



## NEWSLETTER SEPTEMBER 2018

### NEXT MEETING

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

**Date and time:** Wednesday 26 September at 19h15.

**Programme:**

- **Beginner’s Corner:** “Feedback from Karoo Star Party 2018 and ScopeX 2018”  
by Johan Moolman.
- 
- **What’s Up?** by Michael Moller.

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

- **Main talk:** “Our dynamic Earth ” by Danie Barnardo.
- **Socializing over tea/coffee and biscuits.**

The chairperson at the meeting will be Fred Oosthuizen.

### NEXT OBSERVING EVENING

Friday 21 September 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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## Astronomy- related articles on the Internet

**Young star caught eating its planet.** Now astronomers have the first solid evidence – from the Chandra X-ray Observatory – of such an event.

[http://earthsky.org/space/1st-evidence-young-star-devouring-planet-chandra?utm\\_source=EarthSky+News&utm\\_campaign=b17ba66d88-EMAIL\\_CAMPAIGN\\_2018\\_02\\_02\\_COPY\\_01&utm\\_medium=email&utm\\_term=0\\_c643945d79-b17ba66d88-394671529](http://earthsky.org/space/1st-evidence-young-star-devouring-planet-chandra?utm_source=EarthSky+News&utm_campaign=b17ba66d88-EMAIL_CAMPAIGN_2018_02_02_COPY_01&utm_medium=email&utm_term=0_c643945d79-b17ba66d88-394671529)

**61 Cygni is the Flying Star.** [http://earthsky.org/brightest-stars/61-cygni-suns-near-neighbor?utm\\_source=EarthSky+News&utm\\_campaign=7de6963fa7-EMAIL\\_CAMPAIGN\\_2018\\_02\\_02\\_COPY\\_02&utm\\_medium=email&utm\\_term=0\\_c643945d79-7de6963fa7-394671529](http://earthsky.org/brightest-stars/61-cygni-suns-near-neighbor?utm_source=EarthSky+News&utm_campaign=7de6963fa7-EMAIL_CAMPAIGN_2018_02_02_COPY_02&utm_medium=email&utm_term=0_c643945d79-7de6963fa7-394671529)

**Scientists identify best exoplanets for Earth-like life.** Scientists have now identified some exoplanets that might have suitable temperatures for liquid water and enough UV light for the chemistry thought to have led to life on Earth.

<http://earthsky.org/space/scientists-identify-exoplanets-possible-best-conditions-life>

**Dark Rift in the Milky Way.** There is a long, dark lane dividing the bright Milky Way. This Dark Rift is a place where new stars are forming. [http://earthsky.org/clusters-nebulae-galaxies/the-great-rift-in-the-milky-way?utm\\_source=EarthSky+News&utm\\_campaign=95ce632f60-EMAIL\\_CAMPAIGN\\_2018\\_02\\_02\\_COPY\\_01&utm\\_medium=email&utm\\_term=0\\_c643945d79-95ce632f60-394671529](http://earthsky.org/clusters-nebulae-galaxies/the-great-rift-in-the-milky-way?utm_source=EarthSky+News&utm_campaign=95ce632f60-EMAIL_CAMPAIGN_2018_02_02_COPY_01&utm_medium=email&utm_term=0_c643945d79-95ce632f60-394671529)

**Parker Solar Probe.** This observatory will eventually orbit as close as 4.8 million km from the photosphere of the Sun. (The Earth's average distance from the Sun is 150 million km.)

<https://www.nasa.gov/content/goddard/parker-solar-probe-humanity-s-first-visit-to-a-star>

**Astronomers find weird rogue world with wild auroras.** This free-floating rogue planet – untethered to any star – has a magnetic field millions of times more powerful than Earth's and auroras much more brilliant than Earth's.

<http://earthsky.org/space/rogue-planet-powerful-magnetic-field-brilliant-auroras>

**Astronomers see a baby planet growing.** PDS 70b is the first newly-formed planet confirmed by astronomers to be actively accreting material from the circumstellar disk surrounding its star.

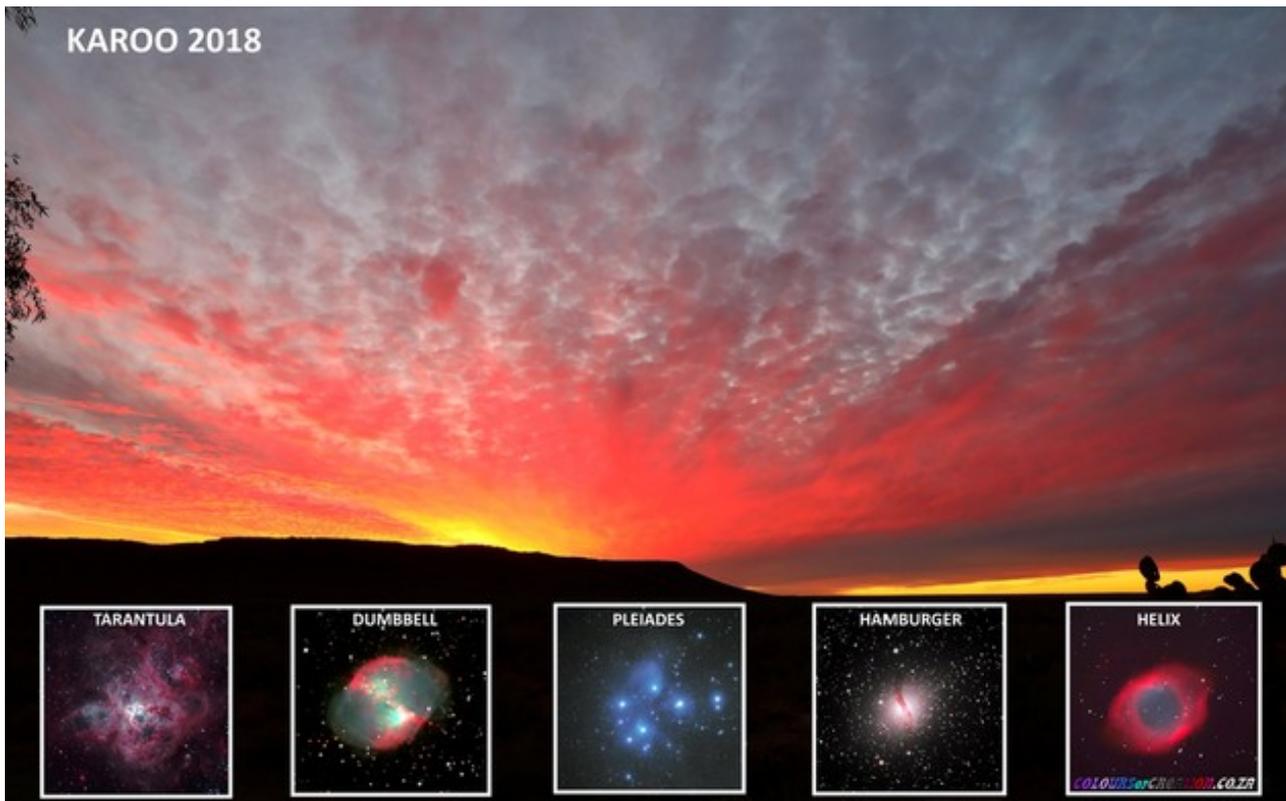
[http://earthsky.org/space/astronomers-see-baby-planet-pds-70b-growing?utm\\_source=EarthSky+News&utm\\_campaign=35463b5d6a-EMAIL\\_CAMPAIGN\\_2018\\_02\\_02\\_COPY\\_01&utm\\_medium=email&utm\\_term=0\\_c643945d79-35463b5d6a-394671529](http://earthsky.org/space/astronomers-see-baby-planet-pds-70b-growing?utm_source=EarthSky+News&utm_campaign=35463b5d6a-EMAIL_CAMPAIGN_2018_02_02_COPY_01&utm_medium=email&utm_term=0_c643945d79-35463b5d6a-394671529)

**OSIRIS-REx sets sights on asteroid Bennu.** NASA released the 1st images of asteroid Bennu from OSIRIS-REx, its first mission to an NEA.

[http://earthsky.org/space/osiris-rex-asteroid-bennu-1st-images-aug-2018?utm\\_source=EarthSky+News&utm\\_campaign=5ba8d07f8f-EMAIL\\_CAMPAIGN\\_2018\\_02\\_02\\_COPY\\_01&utm\\_medium=email&utm\\_term=0\\_c643945d79-5ba8d07f8f-394671529](http://earthsky.org/space/osiris-rex-asteroid-bennu-1st-images-aug-2018?utm_source=EarthSky+News&utm_campaign=5ba8d07f8f-EMAIL_CAMPAIGN_2018_02_02_COPY_01&utm_medium=email&utm_term=0_c643945d79-5ba8d07f8f-394671529)

**Astronomers map a starburst galaxy.** The monster or starburst galaxy COSMOS-AzTEC-1 is now known to have two gigantic star-forming lobes off-center in the galaxy. It's known to be producing stars at a rate 1000 times as fast as our Milky Way.

[http://earthsky.org/space/starburst-galaxy-cosmos-aztec-1-unstoppable-monster?utm\\_source=EarthSky+News&utm\\_campaign=a36a0e9c37-EMAIL\\_CAMPAIGN\\_2018\\_02\\_02\\_COPY\\_01&utm\\_medium=email&utm\\_term=0\\_c643945d79-a36a0e9c37-394671529](http://earthsky.org/space/starburst-galaxy-cosmos-aztec-1-unstoppable-monster?utm_source=EarthSky+News&utm_campaign=a36a0e9c37-EMAIL_CAMPAIGN_2018_02_02_COPY_01&utm_medium=email&utm_term=0_c643945d79-a36a0e9c37-394671529)



**Photographs taken by Johan Moolman at the Karoo Star Party 2018.**

### Observing: NGC 3114, a special cluster - by Magda Streicher

When the constellation of Carina makes her appearance in the south-east and at the foot of the constellations Vela and Puppis, she brings with her a sense of deep enchantment.

NGC 3114 was one of the first memorable objects I studied in this fairy tale constellation. To find the cluster, and also a naked-eye object, is easy enough. Start with the two eastern-most stars of the False Cross, magnitude 2.2 iota Carinae and 2.4 kappa Velorum. From iota Carinae it is almost 6 degrees east-south-east, halfway to the Eta Carina nebula. NGC 3114 is a large, bright cluster, its stars, haphazardly dispersed, coming in a range of magnitudes. On the southern edge of the grouping is a curved string of stars with a reddish magnitude 6 member that is brighter than the rest of the stars in the cluster. The northern part of the cluster appears denser but fainter. The cluster is believed to be an amazingly ancient 110 million years old. Under ideal dark skies it can even be glimpsed with the naked eye. Just 30' to the south-east of NGC 3114, is the attractive open cluster Trumpler 12 with its 12 splinters of starlight. Stars randomly form a half-moon shape that opens towards the western side. Another string attached to it runs out to the west-south-west.

James Dunlop discovered NGC 3114 while surveying the sky at Parramatta Observatory after arriving in Sydney Australia in 1821. Between April and November 1826 Dunlop discovered 629 galaxies, nebulae and clusters.

Explore the bow of the ancient ship Argo, seeing NGC 3114 as the plume of smoke curling up towards the skies, if you allow your imagination to come into play.

OBJECT	TYPE	RA	DEC	MAGNITUDE	SIZE
NGC 3114	Open cluster	10h 02.7m	-60° 06.0'	4.2	35'



NGC 3114

Photographs of the total lunar eclipse on 27 July 2018, taken by Johan Moolman.



**Photographs of the total lunar eclipse on 27 July 2018, taken by Barbara Cunow. t stands for time.  $t_1 < t_2 < t_3 < t_4 < t_5 < t_6$ .**



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

**Wow! Zoom to the Milky Way's centre.** Decades of work have gone into probing the heart of our Milky Way galaxy. See a video clip showing stars orbiting the 4-million-solar-mass black hole at our galaxy's core.

[http://earthsky.org/space/video-zoom-in-to-the-center-of-the-milky-way?utm\\_source=EarthSky+News&utm\\_campaign=7de6963fa7-EMAIL\\_CAMPAIGN\\_2018\\_02\\_02\\_COPY\\_02&utm\\_medium=email&utm\\_term=0\\_c643945d79-7de6963fa7-394671529](http://earthsky.org/space/video-zoom-in-to-the-center-of-the-milky-way?utm_source=EarthSky+News&utm_campaign=7de6963fa7-EMAIL_CAMPAIGN_2018_02_02_COPY_02&utm_medium=email&utm_term=0_c643945d79-7de6963fa7-394671529)

**More favourite Perseid meteor shower photos.**

[http://earthsky.org/todays-image/photos-perseid-meteor-shower-2018?utm\\_source=EarthSky+News&utm\\_campaign=7de6963fa7-EMAIL\\_CAMPAIGN\\_2018\\_02\\_02\\_COPY\\_02&utm\\_medium=email&utm\\_term=0\\_c643945d79-7de6963fa7-394671529](http://earthsky.org/todays-image/photos-perseid-meteor-shower-2018?utm_source=EarthSky+News&utm_campaign=7de6963fa7-EMAIL_CAMPAIGN_2018_02_02_COPY_02&utm_medium=email&utm_term=0_c643945d79-7de6963fa7-394671529)

**A 'fireball' 40 times brighter than the moon shoots across Alabama skies.** See a video clip. [https://www.livescience.com/63379-nasa-spots-fireball.html?utm\\_source=ls-newsletter&utm\\_medium=email&utm\\_campaign=20180820-ls](https://www.livescience.com/63379-nasa-spots-fireball.html?utm_source=ls-newsletter&utm_medium=email&utm_campaign=20180820-ls)

## August 17<sup>th</sup> 2018 observing evening report - by Michael Poll

Aaagh! Clouds at the wrong time. Neville Young was there with students from the astronomy module at Sefako Makgatho University (SMU), and he was aiming to test them on what they had learned, but as they arrived so did some patches of indolent cloud, which, as they do, parked in front of the bit of sky that one wanted to look at. Neville Percy and Michael had brought telescopes.

The blue sky during the day had that milky look which is due to dust, and this, the street lights and half Moon, rendered the stars invisible apart from some first magnitude stars – we could see Arcturus, Vega, Altair the Southern Cross and Alpha and Beta Centauri. For example Alpha Librae at magnitude 2.7 and Beta Cygi (Albireo) also at magnitude 2.7 were hardly, if at all, visible to the naked eye.

Fortunately there was a Moon and there were four planets in view. We looked at the Moon, but not in much detail as the cloud kept intervening. Venus was high in the west, showing a half phase – greatest elongation of  $46^\circ$  was on the very day. We showed Jupiter and its moons, Saturn with its rings and Mars, on which not much detail was visible. We did manage to skim around the sky and show some other things to the students as the gaps in the clouds came by – Michael showed Arcturus and Vega in the telescopes to show the difference in colour, and he also found Albireo as an example of a double star with components of contrasting colours. In addition to this, it was mentioned that the brighter stars of Cygnus form what is known as the “Northern Cross”. People were surprised that there was such a thing, but it is not surprising that they did not know about it as it is not mentioned much in these southern parts. However, the brightest star, Deneb, was not visible so a constellation book and one’s imagination came into play. We noted that Alpha Centauri, Arcturus and Vega were the 3<sup>rd</sup>, 4<sup>th</sup> & 5<sup>th</sup> brightest stars in the night sky. We also noted the Southern Cross and the Pointers and there was the usual discussion about finding south.

It was discussed with some of the students that the constellation names we use are based on Greek and Roman (“western”) mythology, and the star names are commonly Arabic. Michael recounted the story of Perseus and Andromeda, which some of the students had heard about. We had a laugh about the fact that the head full of snakes that Perseus showed to the sea monster was that of Medusa, which was not to be confused with the old name of SMU which was Medunsa.

Around 8.00 pm 5 visitors arrived – there was Mahomed and Nadia, and Marietjie and her two sons. (apologies if the names are recorded incorrectly). We did the tour of the sky again and showed the Skymaps chart. Marietjie had brought her 4 ½ inch telescope which she wanted to set up, so after more or less aligning the finder with the tube, she had a first look at the Moon with her own telescope.  $\Omega$

## **Chairman's report for the meeting on 22 August 2018 – by Bosman Olivier**

The meeting was attended by approximately 20 persons. Michael Poll started the evening with his talk on conjunctions, which is defined as the time when two objects appear close together in the sky. A more specific meaning of the word conjunction also exists. A conjunction can be of an outer planet with the Sun, an inner planet with the Sun, the Moon with the Sun (New Moon), the Moon with a planet, the Moon with a star, a planet with another planet and, finally, a planet with a star.

With this definition in mind, a conjunction of the Moon and a planet occurs about once per month because the Moon travels once around the sky in that time and it passes the more slowly moving planets during this period. It must be realized that the time of closest approach may not be at the observers own local time.

Michael stimulated our conjunction appetites by describing the Great Conjunction between Jupiter and Saturn which is slowly approaching. In 2016 the setting times of these two planets were about six hours apart, in 2017 it was about 4,5 hours and this year it is 3,5 hours. In 2019 the difference will be approximately 2 hours and in 2020 it will be less than an hour. The planets will appear closest to each other on 21 December 2020, when the planets will then be only 6' apart.

On the same day Jupiter and Saturn will have both a RA conjunction at 13:22 and an ecliptic conjunction at 18:37.

These Great conjunctions occur between 18 to 20 years apart, when Jupiter's 12-year orbit catches up with Saturn, whose orbit is 29,5 years. The next ones after 2020 will be on 31 October 2040, 7 April 2060 and 15 March 2080

According to Michael there are two definitions for conjunction depending on the choice of coordinate grid. These are Conjunctions in Right Ascension and conjunction in Ecliptic Longitude. These are both valid definitions.

Conjunctions can also occur in both RA and Ecliptic Longitude, or in RA and not in Ecliptic Longitude or in Ecliptic Longitude and not in RA.

If the co-ordinate grid is based on the celestial equator, then a conjunction occurs when two bodies have the same RA. The poles of this co-ordinate grid are the north and south celestial poles.

If the coordinate grid based on the ecliptic is used, conjunction occurs when two bodies have the same Ecliptic Longitude (EL).

EL is measured eastward in degrees from the March (Vernal) Equinox. The EL tells us how far around the ecliptic the planet is.

Conjunction in EL means the two bodies have the same Ecliptic Longitude. The poles of this coordinate grid are at RA 18h and 6h and at declination 66,5 degrees north and south.

Other terms that may appear when the subject of conjunctions are discussed are Appulses (the closes approach to two objects that are not in conjunction in the strict definition of the word; "Quasi-conjunction" when two bodies are within 5° of each other; and A trio refers to any grouping of three planets or two planets and a bright star within a circle of less than 5° in diameter.

Planetary conjunctions can be easily identified using the diagrams of the rise and set times in the Sky Guide, Africa South. They occur when either the rise lines or the set lines intersect. From these charts it is clear that Venus and Mercury will be in conjunction in the early evening of October 1 and a conjunction of Mercury and Jupiter will follow about two weeks later, also in the early evening.

Triple conjunctions occur when two planets of a planet and a star meet each other three times in a short period. A triple conjunction may occur in RA and not in EL or vice versa. If a planet makes a retrograde loop a triple conjunction may occur in RA and one may occur in EL. A triple conjunction may occur in RA and not in EL or vice versa.

Michael continued to explain that for triple conjunctions of planets, the dates of their opposition should be close together. These events do not occur often and the next triple conjunction between Mars and Jupiter will only occur in 2123 again, while a Mars and Saturn triple will occur in 2148-2149. Jupiter and Saturn will have a triple in 2238.

Next Michael discussed the Venus-Jupiter conjunctions which occur at intervals of about 3 years and 3 months. The synodic periods of Venus (1,6 years) and Jupiter (1,09 years) means that Venus has to complete two synodic periods (3,2 years) before it catches up with Jupiter after it has completed three synodic periods (3,27 years). Because the 3,27-year cycle of Jupiter is slightly longer than the two-year cycle of Venus, the morning conjunctions of the planets gradually move closer to the sun, while the evening conjunctions move away from the sun. Although Venus-Jupiter conjunctions generally occur only once, triples are possible when Jupiter encounters Venus when Venus is nearly at its greatest elongation from the Sun in the evening sky, Venus can pass Jupiter a second time at or near inferior conjunction and Venus can pass Jupiter a third time in the morning sky.

Triple conjunctions mark the end or the beginning of a series of conjunctions lasting some 70 years.

The next conjunctions of Venus and Jupiter will occur on 22 January 2019 with Venus 2°6" degrees north of Jupiter in the morning sky and on 24 November 2019 in the evening sky with Venus 1°24" south of Jupiter.

Michael concluded his presentation with a discussion of various other conjunctions involving stars and the planets.

In his What's Up section Percy Jacobs entertained us with views from the recent Karoo Star Party, starting off with the arrival, unpacking and setting bay the various members who attended.

He then reminded us of the September Equinox and the best viewing dates for the month. The positions of the planets around 12 September was discussed, with most of the planets being visible naked eye and Uranus and Neptune as telescopic objects. The Piscid Meteor Shower was also discussed, with the peak as 9 September, with some 6 meteors per hours being visible.

Percy then discussed the views toward the south, east and north. He concluded his presentation with a report on the past Lunar Eclipse in July, highlighted with photographs by Barbara Cunow and Johan Moolman, both members of the branch. The main talk was delivered by Jose da Silva, an astronomy graduate of Unisa, who discussed the atmospheres of exoplanets under the title: "Alien Worlds, alien weather: investigating exoplanet atmospheres". The was a practice run for the talk he plans to present at Scopex in September.

According to Jose one probes these alien worlds by measuring the ultraviolet (UV), optical or infrared spectra of their atmospheres. There are only two methods – direct imaging (44 cases) and transit spectroscopy (2974 cases) that yield photos from the planet itself. This enable direct measurement of atmospheric properties.

He then discussed transit spectroscopy as a means of studying the characteristics of exoplanets. In these cases, the exoplanet transits its star with a resulting dip in the brightness of the star. This dip is measured by means of specialized equipment. He showed graphs of some of the work he performed while studying at Unisa, using their Celestron C14 14" SCT telescope and a SBIG ST9-XE CCD camera. He also showed that this work is possible by using a DSLR camera, using a 10" Meade SCT, DSLR and exposures of 105 seconds.

Jose is also involved in a project with Neville Young, using a 10" Meade SCT and a DSLR camera taking 15 second exposures. They are looking at exoplanet HD189733b orbiting the star HD189733 in Vulpecula.

He also discussed the work of Gabriella Mallén-Ornelas and Sara Seager who developed the intricate mathematics to analyse the photometric results. Kepler's laws are used to determine further characteristics of the exoplanets.

Several parameters of exoplanets can be determined from their light curve. These include orbital period, area relative to the star, duration of the transit, the stellar mass and radius, orbital semi-major axis, orbital inclination and planet radius.

By studying the isolated spectrum of the planet, the composition of its atmosphere can be determined. By using several space-based and earth based-telescopes a comprehensive study of the atmosphere of WASP-39b was made. The signal strength indicates the concentration of the various molecules in the atmosphere.

By means of these studies of the spectra of the atmospheres of different planets, it could be determined that it rains sulphuric acid on Venus, possibly diamonds on Neptune, and methane on Titan. It also possibly rains glass on planet HD 198733b and iron on planet OGLE-TR-56b.

It has also been determined by the Pioneer Venus spacecraft that the sulphuric acid rain on Venus evaporated before it reached the surface of the planet. The diamonds on Neptune, if they occur, do so in the deep atmosphere. The iron rain on OGLE-TR-56b is only theoretically possible.

Quoting from an article by Deming and Seager, he pointed out that these measurements are difficult since the signals are often only .0001% of the host star's flux. This shows that "some early results have been illusory and not confirmed by subsequent investigations".

"Topics at the current frontier include the measurement of heavy elements on exoplanets and using polarimetry and albedo in the analyses of their atmospheres.  $\Omega$

## NOTICE BOARD

- ◆ **Beanies.** Beanies will be offered for sale @ R40.00 each at every monthly meeting, until they are sold out.
- ◆ **New Zooniverse project.** This is for citizen scientists and is about gravitational lensing. Can you beat the artificial intelligence that is used for finding gravitational lenses in images of galaxies?  
<https://www.zooniverse.org/projects/hughdickinson/euclid-challenge-the-machines>
- ◆ **Another new Zooniverse project.** This is also for citizen scientists. In this project your help is needed to look through data from the SuperWASP survey and identify different types of variable stars.  
[https://www.zooniverse.org/projects/ajnorton/superwasp-variable-stars?utm\\_source=Twitter&utm\\_campaign=announce5sep2018](https://www.zooniverse.org/projects/ajnorton/superwasp-variable-stars?utm_source=Twitter&utm_campaign=announce5sep2018)
- ◆ **Home page of SKA web site.** Put this web link on your list of favourite web links.  
<https://www.skatelescope.org>
- ◆ **Home page of MeerKAT web site.** Put this web link on your list of favourite web links. <http://www.ska.ac.za/>
- ◆ **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 data base of the books in our library is to be found on our website.

### Astronomy basics: The multiverse idea - by Pierre Lourens

In my younger days I read a lot of science fiction (SF). (Sadly, one seems to outgrow doing this.) I can recall a striking sentence from one of the late Arthur C Clarke's SF novels: "*Many and strange are the universes that drift like bubbles in the foam upon the river of Time.*" When it was written, the idea of an almost infinite number of parallel universes with other laws of physics than our own, was just science fiction. Nowadays, the idea is taken seriously by cosmologists.

A clear, popular explanation of this important idea in present-day cosmology is to be found at the following web link. It will require concentrated effort to understand it. But I think it is worth the effort.  $\Omega$  <http://documentaryheaven.com/which-universe-are-we-in/>

**Pretoria Centre committee**

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**Feature of the month: NEO's**

[http://earthsky.org/space/asteroid-tracking-center-for-near-earth-object-studies?utm\\_source=EarthSky+News&utm\\_campaign=22496f004f-EMAIL\\_CAMPAIGN\\_2018\\_02\\_02\\_COPY\\_01&utm\\_medium=email&utm\\_term=0\\_c643945d79-22496f004f-394671529](http://earthsky.org/space/asteroid-tracking-center-for-near-earth-object-studies?utm_source=EarthSky+News&utm_campaign=22496f004f-EMAIL_CAMPAIGN_2018_02_02_COPY_01&utm_medium=email&utm_term=0_c643945d79-22496f004f-394671529)