The PRETORIA CENTRE
of the
Astronomical Society of Southern Africa
www.pretoria-astronomy.co.za

NEWSLETTER MAY 2019

NEXT MEETING

Venue: The auditorium behind the main building at Christian Brothers College (CBC), Mount Edmund, Pretoria Road, Silverton, Pretoria.
Date and time: Wednesday 22 May at 19h15.
Programme:

- **Beginner's Corner:** "Sunspots and the sunspot cycle part 1" by Michael Poll *****.
- **What's Up?** by Johan Smit.

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

- **Main talk:**"Sunspots and the sunspot cycle part 2" by Michael Poll *****
- **Socializing over tea/coffee and biscuits.**

The chairperson at the meeting will be Bosman Olivier.
***** See page 7 for a summary of this talk.

NEXT OBSERVING EVENING

Friday 17 May 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.

TABLE OF CONTENTS

Astronomy-related articles on the Internet

The 12 strangest objects in the Universe.
https://www.livescience.com/64993-weirdest-celestial-objects.html?utm_source=ls-newsletter&utm_medium=email&utm_campaign=20190318-ls

What happened before the Big Bang?
https://www.livescience.com/65254-what-happened-before-big-big.html?utm_source=ls-newsletter&utm_medium=email&utm_campaign=20190421-ls

How will the Universe end? In textbooks and cosmology class, budding cosmologists learn that there are three scenarios for the end of the Universe. What are they? See: https://www.livescience.com/65299-how-will-the-universe-end.html?utm_source=ls-newsletter&utm_medium=email&utm_campaign=20190424-ls

Navy plans to document UFO sightings, but keep them confidential. The U.S. Navy plans to set up an official reporting and investigative system that will monitor reports from its pilots about unidentified flying objects. The Navy doesn't intend to make the data public. "The military is interested in this stuff not because they think that Klingons are sailing in the skies, but I think because maybe they think the Chinese or the Russians are sailing through the skies," said Seth Shostak. a senior astronomer at the Search for Extraterrestrial Intelligence (SETI) Institute.
https://www.livescience.com/65387-navy-ufo-sightings.html

7 things most often mistaken for UFO's. https://www.livescience.com/32849-7-ways-to-generate-a-great-space-hoax.html

'Alien' lights in Norway were a NASA test, not an extraterrestrial visit.
https://www.livescience.com/65176-aurora-alien-lights-nasa.html?utm_source=ls-newsletter&utm_medium=email&utm_campaign=20190409-ls

Japan creates first artificial crater on an asteroid.
https://www.msn.com/en-za/news/techandscience/japan-creates-first-artificial-crater-on-asteroid/ar-BBWhoGl?ocid=spartandhp

How do you stop a hypothetical asteroid from hitting Earth? NASA's on it.
https://www.livescience.com/65390-asteroid-threat-simulation-nasa-deflection-idea.html?utm_source=ls-newsletter&utm_medium=email&utm_campaign=20190504-ls

Our library

- Members are invited to make more use of our library. There are many astronomy books of a considerable variety there that can be taken out by members. The library is open during the break at our monthly meetings.
- Members are reminded that a database of the books in our library is to be found on our website. Go to the home page, then left click on "Click for Library website".

Astronomy-related images and video clips on the Internet

Phenomena in the atmosphere of planet Earth.
https://www.msn.com/en-za/weather/photos/wonderful-weather-phenomena-you-should-know-about/ss-BBjAT9e?ocid=spartanntp#image=1

Amazing aurora borealis: 35 breathtaking images of northern lights.
https://www.msn.com/en-za/weather/photos/amazing-aurora-borealis-35-breathtaking-images-of-northern-lights/ss-AAjIyWD?ocid=spartandhp&pfr=1

More images of northern lights.
https://www.bing.com/images/search?q=Northern+Lights&form=hpbap1&first=1&cw=1129&ch=482

A look at the Universe through the Hubble Space Telescope. Take a look at the Universe's stellar tapestry with 79 of the iconic images from the earth-orbiting observatory. https://www.msn.com/en-za/news/photos/a-look-at-the-universe-through-hubble-space-telescope/ss-BBijUyi?ocid=spartandhp&pfr=1

Zoom out from the far reaches of the Universe. See an animation composed of a large number of images made by the HST.
https://www.livescience.com/65414-hubble-telescope-creates-universe-mosaic.html?utm_source=ls-newsletter&utm_medium=email&utm_campaign=20190507-ls

Israel's spacecraft "Beresheet" crashes on the moon. See a recording of the live broadcast. https://www.jpost.com/Israel-News/How-to-watch-the-Beresheet-spacecraft-land-on-the-moon-586454

Feature of the month:
A house-size asteroid zipped past Earth

An asteroid the size of a house gave Earth a close shave on April 18, zipping past at slightly more than half the average distance between Earth and the Moon.
https://www.space.com/near-earth-asteroid-2019-gc6-flyby.html **Ω**

NOTICE BOARD

- **E-books published by Scientific American for only $5.99 (about R84.00) each.**
  - https://www.scientificamerican.com/store/books/ask-the-experts-astronomy/?utm_source=newsletter&utm_medium=email&utm_campaign=sciences&utm_content=link&utm_term=2019-04-19_featured-products&spMailingID=59063433&spUserID=NDAzMzk1ODIxMTMwS0&spJobID=16227532
  - https://www.scientificamerican.com/store/books/mysteries-of-life-in-the-universe/?utm_source=newsletter&utm_medium=email&utm_campaign=ebook-mysteriesoflife&utm_content=body-position6&utm_term=SA-EB-MysteriesofLife-1_CVP_v1__&spMailingID=58996695&spUserID=NDAzMzk1ODIxMTMwS0&spJobID=1621730361&spReportId=MTYyMTczMDM2MQS2
  - https://www.scientificamerican.com/store/books/wonders-of-the-cosmos/?utm_source=newsletter&utm_medium=email&utm_campaign=space&utm_content=link&utm_term=2019-04-18_featured-products&spMailingID=59055832&spUserID=NDAzMzk1ODIxMTMwS0&spJobID=1622633817&spReportId=MTYyMjYzMzgxNwS2
  - https://www.scientificamerican.com/store/books/possibilities-in-parallel-seeking-the-multiverse/
  - https://www.scientificamerican.com/store/books/the-copernicus-complex-our-cosmic-significance-in-a-universe-of-planets-and-probabilities/
  - https://www.scientificamerican.com/store/books/exploring-mars-secrets-of-the-red-planet/?utm_source=newsletter&utm_medium=email&utm_campaign=tech&utm_content=link&utm_term=2019-05-07_featured-products&spMailingID=59219095&spUserID=NDAzMzk1ODIxMTMwS0&spJobID=1640950873&spReportId=MTY0MDk1MDg3MwS2
- **Karoo Star Party:** Thursday 30 May 2019 to Sunday 2 June 2019. See http://pretoria-astronomy.co.za/pdf/kambro_2019.pdf
- **Free State Winter Star Party:** Friday 28 June 2019 to Sunday 30 June 2019. http://assabfn.blogspot.com/p/blog-page_6.html
- **Help to identify asteroids in ESA's archival images of the HST.** https://www.zooniverse.org/projects/sandorkruk/hubble-asteroid-hunter?utm_source=newsletter&utm_campaign=hahbeta1may19
- **Beanies.** Beanies will be offered for sale @ R40.00 each at every monthly meeting, until they are sold out.
- **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.

April 19th 2019 observing evening report
- by Michael Poll & Johan Smit

This evening turned out better than anticipated – just as it was getting dark, a lot of cloud appeared from the south, and with that and the full moon, we were not hopeful. However, the cloud cleared an hour later.

There were four of us present – Johan S, Michael P, Gregory and Etsuo from the Japanese school.t. We noted that this evening's full moon was the one before Easter Sunday. Easter Sunday follows the first full moon after the March equinox, but…. although the equinox fell (just) for South Africa on March 20th, and there was a full moon on (Thursday) March 21st, Sunday March 24th was not Easter Sunday. This was because the Ecclesiastical calendar uses a fixed equinox of March 21st, and an Ecclesiastical full moon, which occasionally does not coincide with the astronomical full moon, as was the case this year. This year the Ecclesiastical full moon was on March 20th and the fixed equinox was March 21st so the first full moon after the (Ecclesiastical) equinox was in fact April 19th.

Just as it got dark enough, the clouds started breaking up and stars started to appear – Canopus, Sirius, Rigel, and then the rest of Orion. The in the north we could see the Castor and Pollux and the "rectangle" of Gemini, comprising Alpha, Beta, Gamma and Mu. In the north east was Leo, and low in the north was Capella. In the north west was Aldebaran, with Mars just below. Aldebaran and Mars were the same colour, but with Mars marginally fainter. Mars is a comparatively small object, and increasing distance has a proportionally larger effect on its apparent diameter and brightness, compared with, say, Jupiter. According to Stellarium, on the night Mars was just over two astronomical units away from the Earth – so it was in excess of 300 000 000 km. away. No other planet has such a large relative difference between its closest approach to and furthest distance from Earth.

In the south, the Southern Cross was up, and we noted the Diamond Cross and False Cross. We further noted later that a line drawn southwards from the long axis of the Diamond Cross will intersect a line drawn southwards from Sirius to Canopus and extended half as far again. The Large Magellanic Cloud lies at the point of intersection of these two lines, but light pollution blotted out the Cloud itself.

We did a tour of some double stars – Castor showing its two white stars of equal brightness, and Gamma Leonis with components of almost equal brightness with a bright field star. We also saw Rigel b – usually referred to as "Rigel's Companion". Seen in a 6-inch telescope at 180x, it was fortuitously placed between two diffraction spikes. Rigel b is as bright as magnitude 7 but is usually lost in the glare of bright Rigel itself.

In Canis Major we found the Southern Albireo, a.k.a. the Summer Albireo, a.k.a. h3945, a.k.a. 145 Canis Majoris. Danie had reminded us about this star in his "What's Up" for April at the March meeting. This is a yellowish-orange / bluish white pair, and is very similar to its namesake, Albireo (Beta Cygni), but the colours of h3945 appeared rather more mellow than the Cygnus version. The star forms an equilateral triangle with Delta and Omicron^2 Canis Majoris, with h3945 to the east of the other two stars. The lower case "h" in the in the catalogue number refers to Sir John Herschel who was the discoverer. Sue French (who writes in Sky and Telescope) has noted that *"the double also carries the catalogue number "145 G Canis Majoris", though the designation is often incorrectly listed without the G. The "G" indicates that it is listed in the 1879 Uranometria Argentina by Benjamin Apthrop Gould."*

The doubles we looked at in the south were Gamma Velorum, which has two bright stars of magnitudes 2 and 4. The brighter component of Gamma is designated Gamma^2, because the components of double stars are labelled in order of right ascension. Gamma^2 is a spectroscopic double comprising a spectral type O star and an even rarer type of star called a Wolf -Rayet star. Spectral type O stars comprise only 0.00003% of all stars. The only other naked eye Wolf Rayet star is Theta Muscae. Two fainter stars of magnitudes 8 and 9 lie at right angles to the two bright components of Gamma to create a "T" shape.

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Gamma Velorum is the brightest star in Vela – there is no Alpha or Beta Velorum. This situation came about when the constellation of Argo Navis was split up – Alpha and Beta of Argo Navis ended up as Alpha Carinae (Canopus) and Beta Carinae (Miaplacidus).

We also looked at Alpha Centauri, now becoming a little easier to split after the close approach of 2015 and we looked at a lesser known double, Alpha Circinae, which is about 5° south of Alpha Centauri – Alpha Circinae comprises a 3rd magnitude star with a 9th magnitude companion. The companion was just a little speck on this moonlit night but showed a distinct russet colour.

In spite of the moon we were able to look at some clusters and nebulae. In Johan's low power telescope [see below] there was a grand view the whole of Orion's Sword. As well as the usual look at the Orion Nebula (M42) in the centre of the row of three naked eye objects that comprise the Sword, we noted the cluster(s) to the north of the nebula which we need to revisit at some stage - there is the emission / reflection complex of NGC 1973-1975-1977, but we were probably looking at the open cluster NGC 1981.

In the south we looked at some open clusters: IC2602, (the Southern Pleiades) the brightest star of which is Theta Carinae; the Southern Beehive (NGC 2516) which lies just off the long axis of the False Cross, near Epsilon Carinae; and we chanced upon IC 2391 which features a distinct arc of three stars. This cluster lies just off the short axis of the False Cross, near Delta Velorum.

Gregory brought an 8" GSO Dobsonian which he had bought second-hand on that very same day and Johan assisted in helping him set it up and to align the finder-scope. In the process of helping him to get comfortable Gregory and Johan hunted down a few targets. Apart from the already mentioned doubles, they compared the views of the Orion nebula between Gregory's telescope and Johan's wide field, low power refractor. They also viewed Omega Centauri, but due to the bright moon this type of target was rather unspectacular - brighter, compact objects were more suitable for the night. While in the south they looked at the Jewel Box and the carbon star Ruby Crucis, which is near Mimosa (Beta Crucis). It was noted that Ruby Crucis was similar in colour and magnitude to the companion of Alpha Circinae

Johan's refractor is a rather interesting beast. Some years ago, he found an interesting Zeiss lens in some equipment destined for the scrap yard. On closer inspection it turned out to be a 5" f/5 lens from an aerial camera that was used to image the ground from airships in the First World War era. It would have been very sad if it got lost and / or destroyed, so it just had to be used in a telescope. The eventual telescope turned out to be a superb low power, wide field refractor. By looking up some Zeiss history and their serial number sequences Johan has a good estimate that the lens was made somewhere between 1916 and 1919. Looking at stars through 100-year old optics adds something special to the occasion!

Otherwise, Johan found his favourite heart cluster, NGC 2547, near Gamma Velorum. Due to the bright conditions it was not as spectacular as usual and could not be located in any of the other telescopes. As with Omega Centauri, the Eta Carinae nebula was lost in the bright conditions, so they settled for what they could see, including viewing the Wishing Well Cluster (NGC 3532) in Gregory's telescope and Johan's refractor. While in the area Johan stumbled across one of his favourites, the Gem Cluster (NGC 3293), an open cluster containing some stars of different colours. It is slightly smaller and more compact than the better-known Jewel Box, but Johan considers it as a "prettier" cluster than the Jewel Box. It is worth hunting down when viewing in that area.

All-in-all this was a very good evening and a member with a new telescope got used to using it.

Other members that are not comfortable with their telescopes are urged to come and practice at our viewing evenings. Guidance can be given and soon anyone would be able to use their equipment productively. After all these sights, we never even looked at the Moon!

The next observing evening will be on May 17th 2019. **Ω**

Summary of "Beginners Corner" and "Main Topic" for May 22nd 2019 - by Michael Poll

"Beginners Corner": Sunspots and the Sunspot Cycle Part 1.

This part discusses the discovery of sunspots and an overview of the sunspot cycle and sunspot properties. The presentation will cover the discovery of the cycle, the variation in solar latitude during a cycle, the Butterfly diagram and the discovery that sunspots were magnetised. Famous names involved in these discoveries include Galileo, Heinrich Schwabe, Rudolph Wolf and George Ellery Hale.

"Main Topic": Sunspots and the Sunspot Cycle Part 2.

This is the main part of a presentation about **Sunspots and the Sunspot Cycle.** The first part discusses the differential rotation of the outer convection layer of the sun which causes the equatorial regions rotate faster than the polar regions, and how shear forces deep within the sun create strong magnetic fields which rise to the surface and form sunspots. The flow ("flux") of magnetic fields in the sun can be in azimuth ("toroidal") or meridional ("poloid") and the shift of magnetic energy from one flow to the other and back again during the sunspot cycle will be illustrated.

This, the second part of the presentation discusses the irregular modulations of the 11 year sunspot cycle covering periods of increased solar activity, when there are increased numbers of sunspots (e.g.the Mediaeval Maximum and the Modern Maximum) and periods of decreased solar activity where there are decreased numbers of sunspots (including the Sporer Minimum, the Maunder Minimum and the Dalton Minimum). The effect of these periods on the weather in Europe will be discussed and the social and demographic effects will be illustrated with examples and quotations from contemporary chroniclers. There will be discussion about the prolonged minimum between Cycles 23 and 24 and prospects for the upcoming Cycle 25. **Ω**

Telescope for sale

Celestron Astromaster 90 Telescope.

Price: R3 000.

Hardly been used, and has the accompanying DVD-Rom and booklets.

Contact Melody Kearney.

Shop 40, Southdowns Shopping Centre.

1 Karee Avenue, Irene, Centurion.

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Summary of coming presentation on 22 May under "What's Up?" - by Johan Smit

What's up in June 2019?

Lunar phases:

New Moon happens over the first weekend in June
That is the reason why we are hosting the Karoo star party that weekend.
So, if you wish to see the Moon growing in phase up to full Moon in the middle of June, use the first 2 weeks June.
New Moon is again at the beginning of July. That is why the Free State Star party is held over the last weekend in June.
So, the best dark sky nights (early evening, till early morning) would be the last week of June, going into July.

Planets:

Mercury return to the evening sky towards the end of june.
So does Venus.
Jupiter and Saturn rises earlier and earlier after sunset, so they will be good to view for most of the night.
For a change we will not have to get up early in the morning to see our favourite planets.
Uranus is too clsoe to the Sun in the sky to be observable. Neptune rises early in the morning and is situated in a quiet area of the sky in Aquarius.
If you still want to get up early, Neptune could be your target of choice.

As a special treat I will show the audience how to find and identify Pluto during the next few months.

Deep Sky:

This is galaxy hunting season.
I will show the audience where to go hunting, and in which constellations.

See you at the meeting for detailed information. **Ω**

Astronomy basics: Tallest mountain to deepest ocean trench

Our amazing planet top to bottom.

https://www.livescience.com/29536-infographic-tallest-mountain-to-deepest-ocean-trench.html

Chairman's report for meeting on 24 April 2019 - by Pierre Lourens

Under "Beginner's Corner", Michael Poll gave a presentation titled "Why does the Sun shine?".

The Sun is a star. It is in the central regions of a star where nuclear fusion reactions occur. He discussed the basics of atomic structure and explained what ions are and what the plasma state is. The matter in the Sun and other normal stars is in this state.

Nuclear fusion reactions can only take place at very high temperatures and pressures, which are found in the core of the Sun. Atomic nuclei collide with high speeds. These are high enough to bring the nuclei close together. Then the short range, strong nuclear force overcomes the electrostatic repulsion of the positively charged nuclei, and fusion occurs.

He discussed the dominant fusion reactions that take place in solar mass stars like the Sun. These are the reactions in the proton-proton chain, which lead ultimately to the formation of He^4. He also discussed the fusion reactions in the CN cycle, which is the dominant chain of reactions in higher mass stars, where the core temperatures and pressures are higher.

The reactions release energy in the form of kinetic energy of the fusion products and gamma rays, as well as neutrinos. Mass is converted into energy.

The kinetic energy appears as heat. The gamma rays lose energy as they diffuse to the surface, where they emerge as visible light. The neutrinos interact very weakly with matter, and most of them leave the Sun.

He also discussed the triple-alpha process, which occurs at temperatures of about 10^8 K. (An alpha particle is the same as a He^4 nucleus.) In this process, helium is fused to carbon. This temperature is reached when the hydrogen in the core begins to run out. Then the core collapses and starts to heat up in the process, and the star becomes a red giant. Higher mass stars reach higher temperatures in their cores, and form heavier elements by further fusion reactions.

Next was Michael Moller, who presented "What's Up?". A summary of his presentation can be found in the April newsletter.

Next was Percy Jacobs with the main topic: "Spectroscopic project results".

Spectroscopy is the study of the different frequencies of electromagnetic radiation, from radio waves to gamma rays, and is a powerful tool in astronomy. It can reveal:

- Composition of the object (surface conditions).
- Temperature.
- Red or blue shift.
- Speed associated with shift.
- Distance.
- Mass and size.
- More.

It is difficult to interpret spectra.
He focused on optical spectroscopy.
There are three types of optical spectra:

- Continuous spectra, emitted by hot, opaque bodies.
- Absorption spectra. These are obtained when light from a source with a continuous spectrum passes through a cool gas. The atoms and/or molecules of the gas absorb the light only at specific frequencies. This yields dark lines in the spectrum of the light. (Continued on next page.)

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- Emission spectra. These are emitted by hot, tenuous gases consisting of atoms and/or molecules. The spectra consist of bright lines. They can be seen against a dark background.

In the hydrogen atom, the emission lines result from transitions of electrons around the nucleus from higher energy levels to lower ones.

He discussed different spectroscopes and their prices. He showed how his own is mounted onto his telescope. Selecting a spectroscope depends on:

- What you want to do or are skilled to do.
- The limiting magnitude of your telescope.
- What your current equipment is able to cope with.
- What you can afford.

He gave the resolutions of the different spectroscopes. He explained how to go about using the spectroscope to obtain a spectrum of a celestial body. Three projects he worked on are as follows. He registered and studied the spectra of:

- Regulus, Phi Sagittarii and Rigel.
- Wolf-rayet stars, viz. Tet Mus, Gamma Velorum and Eta Carinae.
- The Sun, Saturn and Jupiter.

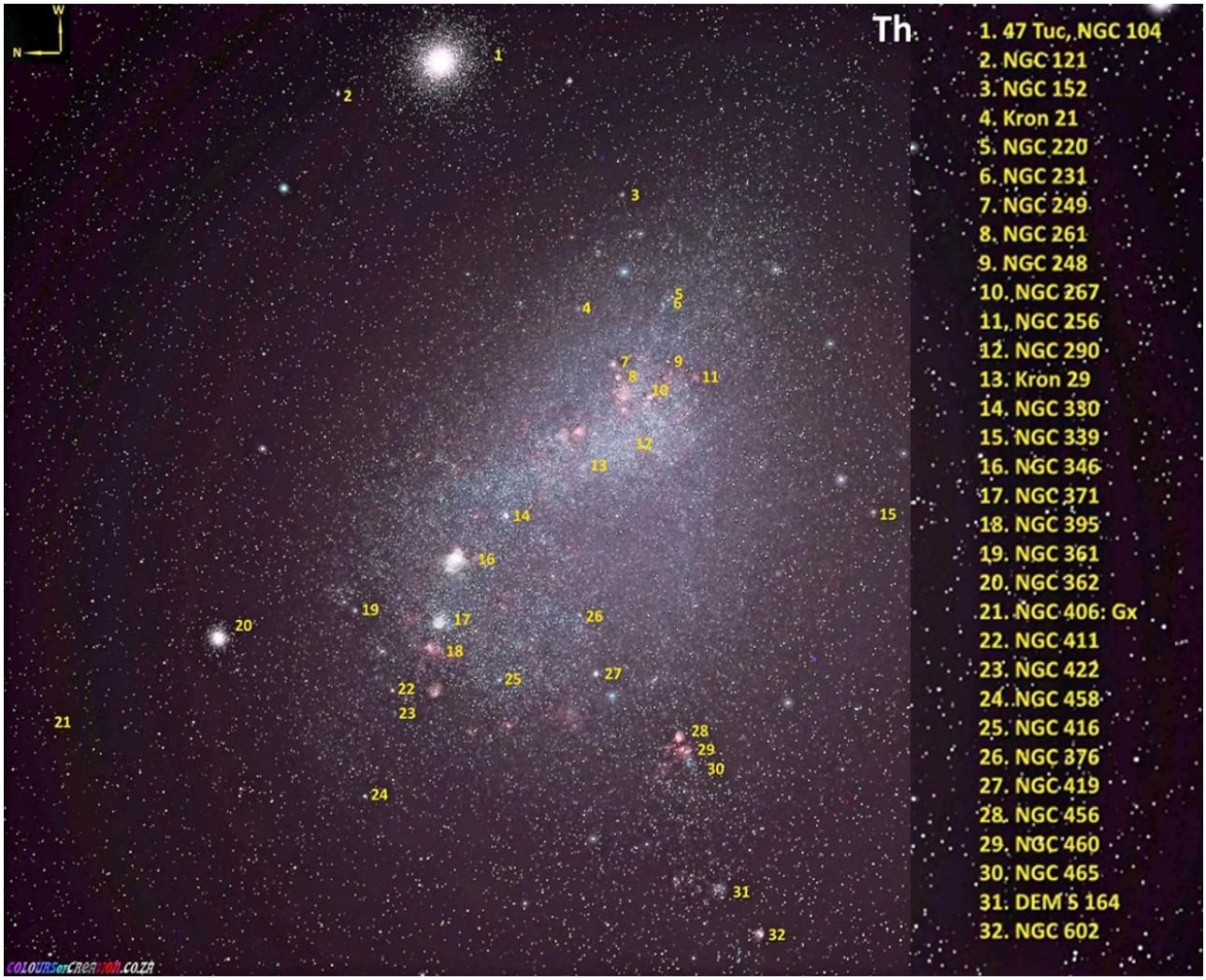
Some of the blue part of sunlight is scattered by the molecules of the atmosphere, which is the reason why the sky is blue. The red part mostly passes through. When the Sun is at the horizon, the path through which the sunlight travels is long, and a lot of the blue part of the sunlight is scattered, and the Sun looks red. During a lunar eclipse, a lot of the blue part of the sunlight that passes close by Earth is scattered out, and the sunlight that reaches the moon is red. Moreover, the light is refracted into the geometric shadow of the Earth on the moon.

He showed some spectra he registered during a lunar eclipse and gave an interpretation of them. He showed some spectra he registered of Albireo and of the calibration star Deneb, of the Mira variable R Horologium, of the cataclysmic variable SS Lepus, of the Sun, of Saturn, and gave an interpretation in each case.

He mentioned his database and briefly discussed some astronomical spectroscopy software.

After his presentation, we socialized over cups of coffee and tea and biscuits. **Ω**

Small Magellanic Cloud guide. This is especially for those who will attend the Karoo Star Party. Image and text by Johan Moolman.



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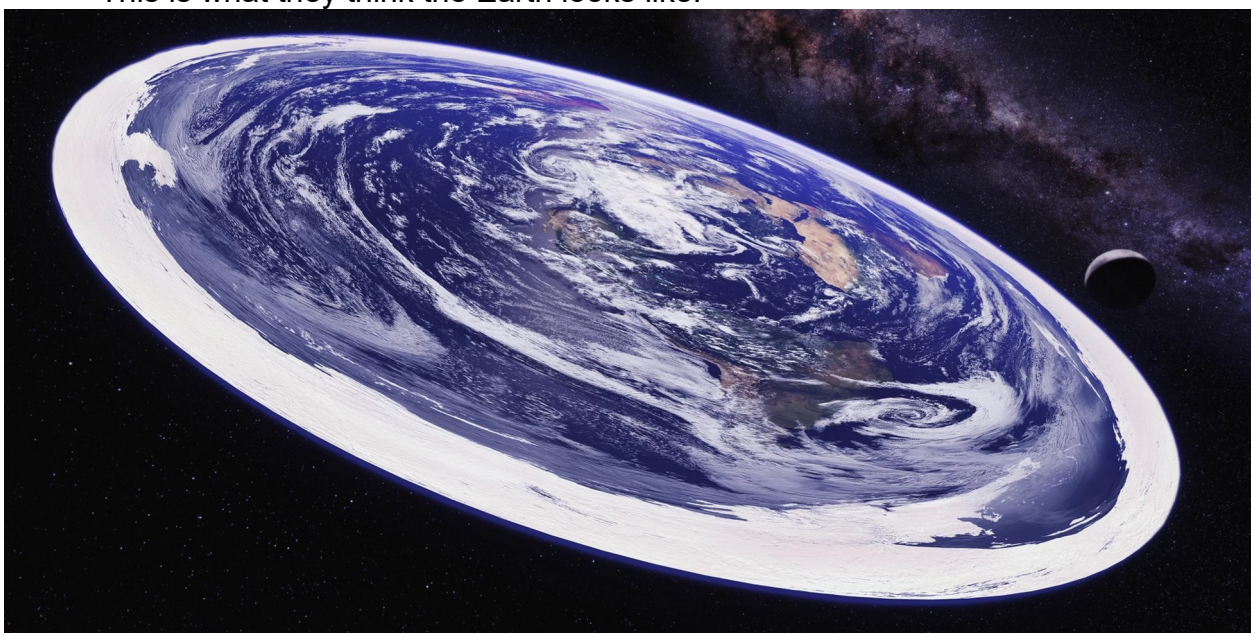
Have a good laugh!

The Flat-Earthers plan a cruise. They want to sail to the “Antarctic Ice Wall at the planet's edge”. The goal? To test their assertion that Earth is a flattened disk surrounded at its edge by a towering wall of ice that dams the water in the oceans.

The journey will take place in 2020, the Flat Earth International Conference (FEIC) recently announced on its website.

This is what they think the Earth looks like:



https://www.livescience.com/65053-flat-earther-cruise-antarctica-ice-wall.html?utm_source=ls-newsletter&utm_medium=email&utm_campaign=20190422-ls