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

NEWSLETTER MARCH 2020

Dear member

In the light of the current situation and based upon advice from a virologist at one of the leading pathology laboratories, we regret to have to cancel the March and April viewing evenings and meetings of the Pretoria Centre of ASSA.

The situation will be reviewed in time for the May activities and members will be informed of any changes.

This decision was not taken lightly, but we believe the health of our members is important and we would not like to be the reason one of our members should fall victim to the virus.

We apologize for the inconvenience and trust the skies will be clear wherever you wish to spend time under the stars.

Bosman Olivier
Chairman

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Astronomy-related articles on the Internet

Achernar marks the end of the River. Achernar is the star at the southern end of Eridanus. It is now visible in the evening.
https://earthsky.org/tonight/star-achernar-marks-the-end-of-the-river

This date in science: Clyde Tombaugh discovers Pluto. Clyde Tombaugh discovered Pluto on February 18, 1930, 90 years ago. Pluto was for a long time considered to be the 9th planet of the solar system. But it was demoted by the IAU in 2006 to be the largest of five known dwarf planets.
https://earthsky.org/space/this-date-in-science-clyde-tombaugh-discoverer-of-pluto?utm_source=EarthSky+News&utm_campaign=1c0f5b4239-EMAIL_CAMPAIGN_2018_02_02_COPY_01&utm_medium=email&utm_term=0_c64394 5d79-1c0f5b4239-394671529

A 9th planet? However, there is evidence that there is a 9th planet with mass = 10 x the mass of Earth moving in a bizarre, highly elongated orbit about 20 times farther from the Sun on average than Neptune. See a video clip.
https://earthsky.org/space/solid-evidence-for-a-9th-planet-say-caltech-astronomers

Betelgeuse: What's up? Betelgeuse is a slowly pulsating red supergiant star in the constellation Orion, now visible in the evening. It started dimming recently. Now Betelgeuse is at about 36% of its normal brightness.
https://earthsky.org/space/betelgeuse-dimming-late-2019-early-2020-supernova?utm_source=EarthSky+News&utm_campaign=ac87b17201-EMAIL_CAMPAIGN_2018_02_02_COPY_01&utm_medium=email&utm_term=0_c64394 5d79-ac87b17201-394671529

VLT sees surface of dim Betelgeuse. The new images show how the apparent shape of this star is changing.
https://earthsky.org/todays-image/betelgeuse-dimming-supernova-new-vlt-images?utm_source=EarthSky+News&utm_campaign=ac87b17201-EMAIL_CAMPAIGN_2018_02_02_COPY_01&utm_medium=email&utm_term=0_c64394 5d79-ac87b17201-394671529

Procyon is the Little Dog Star. The Dog Star, Sirius (aka Alpha Canis Majoris), is easy to spot because it's the night sky's brightest star. Procyon (aka Alpha Canis Minoris) is near its brighter brother on the sky's dome and is the eighth brightest star in the night sky. Both are binaries, and the secondary of each is a white dwarf star. They are now visible in the evening.
https://earthsky.org/brightest-stars/procyon-harbringer-of-the-dog-star?utm_source=EarthSky+News&utm_campaign=31607d8dd2-EMAIL_CAMPAIGN_2018_02_02_COPY_01&utm_medium=email&utm_term=0_c64394 5d79-31607d8dd2-394671529.

Why does Arrokoth look like a snowman? Just over a year ago, NASA's New Horizons spacecraft sent back images of 2014 MU69 - aka Arrokoth - a small KBO (**K**uiper **B**elt **O**bject) 6.6 billion km from the Sun and the most distant object yet visited by an earthly spacecraft.
https://earthsky.org/space/Arrokoth-nowman-peanut-shape-new-horizons-distant-object?utm_source=EarthSky+News&utm_campaign=b18ade9776-EMAIL_CAMPAIGN_2018_02_02_COPY_01&utm_medium=email&utm_term=0_c64394 5d79-b18ade9776-394671529

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Using radio waves to discover and study exoplanets. A new study from researchers in the Netherlands shows how scientists can detect exoplanets orbiting red dwarf stars and learn about their environments, from the radio waves generated by auroras on those worlds.
https://earthsky.org/space/exoplanets-red-dwarfs-radio-waves-auroras?utm_source=EarthSky+News&utm_campaign=df83f0e451-EMAIL_CAMPAIGN_2018_02_02_COPY_01&utm_medium=email&utm_term=0_c64394 5d79-df83f0e451-394671529

Castor and Pollux. These two stars can be seen with the naked eye. They are now visible in the evening near the ecliptic in the constellation Gemini. Castor actually consists of 3 binary pairs. Pollux is a single star and has one known planet orbiting it.
https://earthsky.org/brightest-stars/best-castor-brightest-second-magnitude-star?utm_source=EarthSky+News&utm_campaign=15604ede42-EMAIL_CAMPAIGN_2018_02_02_COPY_01&utm_medium=email&utm_term=0_c64394 5d79-15604ede42-394671529

https://earthsky.org/brightest-stars/pollux-not-castor-is-geminis-brightest-star?utm_source=EarthSky+News&utm_campaign=15604ede42-EMAIL_CAMPAIGN_2018_02_02_COPY_01&utm_medium=email&utm_term=0_c64394 5d79-15604ede42-394671529

InSight Lander reveals 1st marsquakes on Mars. Mars is seismically active!
https://earthsky.org/space/mars-quakes-insight-lander-shows-active-faults?utm_source=EarthSky+News&utm_campaign=e44e14dab0-EMAIL_CAMPAIGN_2018_02_02_COPY_01&utm_medium=email&utm_term=0_c64394 5d79-e44e14dab0-394671529

March equinox: all you need to know.
https://earthsky.org/astronomy-essentials/everything-you-need-to-know-vernal-or-spring-equinox?utm_source=EarthSky+News&utm_campaign=c5d2157a12-EMAIL_CAMPAIGN_2018_02_02_COPY_01&utm_medium=email&utm_term=0_c64394 5d79-c5d2157a12-394671529

Here's how to see that huge asteroid that'll safely pass Earth in April. The huge asteroid known as (52768) 1998 OR2 will pass closest on April 29, 2020. Observers peering through telescopes will see it as a slow-moving point of light.
https://earthsky.org/astronomy-essentials/asteroid-52768-1998-or2-april-2020-how-to-see?utm_source=EarthSky+News&utm_campaign=6a1f46c4fe-EMAIL_CAMPAIGN_2018_02_02_COPY_01&utm_medium=email&utm_term=0_c64394 5d79-6a1f46c4fe-394671529

Astronomy equipment for sale

You might remember Jim and Pam Prentice who were active members of the Pretoria Centre at least a decade ago. Jim - now 82 - contacted Neville Young to say that due to advancing age, he wishes to dispose of his astronomy equipment.

He has a 150 mm Celestron Cassegrain NexStar telescope with many extras (power tank, Acer computer, Celestron Astro camera, several 50mm eye pieces, with filters, Hyperion zoom 50 mm eye piece, etc.) His asking price is R25000 and it is negotiable.

If you are interested, please contact him at james@prentice.co.za or cell phone number 083 452 2242. **Ω**

Astronomy-related images and video clips on the Internet

New image of Earth's new mini-moon. Astronomers released this new image of 2020 CD3, a small object now confirmed to be orbiting Earth temporarily. It was apparently captured into Earth orbit 3 years ago.
https://earthsky.org/space/new-natural-temporary-moon-for-earth-2020-cd3?utm_source=EarthSky+News&utm_campaign=c66f6de511-EMAIL_CAMPAIGN_2018_02_02_COPY_01&utm_medium=email&utm_term=0_c643945d79-c66f6de511-394671529

Curiosity rover on Mars snags highest-resolution panorama yet. See the image and a video clip. https://earthsky.org/space/curiosity-mars-rover-highest-resolution-panorama?utm_source=EarthSky+News&utm_campaign=a7a3e6d04f-EMAIL_CAMPAIGN_2018_02_02_COPY_01&utm_medium=email&utm_term=0_c643945d79-a7a3e6d04f-394671529

Report of observing evening on February 21st 2020 – by Michael Poll

Another cloudy night – even more cloud than last month. Four people attended - there were Michael and Rudolph, and two visitors – Keo and Havisha. Our visitors were interested to learn more about the night sky, Rudolph and Michael introduced them to the Sky maps star chart. We gave them a copy each and explained how to use it. We did see *one* star through the *one* sky hole – Sirius was almost overhead, so we could show *one* example on the star map. We told them to look for Betelgeuse if they got the chance – we told them how it had faded a great deal over the last couple of months. This led to a discussion about stellar life histories – including the fact that stars massive enough to become supernovae are exceedingly uncommon compared with other star types. **Ω**

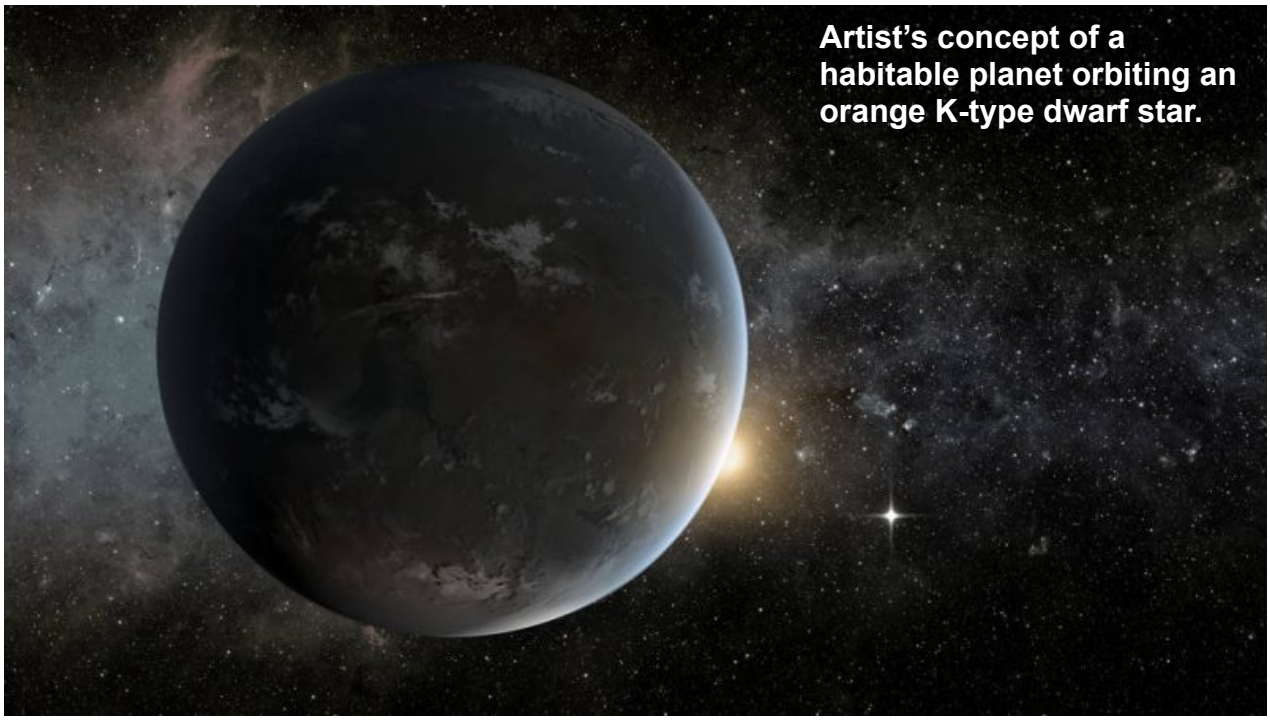
Astronomy basics: The aurorae

They are caused by charged particles (mainly electrons and protons) that stream away from the Sun and get trapped in Earth's magnetic field. Here they spiral down to the poles and eventually collide with the molecules of the atmosphere, exciting them to higher energy levels. As the molecules fall back to lower energy levels, they emit visible light. This light is called the aurorae or polar lights. As the charged particles spiral down, they are accelerated, because their direction changes all the time. Charged particles that are accelerated generate radio waves.

https://en.wikipedia.org/wiki/Aurora

Feature of the month: "Goldilocks stars" best for alien life?

A new research study suggests that orange K-type dwarf stars (smaller and cooler than yellow G-type dwarf stars like the Sun) are the best places to search for alien life. These stars are not too hot, not too cool, and not too violent for life to evolve on planets around them. And they are three times as numerous in the Galaxy as stars like the Sun.



Artist's concept of a habitable planet orbiting an orange K-type dwarf star.

https://earthsky.org/space/goldilocks-stars-g-k-dwarfs-best-for-alien-life?utm_source=EarthSky+News&utm_campaign=99b582a218-EMAIL_CAMPAIGN_2018_02_02_COPY_01&utm_medium=email&utm_term=0_c643945d79-99b582a218-394671529

Observing: Deep Sky Two - by Magda Streicher

When I glance up at our southern skies during this time of year when the Large and Small Magellanic clouds are visible, I say: "*Thank you very much, Mr Dorado the Fish, for coming to our southern waters.*" The Large Magellanic Cloud (LMC) is a satellite galaxy, and a very clear misty Cloud in appearance against a dark starry sky. But what this famous Cloud harbours is what counts most.

NGC 1850 is situated in the northern part of the LMC about 2.5 degrees west of the famous Tarantula Nebula. It is a special object that conceals itself in the flimsy nebulosity of its surroundings, which is also rich in faint clusters and nebulae. It is an unusual cluster of stars because the distribution of its stars is like in a globular cluster, but unlike the globular clusters of the Milky Way it is composed of young stars.The soft glow of this small round hazy ball displays a bright, well-concentrated core. Higher magnification through an amateur telescope brings faint star streamers into view, expanding into the hazy field of view. Use a nebular filter and the cluster is enfolded in a web of smoke, providing a lovely feather bed.

But the main focus is the double nature of NGC 1850, which is about 40 million years old. It houses a second, smaller, tight cluster on its south-western rim which is only 4 million years old and mostly composed of extremely hot young stars. It is by far one of the most spectacular areas to discover, study and just adore in the rich southern celestial hemisphere. **Ω**

OBJECT	TYPE	RA	DEC	MAG	SIZE
NGC 1850	Very massive young open cluster	05 h 08.8'	- 68˚46.2'	9	3.4'

Chairperson's report for the meeting on 26 February 2020 - by Pierre Lourens

Under 'Beginner's Corner" Michelle Ferreira presented "Discoveries by amateur astronomers".

Japanese astronomer Masayuki Iwamoto discovered a new comet on January 9, 2020. It was discovered independently by Gennady Borisov in Crimea. It was later confirmed to be a comet. She showed the discovery image. The comet has since been given the official designation and name "C/2020 A2 (Iwamoto)" and and its parabolic orbit has been calculated.

Several asteroids were also discovered by Masayuki Iwamoto:

6383 Tokushima, co-discovered with Toshimasa Furuta and MasaruInoue on 12 December 1988.

27714 Dochu, co-discovered with Toshimasa Furuta 29 January 1989.

5399 Awa, co-discovered with Toshimasa Furuta and Masaru Inoue 29 January 1989.

4835 (1989 BQ), co-discovered with Toshimasa Furuta.29 January 1989, part of asteroid group 'Jupiter Trojan'.

5581 Mitsuko, co-discovered with Takeshi Urata, Toshimasa Furuta and Masaru Inoue 10 February 1989.

9943 Bizan, co-discovered with Toshimasa Furuta and Masaru Inoue 29 October 1989.

She showed an image of his discovery equipment: a 10-cm f/4.0 Pentax SDUF II telephoto lens and a Canon EOS 6D camera.

The following comets were also dicovered by Masayuki Iwamoto:

C/2013 E2 (Iwamoto), co-discovered with Toshimasa Furuta 10 March 2013.

C/2018 Y1 (Iwamoto), discovered 18/20 December 2018.

She showed an image of the latter comet.

John Caister Bennett (Pretoria, South Africa) discovered comet Bennett on 28 December 1969 while it was still still almost 2 AU from the Sun.
It reached perihelion on 20 March 1970, passed closest to Earth on 26 March 1970.

Comets for observation in 2020:

PanSTARRS (C/2017 T2).

Encke's Comet.

Comet 88P/Howell.

Next was Michael Poll with a presentation under "What's Up". A summary of it was given in the February newsletter.

Next was Johan Smit with a presentation under "Main talk". The title was "Telescopes - what we see and how we see it".

He started by discussing the electromagnetic (EM) spectrum. Thomas Young showed that light acts like a wave. William Herschel discovered infrared radiation. Johann Ritter and William Wollaston discovered ultraviolet radiation. James Maxwell proposed that a whole family of electromagnetic radiation exists of which light is only a small part. Heinrich Hertz discovered radio waves. In 1888 he produced radio waves with a wavelength of 66 cm. It was picked up by distant circuits.

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Wilhelm Roentgen discovered X-rays. Paul Villard discovered gamma rays. He showed a picture of the whole EM spectrum. He showed a chart that shows which technologies make use of different parts of the EM spectrum.

Astronomers use different types of telescopes (many of which orbit Earth) to see in different parts of the EM spectrum. For both lenses and mirrors, the focal ratio is the focal length divided by the aperture. There are three types of optical telescopes: Reflecting (uses mirrors), refracting (uses lenses) catadioptric (uses lenses and mirrors).

He showed a sketch that explains how a single convex lens creates an image and how such a lens combined with another creates an upside down image.

The lens of the human eye has a focal length of 25 mm. A crescent moon (angular diameter ½ º), has an image size of 0.2 mm on the focal plane on the retina. A lens with focal length 1000 mm has an image size of 8 mm on the focal plane, 40X as large.

The objective lens of a telescope gives the primary magnification. The lens in the eyepiece gives the secondary magnification. The total magnification is given by the formula: Total magnification = F(objective) / F(eyepiece).

The most important characteristic of a telescope is the aperture. The larger it is, the more light it gathers. The angular resolution is given by: Ə” = 120 / D(mm). The smaller Ə” is, the smaller the detail that can be seen. To see a lunar lander, 5 m in diameter, on the moon, you would need a telescope with D = 47 m!

The prime purpose of any telescope is to collect light from a distant object and to focus an image of that object on the retina, a photographic plate or a CCD camera with as) distortion as possible. The “little distortion” bit is what drives telescope optics design and development: spherical aberration, off-axis distortion (coma) and chromatic aberration (longitudinal and transverse). He showed this table:

	Focal length			
	Short		**Long**	
Aberration	**Mirror**	**Lens**	**Mirror**	**Lens**
Focal plane curvature	More	More	Less	Less
Spherical aberration	More	More	Less	Less
Chromatic aberration (longitudinal)	None	More	None	Less
Chromatic aberration (transverse)	None	More	None	Little less

It is clear that the longer the focal length, the better. To fix chromatic aberration in lenses, add extra lenses with different refractive indices. Reflectors are more suitable for large telescopes. He showed the principle of the Newtonian and Cassegrain telescopes. He then showed this table:

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Type	Primary	Secondary	Corrector / Comments
Astrographic	1 lens		El cheapo
Achromatic	2 lenses		2 colours corrected
Apochromatic	3 lenses		3 colours corrected
Newtonian	Concave paraboloid	Flat diagonal	
Cassegrain	Concave paraboloid	Convex hyperboloid	
Dall-Kirkham	Concave ellisoid	Convex spheroid	
Rithey-Chretien	Concave hyperboloid	Convex hyperboloid	
Schmidt-Cassegrain	Concave spheroid	Convex spheroid	Quadratic corrector plate (w curve)
Maksutov	Concave spheroid	Convex spheroid	Double concentric spherical meniscus

Use of telescopes and binoculars:
Telescopes:
What determines the dimmest object you can see?
What determines the magnification?
What is the combined effect?

Field of view (FOV):
Telescope: Shorter focal length = larger FOV
Lower magnification
Automatically “brighter” image

Eyepiece: Shorter focal length = Smaller FOV
Higher magnification
Automatically “dimmer” image

General rules.
Low power viewing: Use the highest power that frames the subject
High power viewing: Use the lowest power that reveals the detail you're looking for.

He showed a MicroSoft Excel spreadsheet with eyepiece guidelines.

He explained what the numbers (e.g. 12X50) on binoculars mean and how to use binoculars.

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Radio telescopes.

There is a radio window in the atmosphere.
Radio telescopes are used to study radio emission from astronomical objects between wavelengths of about 10 meters and 1 millimetre.
Between 1 and 20 cm, the atmosphere only minor distortions in the incoming signal.
Radio telescopes designed for operation at millimetre wavelengths are typically only a few tens of meters across, whereas those designed for operation at centimetre wavelengths range up to 100 meters in diameter.
Power αD^2.
Resolution $\Theta \approx \lambda / D$.
Examples:
Yellow light with a wavelength of 580 nm, for a resolution of 0.1 arc second, we need D = 1.2 m.
For a 1.2 meter radio telescope observing at 21 cm, the resolution is 14.8º.
He showed images of the Milky Way in different wavelengths, and combined images at different wavelengths.
The SKA is a mix of high frequency parabolic dishes and LOFAR (Low frequency array) core.
Total collecting area = 1 square kilometre.
It will be 100 times more sensitive than the largest current radio telescope.

After his presentation, the attendees socialised over coffee, tea and biscuits. **Ω**

NOTICE BOARD

- **Astronomical data mining:** Superluminous supernovae - what the researchers say about them: "Superluminous supernovae are stellar explosions that are at least ten times brighter than normal supernovae. Intriguingly we do not yet know exactly what causes them. With your help on this project we will identify more of them and use these to understand more about how they are formed." https://www.zooniverse.org/projects/mrniaboc/superluminous-supernovae?utm_source=Newsletter&utm_medium=Email&utm_campaign=ssbeta13feb2020
- **Image processing:** The Juno spacecraft has been orbiting Jupiter since 2016, and NASA has made the raw images from Juno's camera available to the public for processing. https://www.missionjuno.swri.edu/junocam/processing?utm_source=EarthSky+News&utm_campaign=a0442c633d-EMAIL_CAMPAIGN_2018_02_02_COPY_01&utm_medium=email&utm_term=0_c643945d79-a0442c633d-394671529
- **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.
- **Database:** Members are reminded that a data base of the books in our library is to be found on our website.
- **Request to members:** Members are requested to inform Danie Barnardo of any good books on astronomy that they encounter, so that he can purchase them for our library. His contact details are to be found immediately below.

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