 16 minutes earlier or 14 minutes later than noon as indicated on our clocks and watches – the difference between clock time and the time that the sun crosses the meridian is called the equation of time – adding the equation of time to the apparent time gives the mean time.

This presentation discusses the causes of the sun not being a regular time keeper : they are the direct result of the Earth being tilted on its axis, and its eccentric orbit.

The concept of Mean Time is introduced, and Local Apparent Time, Local Mean Time and Local Standard Time are compared,

The irregular movement of the sun will be illustrated using the Earth’s analemma. The analemma is a figure of 8 pattern made on the sky by the sun if the sun is observed at exactly the same time of day for one year.

Some of the effects of the sun’s irregular movement are that sunrise and sunset are not at exactly 6.00 am and 6.00 pm at the equinoxes and that neither the earliest sunrise or the latest sunset is on the day of the December solstice. Likewise the earliest sunset and latest sunrise are not at the June solstice. The reasons for these extremes being not-coincident with the solstices will be illustrated by examining the position of the analemma at sunrise and sunset. Ω

Summary of “What’s Up?” to be presented October 25th 2017 - by Michael Poll

Mercury is visible in the evening sky during the latter half on November. It is at greatest elongation east on November 25th when it will be 22° from Sun. Mercury is near Antares (brightest star in Scorpius) on November 12th.

Saturn: Is a dull yellowish object, currently moving from Scorpius into Sagittarius. It will be setting in twilight by the end of November and will not be easy to see thereafter. On November 20th

Mercury, Saturn and the Moon will be close together in the west. Saturn will be in conjunction with the Sun on December 21st, and will become visible in the morning sky during early 2018

Venus will be visible in the east before sunrise until December, although it may be difficult to see as it is rising in twilight.

Mars is visible in the east before sunrise. The moon will be near Mars on November 15th. Mars will move past the bright star, Spica from about November 25th - December 3rd. They will be closest on November 29th

Jupiter is in conjunction with the sun on October 26th i.e. it is on the far side of the Sun as viewed from Earth. Thereafter it appears in the morning sky before sunrise. Venus and Jupiter will be very close to each other on November 13th, but they rise only about 45 minutes before the sun.

Jupiter will be more easily visible from about the beginning of December

Constellations to be discussed are those in the northern sky, ranging from Pegasus in the west through Aries and Taurus to Orion, highlighting the Pleiades and the Crab Nebula.

It will also be noted that the south **Galactic Pole** is overhead at the latitude of Pretoria on November evenings, so the Milky Way runs around the horizon. Ω

Astronomy-related images and video clips on the Internet

1. **Mystery of high-energy cosmic rays.** See a video clip. <http://earthsky.org/space/mystery-high-energy-cosmic-rays-video>
2. **Video clip of total solar eclipse seen over North America.** <https://petapixel.com/2017/09/02/total-solar-eclipse.-looks-like-4k-real-time-up-close-views>
3. **Cassini's last photos.** https://www.space.com/38170-cassini-spacecraft-saturn-crash-site-photos.html?utm_source=sd-newsletter&utm_medium=email&utm_campaign=20170915-sdc
4. **Animation of Cassini's burnup in Saturn's atmosphere.** https://www.space.com/37970-saturn-polar-vortex-cassini-photo.html?utm_source=sd-newsletter&utm_medium=email&utm_campaign=20170830-sdc
5. **Cassini's voyage and its greatest achievements.** http://www.nationalgeographic.com/science/2017/09/cassini-saturn-nasa-3d-grand-tour/?utm_source=NatGeocom&utm_medium=Email&utm_content=specialedition_cassini_20170915&utm_campaign=Content&utm_rd=1654931348%20#preamble
6. **"Our Saturn years."** Cassini's epic journey to the ringed planet, told by the people who made it happen. http://www.bbc.co.uk/news/resources/idt-sh/cassini_huygens_saturn
7. **NASA's free e-book offers top 100 Cassini images.** https://www.space.com/38166-cassini-saturn-photos-nasa-ebook.html?utm_source=sd-newsletter&utm_medium=email&utm_campaign=20170915-sdc
8. **Jaw-dropping Jupiter: Juno probe snaps dramatic up-close views of planet.** https://www.space.com/38192-jupiter-photos-juno-spacecraft-september-flyby.html?utm_source=sd-newsletter&utm_medium=email&utm_campaign=20170920-sdc
8. **Glowing red eye: cosmic bubble surrounds odd 'carbon star'.** U Antliae is a red giant star that has thrown off a surrounding shell of gas. https://www.space.com/38202-carbon-star-bubble-alma-photos-video.html?utm_source=notification
9. **Asteroid odd couple: spitting space rock duo is truly bizarre.** It's a binary asteroid that has a comet-like tail. <https://www.space.com/38214-spitting-asteroids-hubble-telescope-discovery.html>
10. **Sputnik: 60 years.** https://www.space.com/38357-sputnik-launch-60th-anniversary-space-age.html?utm_source=notification

Chairperson's report for the meeting on 27 September 2017

- by Michelle Ferreira & Percy Jacobs

The September meeting was well attended by around 24 persons. Under beginner's corner, Michael Poll gave us a talk on Pluto, which is designated as a "minor-planet". Pluto was discovered Feb 1930 by Clyde Tombaugh. It was explained how people came to realize that something must be out there which affected the orbit of Uranus due to some or other gravitational influence. Using the "blink-comparator" method, Tombaugh finally found Pluto. He studied photographic plates for 7,000hrs. The name Pluto, after the, "god-of-the-underworld" was proposed Venetia Burney, an eleven-year-old schoolgirl in Oxford, England. Pluto is approx. equal in size to Mars. The brightness of Pluto is determined by its albedo and distance from the sun. Pluto's orbit is rather unusual. It takes 247.7 years to go around the Sun. It's orbit is inclined by 17°. In 1989, at perihelion, it was 4.4 billion km's away from the Sun. In 2114, it will be 7.3 billion km's away. The orbit of Pluto crosses the orbit of Neptune. It's magnitude varies from 13.6 to 16.3. From 1992 onward, many bodies were discovered orbiting in the same volume as Pluto, showing that Pluto is part of a population of objects called the Kuiper Belt. This made its official status as a planet controversial, with many questioning whether Pluto should be considered together with or separately from its surrounding population. As objects increasingly closer in size to Pluto were discovered in the region, it was argued that Pluto should be reclassified as one of the Kuiper belt objects, just as Ceres, Pallas, Juno, Vesta, that lost their planet status, after the discovery of many other asteroids. July 29, 2005, astronomers announced the discovery of a new "TNO," (Trans-Neptunian Object), Eris, which was substantially more massive than Pluto and the most massive object discovered in the Solar System since Triton in 1846. For the classification of a planet, according to the IAU Resolution, is as follows:

1. The object must be in orbit around the Sun.
2. The object must be massive enough to be rounded by its own gravity.
3. It must have cleared the neighbourhood around its orbit.

Contributed by Percy Jacobs:

Thereafter Johan Smit presented What's Up and included some interesting information around the rich African Astronomy Heritage, as a contribution to Heritage month. The bright reddish star Antares, lies in the beautiful constellation of Scorpius and was called "The Fire-Finishing Star" by the !Xu Bushmen for looking like a glowing coal. Another bright star Formelhaut is called Ndemara, "The Sweetheart Star" by the Shona and Ntshuna "The Kiss Me Star", by the Tswana. The Sotho saw the clouds as the spoor of two celestial animals. The large Magellanic Cloud was Setlhako sa Naka, "The Spoor of the Horn Star" (Naka, Canopus) and the smaller Magellanic Cloud was Setlhako sa Senakane, "The Spoor of the Little Horn Star". These would be indicators of drought or famine. Capella is called iNtshola by the Zulu and is "The Cattle Thief" and the Nyae Nyae iKung Bushmen called it "Green Leaf Horn" and knew that when it was visible, the first flowers would bloom with the coming of the season of rains. For more interesting insight, refer to African ethnoastronomy, Venus Rising: <https://assa.sao.ac.za/astronomy-in-south-africa/ethnoastronomy/>

Johan Smit concluded the evening with the main talk on the "Secrets of the Foucault test". This was presented on his laptop and a very informative and also enjoyable interactive session. Hope many more of us have now gleaned a better understanding in the making and use of mirrors for our telescopes. Ω

Observing: The Crab Nebula viewing season is almost upon us

- by Michael Poll

The Crab Nebula is Number One ("M 1") on Charles Messier's list of nebulous objects. It is in the northern evening sky from about the beginning of November until about the end of February.

Charles Messier was a Frenchman who came to Paris in 1751 at the age of 21. He discovered 21 comets. By chance, in August 1758, Messier found a small object, which he described as: *"nebulosity above the southern horn of Taurus, not containing any star. It is a whitish light, elongated like the flame of a taper, discovered while observing the comet of 1758this light was a little like that of a comet I had observed before, however it was too bright, too white, and too elongated to be a comet"*.

Later, Messier became serious about making a list of such nebulous objects, saying *"I endeavoured to find others so that astronomers would not confuse these same nebulae with comets just beginning to shine"*.

Although Messier discovered the Crab Nebula independently, he learned later that the object had been discovered in 1731 by the Englishman John Bevis. Bevis informed Messier of his own discovery in a letter to Messier dated June 10th 1771. Messier acknowledged this original discovery in the later publications of his catalogue.

The nebula was named "The Crab" because it had the appearance of a crab's claw in a drawing done by Lord Rosse in 1848. Rosse noted that it had *".... branches streaming off from the oval boundary like claws"*.

The Crab Nebula is the remnant of a supernova that exploded in 1054. The original explosion was recorded in China, where it was stated to have been visible in daylight for more than three weeks. No one in Europe knew about this supernova until 1846, when records were found in Chinese annals.

In 1921, the American, John Duncan, found that the nebula was expanding and he noted that the speed of expansion implied an explosion 900 years previously. It was Edwin Hubble, in 1928, who suggested that the nebula was the remains of the Chinese supernova of 1054. The nebula is 6 300 light years away.

The finder chart on the next page is taken from Sky and Telescope, February 2007, page 52. The Nebula is in the constellation of Taurus, and the bright star in the field, Zeta (ζ) Tauri, is the star that Messier described as "the southern horn of Taurus". Ω



The Crab Nebula

ONE OF THE WINTER SKY'S most interesting objects is also one of its most challenging for binocular observers. M1, the famed Crab Nebula in Taurus, is well known both as the first entry in Charles Messier's catalog of deep-sky objects and as the remnant of a supernova that blazed Venus-bright in the year 1054.

In the predawn hours of August 28, 1758, Messier was observing a comet in Taurus when he noticed a second small fuzzy patch in the same field of view. Initially he believed that he had chanced upon a new comet, but when the object remained motionless against the stars in repeated observations, he realized that he had been deceived. The incident prompted Messier to begin compiling his list of faux comets so that he and other comet hunters could avoid such confusion in the future.

M1 is the exploded debris from a massive star's spectacular death. According to Chinese chroniclers, the Crab supernova remained visible in broad daylight for more than three weeks. One reason was its relative proximity, a mere 6,300 light-years away.

The Crab's general position is easy enough to find. Locate Zeta (ζ) Tauri, the tip of the Bull's eastern horn, and place it about halfway toward your binocular field's southeast edge. Then use the short leg of the little triangle indicated on the chart above as a pointer to the nebula's exact spot.

In my 15 × 45 image-stabilized binoculars, the Crab appears as a compact hazy patch that indeed looks very cometlike. My tripod-mounted 10 × 50s also show it well, if less distinctly. Be warned, though: The Crab is only 9th magnitude, so dark skies are a must if you're to succeed in finding the Messier catalog's first listing.

NOTICE BOARD

- ◆ **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.

Feature of the month: The danger of asteroids – by Pierre Lourens

NEA's (Near Earth Asteroids) are asteroids with orbits that come close to Earth's orbit. New ones are routinely being discovered. Some of them passed close to Earth. Of the latter, many were discovered when they were just about on us, sometimes even when they had already passed us. Here are two examples:

On Feb. 15, 2013, an asteroid slammed into the atmosphere over the Russian city of Chelyabinsk. It did not reach the surface, but when it disintegrated, it created a shock wave that injured 1 200 people. The space rock is thought to have measured about 20 meters wide when it entered Earth's atmosphere. It was not even detected at all before it hit Earth.

Asteroid 2012 TC4 is about the same size. It passed Earth recently at a distance of only 88 000 km, which is only about one fifth the distance between Earth and its moon. And five years from now, it will pass again at half that distance. This is just beyond the orbit of geostationary satellites, which orbit at a distance of 36 000 km. This one was already detected in 2012. If it had been much bigger and had come straight for us, we would have been helpless sitting ducks, praying for deliverance.

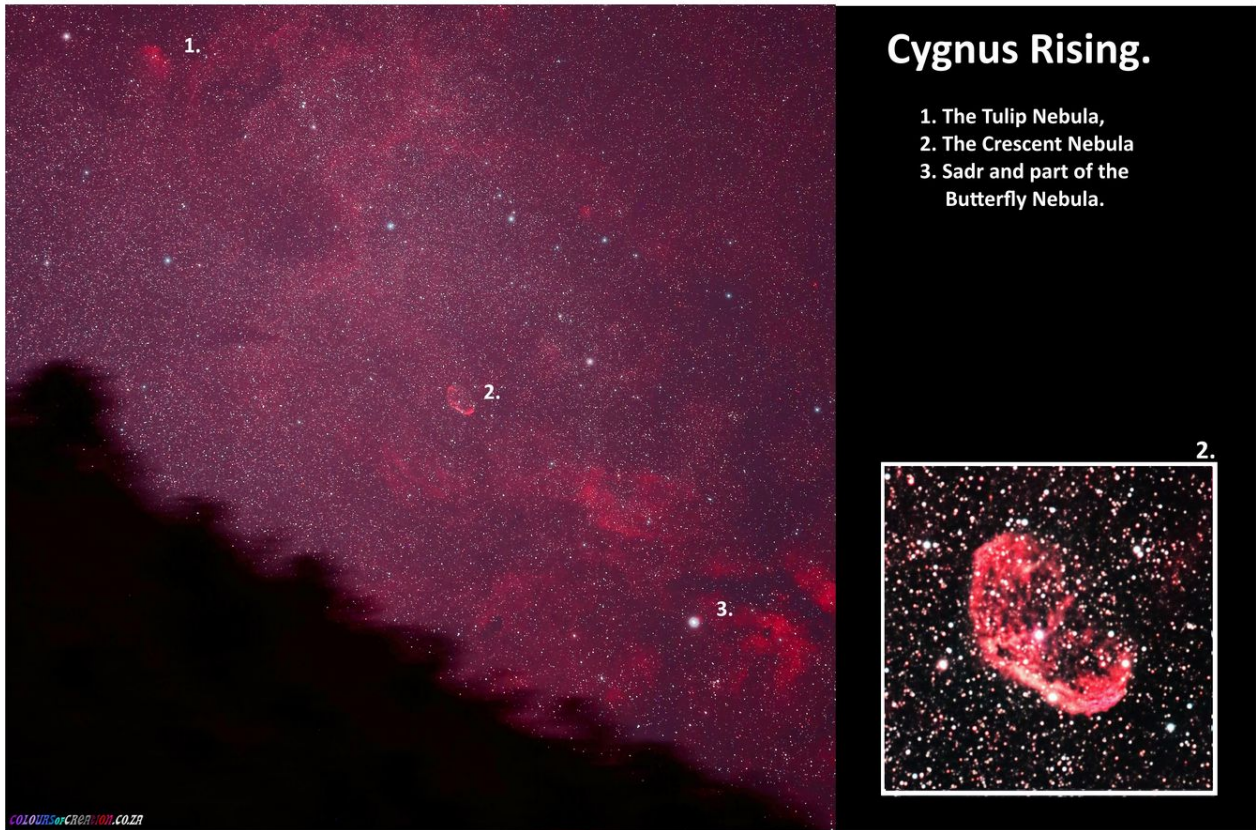
These two recent occurrences, as well as many others, emphasize the need for improving our asteroid detection programmes and for developing asteroid deflection technology. Ω

https://www.space.com/51-asteroids-formation-discovery-and-exploration.html?utm_source=sd-newsletter&utm_medium=email&utm_campaign=20171010-sdc

Astronomy basics: The ecliptic - path of the Sun

As a result of the fact that the Earth moves around the Sun during the course of a year, the Sun apparently moves eastward against the background of stars. The ecliptic is the apparent path of the centre point of the Sun on the celestial sphere. See a video clip that illustrates this. Ω

<https://www.youtube.com/watch?v=Qh9CwOQ2tTM>



Photograph of the northern constellation Cygnus (The Swan) aka The Northern Cross, taken by Johan Moolman.





Above: NGC 6334 (aka **Cat's Paw Nebula**, **Bear Claw Nebula** and **Gum 64**) is an emission nebula and star-forming region located in the southern constellation Scorpius. It was discovered by astronomer John Herschel in 1837, who observed it from the Cape of Good Hope in South Africa. Photographs by Johan Moolman.

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