The PRETORIA CENTRE

of the

Astronomical Society of Southern Africa

www.pretoria-astronomy.co.za

NEWSLETTER JUNE 2021

NEXT MEETING

Internet meeting. *

Date and time: Wednesday 23 June 2021 at 19h00.

Programme:

"Kambro 2021" by Johan Moolman.

Chairman: Michael Poll.

*** You will receive an e-mail invite from Johan Smit around 18:30 to join the meeting. Please join as quickly as possible.**

NEXT OBSERVING EVENING

Friday 18 June from sunset onwards.
Note: we have a new venue for our viewing evening - it is on the rugby grounds of the Silwer Valke Rugby Club in Silverton, about 4.3 km east of CBC. Please see here for a route description. Please note that, to conform to the Covid regulations only ASSA Pretoria Centre members will be allowed at viewing evenings, but members can bring along guests.

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Astronomy-related articles on the Internet

"The Verdict is In" --Mysterious Object Oumuamua is Natural vs Alien Artifact | The Daily Galaxy

Warp drives: Physicists give chances of faster-than-light space travel a boost | Human World | EarthSky
If humanity wants to travel between stars, people are going to need to travel faster than the fastest-moving stuff known in our Universe: light. New research suggests that it might be possible to build warp drives and beat the galactic speed limit. And the warp drive theory does not violate general relativity theory.

Happy birthday, Frank Drake | EarthSky
May 28, 2021, is the 91st birthday of astronomer Frank Drake, an early visionary in the search for other civilizations in our Milky Way galaxy. Drake spearheaded the first modern attempt to listen for radio transmissions from otherworldly intelligences - Project Ozma - in 1960.

It's almost time for Manhattanhenge (earthsky.org)
Every year around May 29 and 30 - and again for a day or two around July 12 - people in New York City look forward to Manhattanhenge. It's a phenomenon where the sunset aligns perfectly with the streets of Manhattan, particularly along 42nd, 34th and 14th Streets.

Bizarre weather on other worlds: 4 examples | Space | EarthSky

7 solar system worlds where the weather is crazy | Live Science

Mars helicopter Ingenuity goes long distance in 3rd flight on Red Planet | Live Science
The little chopper is demonstrating critical capabilities that could enable the addition of an aerial dimension to future missions to Mars & beyond.

NASA's Curiosity rover spots strange, colorful clouds on Mars | Live Science

The most ancient spiral galaxy yetThe most ancient spiral galaxy yet (earthsky.org)
It is 12.4 billion light-years away.

MAGALIES MEMOIR No. 6 THE GREAT OBSERVATORIES OF THE MAGALIESBERG - Magaliesberg Biosphere

Report of the Pretoria Centre meeting of May 26th 2021 – by Michael Poll

The title of the talk was "The Planets up close and personal - a journey into planetary imaging" and it was presented by Clyde Foster.

Clyde's work in the field of planetary imaging earned him international recognition, and he has received various awards, the latest being ASSA's Overbeek Medal for 2021.

Clyde gave an interesting and very well received talk to the Centre. He gave some anecdotes of what he enjoyed the most, gave information about the basics of imaging and shared experiences of his “journey”. Clyde noted that astronomy is a diverse subject, and all can find a niche – he has found his niche and is now on an amazing ride!

His interest started in the late 1960s when he did a school project on the Apollo missions. He came to South Africa in 1970, and with his career as a chemical engineer and a growing family, astronomy was not always to the fore, although he maintained any ongoing enjoyment of the hobby when he had time and he remembered highlights such as the Shoemaker-Levy impacts on Jupiter and Halley’s comet.

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In 2014 he acquired a 14 inch Celestron (with help from money on his bond!) He showed pictures of the telescope, taken on March 28th 2014. It is housed in a backyard observatory which has a motorised roll off roof. He has now been imaging the planets for the past seven years.

He decided to concentrate on monitoring Mars, Jupiter and Saturn because they would be well placed for viewing from South Africa for the next few years. He has met a wonderful world wide community of imagers and enjoys the collaboration between amateur and professional astronomers. Amongst the amateur imagers he mentioned, and who have had a serious influence on his development, were Damian Peach from the UK and Christopher Go from the Philippines. He noted that professional astronomers compete for time on large telescopes, so they use the best amateur images to plan such time, and also directly for their research – with the current technology available to amateurs such images can be of high quality.

Clyde has many affiliations including ASSA, British Astronomical Association (BAA) Association of Lunar and Planetary Observers (ALPO USA and ALPO Japan).

Mars.

An early highlight was when Clyde submitted some images of Mars to Richard McKim, the director of the BAA Mars Section, showing a bright cloud that proved to be a dust storm, although McKim noted that it was not the usual season for dust storms.

In 2017 Clyde was invited to the European Planetary Science Congress (EPSC 2017) in Riga, Latvia to present his Mars 2015-2017 observations in person. There he met Dr Leigh Fletcher a leading planetary scientist and an expert in planetary atmospheres, and John Rogers, Director of the BAA Jupiter section. He also met Dr Michael Ravine from Malin Space Science Systems, the company that has provided imaging systems for many of the NASA outer solar system missions

He mentioned a bright feature seen in April 2018 near the terminator which he initially thought to be Olympus Mons. He sent a message about this to Ravine. The Mars Reconnaissance Orbiter showed it to be a small dust storm 300 km across, near Olympus Mons. Clyde's image was the only Earth based observation.

In October 2018 Clyde's image of the linear cloud over Arsia Mons, was only one of two Earth based observations of this feature which was being studied by Dr Agustin Sanchez Lavega, the Mars Express Principal Investigator.

Clyde has done a growing number of TV interviews – on October 1st 2016 he was on SABC discussing the (failed) Schiaparelli probe, and on another occasion on eNCA he talked about the InSight Lander.

Mars was at opposition on May 22nd 2016 and July 27th 2018. Clyde showed his images of May 12th 2016 and July 7th 2018 in comparison with Hubble Space Telescope images taken a few days apart, commenting on the difference in budgets of the two observing facilities!

Techniques.

Clyde talked about techniques at this stage. He uses a high speed video, which records typically 100 frames per second and the video is taken over a period of one minute. Any longer than this then the rotation of the planet compromises the images. In one minute, 6000 frames are taken of which about 2000 can be used. Colour cameras can be used but Clyde uses monochrome filters Red Green and Blue. One problem Clyde does have is that of data storage – he can get 100GB in a day and in a month 3-4 terabytes.

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Jupiter.

An application called Winjupos can de-rotate Jupiter when RGB images have been acquired, allowing more data, over a longer period, to be combined into a better quality final image. Registax is used to wavelet sharpen the stacked images.

In 2019 Clyde took numerous images of “flaking” of the Great Red Spot (GRS) an effect which is caused by interaction with rotating vortices entering the GRS Hollow. Clyde was lead author for a report on these events that was published on the BAA website and is also included as a co-author on a professional paper that has recently been published. [There is a report of about this event in Sky &Telescope for July 2021 page 10]

The Juno mission.

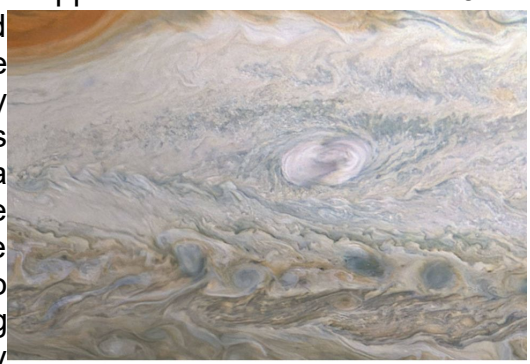
This mission was launched in August 2011 and Juno arrived at Jupiter in July 2016. The principal investigator is Scott Bolton. Candy Hansen is the leader of the Juno Imaging camera project, and Glenn Orton, amongst other responsibilities, assists with co-ordination of amateur astronomers supporting the mission.

Juno is in an elongated 53 day orbit, and at its closest (Perijove) it passes about 3000 – 4000 km above the cloud tops. Juno has a narrow field of view. It arrives at the north pole, crosses the equator and leaves at the south pole.

Maps are generated before each fly-by using amateur images in order to identify interesting features. Amateurs are requested to provide their images about a week before the flyby, and the images are combined.

In May 2018 Clyde attended a Juno workshop at the Royal Astronomical Society (RAS) where he met Christopher Go. (He also saw there a death mask of Isaac Newton – only 7 were made).

On May 31st 2020 using a methane filter at 890 nanometres (nm) Clyde detected a bright spot to the lower right of the GRS. When an Australian observer had imaged Jupiter 10 hours earlier and the spot was not seen. The bright feature was gas being expelled high into the atmosphere, and the feature happened to be near the next Juno flyby path on Perijove No 27. The spot was imaged by Juno on June 2nd 2020 and the pictures were published in a NASA press release approximately four weeks later, cementing the feature’s name as “Clyde’s Spot”. The erupting plume became a depression after the first couple of weeks. It made headline news, and Clyde found himself on Carte Blanche on August 16th 2020. Clyde was also invited to sit in on numerous (virtual) observing sessions of the NASA Infra-Red Telescope Facility held at Mauna Kea.



June 2, 2020

On April 15th 2021 at Perijove 33, Juno again flew over the spot. Storms come and go on Jupiter, but Clyde’s spot could be seen as a dark feature at the probable site. It showed a folded filamentary region typical of combining cyclonic storms – these can become long term.

On May 18th 2021 another NASA Press release compared the June 2nd 2020 image with the one taken on April 15th 2021.

April 15, 2021

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Saturn.

Saturn is difficult to image because storm features are very subtle. The best way to see them is to take images 45 minutes apart and blink them.

Clyde showed his images of the north pole hexagon. These are caused by jet streams at high latitudes in the atmosphere. Clyde has been named as co-author in a recently published paper in Geophysical Research Letters on storms adjacent to the polar hexagon.

Neptune.

A bright equatorial storm erupted in 2017. Some of Clyde's images were mentioned in a subsequent paper in Icarus Volume 321,15 March 2019, Pages 324-345.

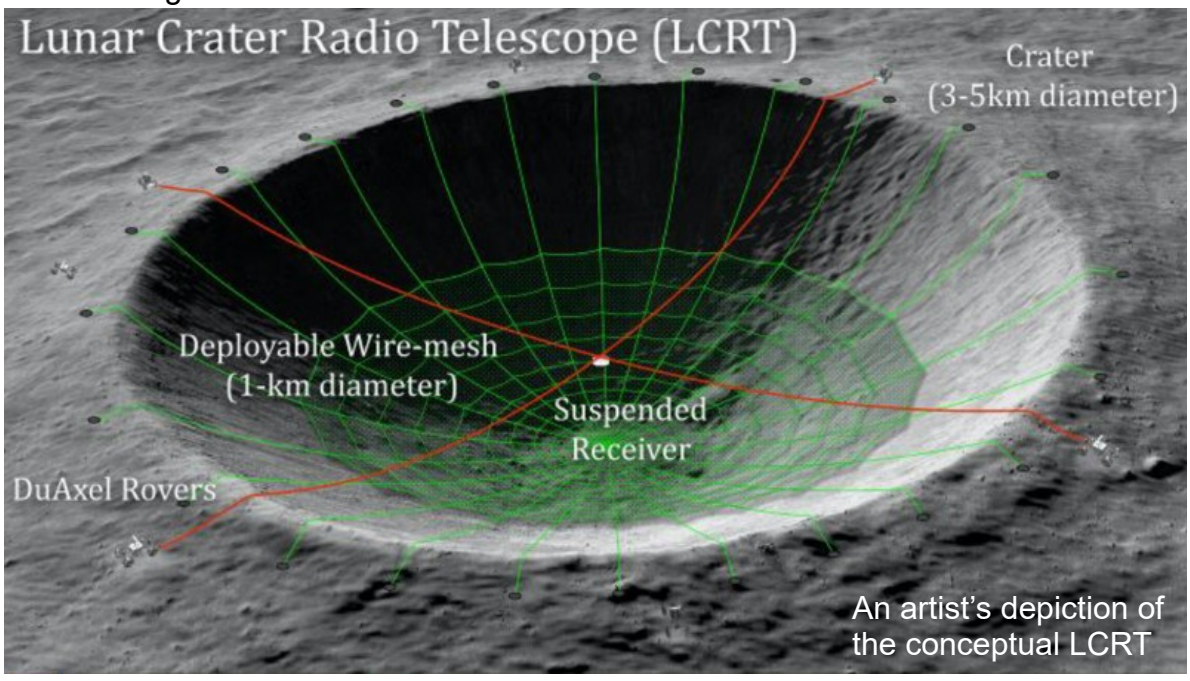
Kuyper Belt and Trans-Neptunian Objects (KBOs and TNOs).

Clyde was asked to be involved in an occultation of a star by the KBO 2014 MU69, now named Arrokoth. After its flyby of Pluto, the New Horizons space craft flew by this object on January 1st 2109, the occultation was in July 2017. **Ω**

Feature of the month: A radio telescope on the moon's far side!

NASA's Innovative Advanced Concepts awarded the Lunar Crater Radio Telescope project $500 000 for further research and development. This telescope is to be built into a natural depression in the landscape (like the decommissioned Arecibo radio telescope). In this case the depression will be a bowl-shaped crater on the far side of the moon. The telescope will be built by robots and will resemble a giant spider's web. (It sounds like SF, doesn't it?)

Why there? For several reasons. There it will be screened from the cacophony of radio noise from Earth, and there is no atmosphere on the moon to absorb any radio waves arriving from space. There is also no wind to ever distort or cause swinging around of the wire-mesh dish - it will hang dead still. On the moon, construction materials weigh only 0.1654 times as much as on Earth. This makes the construction work easier than on Earth, and the support system of the telescope need only be 0.1654 times as strong as it would have needed to be on Earth. **Ω**



At long last, a radio telescope on the moon's far side | Space | EarthSky

What's up in July 2021 - by Michael Poll

Morning sky before sunrise

There is a not very favourable appearance of the Mercury in the Morning sky in July, it is at its best for the first few days of the month. Greatest elongation is on July 4th when it will be 22° away from the Sun. Mercury can be compared in brightness and colour with Betelgeuse which lies a little to the south (right) of it. The Moon will be near Mercury on July 8th.

The Moon will be near the Pleiades on July 6th, when it will also be above left of Aldebaran. On July 7th the Moon will be below left of Aldebaran.

Evening sky

The Moon, Mars and Venus form a neat group in the west after sunset on July 12th. Venus is at its actual closest to Mars on July 13th , when they will be about ½° apart. Venus can be seen approaching Mars from the west during the days prior to the 13th, thereafter it will move away eastwards from Mars. At this time, Venus is moving at 35 km/s in its orbit around the Sun, and Mars at 22 km/s, so Venus can be seen to overtake Mars. They are both moving eastwards against the star background. Venus is moving into Leo and will be near the brightest star of the constellation, Regulus on July 21st & 22nd.

Mars does not catch up with Regulus until July 29th by which time they will be sinking into twilight. Regulus will be marginally brighter than Mars, but compare the contrasting colours – Regulus is blue and Mars is red.

On July 17th first quarter Moon will be near Spica , the brightest star in Virgo.

Saturn rises not long after sunset during July. Jupiter, which is lower down and nearer the eastern horizon, rises before 19h00 by mid-July. On July 24th the Full Moon will be near Saturn, and it will be near Jupiter during the night of July 25th - 26th, the closest approach is at 03.17 on the 26th when they will be about 4° apart.

Constellations for the month

Crux, Centaurus, Libra, Scorpius, Sagittarius, Pavo (the Peacock)

Boötes, Corona Borealis, Lyra

Latest sunrise for Pretoria:

- After June 21st the Sun rises ***later*** each day, until around July 14th (23 days after the solstice).
- The latest sunrise is on July 2nd & 3rd when the sun rises at 6h 54m 22s
- Even by July 21st, (30 days after the solstice) sunrise is still only 3½ minutes earlier than on June 21st.
- Between June 2nd and July 31st (more than 8 weeks) the sunrise time varies by a maximum of only 8 minutes. (Sunrise time ranges from 6h 46 on June 2nd to 6h 54 on July 2nd and 6h 46 on July 31st).
- The sunrise time is 25 minutes earlier on August 31st, compared with August 1st (5 weeks).
- Although the sunrise time varies by very little in June and July, the number of daylight hours are increasing because the ***sunset*** time is getting later (the ***earliest sunset*** was on June 9th). **Ω**

Observing: Discover a Winter Chain - by Magda Streicher

Winter in South Africa is probably one of the most favourable times to try and sniff out, so to speak, the faintest of deep sky objects. The winter air is usually clean and clear and ideal for exploring galaxies in more than one of the several constellations visible at this time of year. Dress up snugly and warmly, make yourself a flask of coffee and get down to seeking out those faint, misty “clouds” that are, in fact, galaxies.

Virgo is a well-known constellation which we sometimes tend to give a wide berth, yet it is a treasure chest of deep-sky objects that are relatively easy to find.

Markarian’s Chain of galaxies is situated within the northern outskirts of Virgo close to the boundary with the constellation Coma Berenices. This “chain” was named by the Russian Benjamin Markarian, who first noted this string of galaxies. What makes this chain special is that Messier 86 and Messier 84, two elliptical star cities rule the area and are easy to find within it. M84 (NGC 4374), is slightly fainter and smaller than M86 (NGC 4406), which is the chain’s largest elliptical galaxy. Several galaxies can be found in this 1.6° chain of galaxies stretching from north-east to south-west. The chain displays galaxies like NGC 4388, a lovely spindle, the edge-on galaxy NGC 4425, and the faintest of them all, IC 3303 and NGC 4387 at the southern point. Very special are NGC 4435 and NGC 4438, situated barely 22’ north-east of M86, a pair of galaxies nicknamed “The Eyes” by Leland Copeland. A pair of fainter galaxies, NGC 4458 and NGC 4461, can be spotted further northeast. The galaxies NGC 4473 and NGC 4477 mark the northern end of the chain.

Join all these links of the chain and explore the infinite heart of the Virgo Cluster of Galaxies.

NAME	TYPE	RA	DEC	MAG	SIZE
Messier 84 NGC 4374	Galaxy	12 h 25.1 m	+12º53’	9.1	5.1’x4.1’
Messier 86 NGC 4406	Galaxy	12 h 26.2 m	+12º57’	8.9	12’x9.3’
NGC 4388	Galaxy	12 h 25.8 m	+12º40’	11	5.7’x1.6’

Astrophotos and text by Johan Moolman

Omega Centauri; NGC 5139; ASSA 56. Nearly 10 million stars (4 million solar masses), between 10 - and 12 billion years old. This globular cluster lies +/- 16 000 light-years from Earth. (Mag 3.7). It may be the core remnant of a disrupted dwarf galaxy?: Has at least two populations of stars with different ages; Astronomers do not entirely rule out an earlier proposed central black hole – if present, they do however limit its maximum mass to 12,000 solar masses. (Kapteyn's Star, a red dwarf in the constellation Pictor, notable for its extremely high proper motion, is believed to originate from Omega Centauri.)

Hubble image: "The majority of the stars in the image are yellow-white, like our Sun. These are *adult stars* that are shining by hydrogen fusion. Toward the end of their normal lives, the stars become cooler and larger. These *late-life* stars are the orange dots in the image.

Even later in their life cycles, the stars continue to cool down and expand in size, becoming *red giants*. These bright red stars swell to many times larger than our Sun's size and begin to shed their gaseous envelopes.

After ejecting most of their mass and exhausting much of their hydrogen fuel, the stars appear brilliant blue. Only a thin layer of material covers their super-hot cores. These stars are desperately trying to extend their lives by fusing helium in their cores. At this stage, they emit much of their light at ultraviolet wavelengths.

When the helium runs out, the stars reach the end of their lives. Only their burned-out cores remain, and they are called white dwarfs (the faint blue dots in the image). White dwarfs are no longer generating energy through nuclear fusion and have gravitationally contracted to the size of Earth. They will continue to cool and grow dimmer for many billions of years until they become dark cinders.

Other stars that appear in the image are so-called "blue stragglers." They are older stars that acquire a new lease on life when they collide and merge with other stars. The encounters boost the stars' energy-production rate, making them appear bluer."

Credit: NASA, ESA, and the Hubble SM4 ERO Team; Page Editor: Robert Garner

This is one of the first images taken by the Wide Field Camera 3 (WFC3), aboard Hubble.

Takahashi TOA 150mm refractor, Nikon D850, Hutech V4 filter: Multiple stacks, 47 minute integration time. Pretoria. April 2021

NOTICE BOARD

June solstice 2021: In South Africa, it will be on Monday 21 June 2021 at 05:32 SAST.

Astronomy on your PC: Identify distant galaxies to help measure dark energy when the Universe was just about 2 to 3 billion years old.
Dark Energy Explorers — Zooniverse

Astronomy on your PC: Help astronomers to find galaxies that look like jellyfish! This will help them understand how they interact with their environment.
Help astronomers find rare cosmic jellyfish galaxies in this new Zooniverse citizen science project! | Max-Planck-Gesellschaft (mpg.de)

UFOs: NASA and UFOs might sound like an odd combination. But the space agency now intends to take a closer look at the phenomenon. (See the January 2021 issue of this newsletter, page 2.)
EarthSky | NASA and UFOs: Space agency to take closer look

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.

Data base: Members are reminded that a data base of the books in our library is to be found on our website.

Astronomy-related images, video clips and documentaries on the Internet

Top 5 Most Promising SETI Radio Signals - YouTube

Watch this stunning new simulation of a star being born | Live Science
The simulation can take three months to run on one of the world's fastest supercomputers.

Wow! Stunning new images reveal Jupiter's chaotic atmosphere | Space | EarthSky

Blood Supermoon Lunar Eclipse wows skywatchers around the world (photos) | Live Science

See it! May 26, 2021 lunar eclipse photos (earthsky.org)

Best Milky Way pics of 2021 | Space | EarthSky

'Ring of fire' solar eclipse wows skywatchers (Photos) | Live Science

Astronomy basics: Angular momentum

In this video clip, several demonstrations are used to convey how the conservation of angular momentum shows up in astronomy – in protostars, pulsars, and black hole accretion disks.

Astronomy Demonstration Videos (unl.edu)

Web links for the astronomy enthusiast

- **The website for all information about the ASSA and the ASSA Centres:**
  https://assa.saao.ac.za/
- **ASSA Specialist Sections:**
  ASSA has various areas of interest. Join and participate!
  https://assa.saao.ac.za/sections/
- **ASSA Publications to download and enjoy:**
  MNASSA: https://www.mnassa.org.za/
  Nightfall: http://assa.saao.ac.za/sections/deep-sky/nightfall/
  To receive as part of ASSA membership benefits - *Sky Guide,* the astronomical handbook for Southern Africa: http://assa.saao.ac.za/about/publications/sky-guide/
- **Mail Groups to join:**
  For general ASSA related information: https://groups.io/g/ASSA-announce
  For posting general items and discussion: https://groups.io/g/ASSA-discussion
- **Social Media to join and share:**
  Facebook: https://www.facebook.com/Astrosocsa/?_rdc=1&_rdr
  Youtube: https://www.youtube.com/channel/UCJ4b1fhmPvYTOsy15YP-_JA
  Twitter: https://twitter.com/AstroSocSA
- **More web links can be found on page 118 of "2021 Sky Guide Africa South". Ω**

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