The PRETORIA CENTRE

of the

Astronomical Society of Southern Africa

www.pretoria-astronomy.co.za

NEWSLETTER JULY 2021

NEXT MEETING

Internet meeting. *
Date and time: Wednesday 28 July 2021 at 19h00.

Programme:

- Annual General Meeting. It will be short and sweet. (About 30 minutes.
- "The Earth is flat" by Neville Young. (15 minutes.)
- "Repairing a Canon 6D astro cooled camera" by Neville Young. (10 minutes.)

Chairman: Bosman Olivier.

*** 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 23 July 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

Our galaxy is warped, and scientists have no idea why | Live Science

Lopsided Galaxy NGC 2276 (hubblesite.org)
Another galaxy is tugging at it, distorting it.

Hubble Watches How a Giant Planet Grows (hubblesite.org)

NASA's Europa Clipper
NASA's Europa Clipper - an orbiting spacecraft - will conduct a detailed reconnaissance of the whole surface of Jupiter's moon Europa to determine whether the icy moon could harbour conditions suitable for life. The planned launch date is 2024 and arrival date 2030. The recce of Europa's surface will last 4 years.

Active seafloor volcanoes on Jupiter's moon Europa? (earthsky.org)

Hubble Finds that Betelgeuse's Mysterious Dimming Is Due to a Traumatic Outburst (hubblesite.org)

Hubble Captures Galaxies' Ghostly Gaze (hubblesite.org)
These two galaxies are undergoing a titanic collision.

EarthSky | NASA announced 2 missions to Venus by 2030. Why that's exciting
For decades, the exploration of our solar system has left Venus largely unexplored. Now things are about to change.

EarthSky | Methane on Enceladus: A possible sign of life?
Something is producing a lot of methane in Enceladus' subsurface ocean. Could the cause be a life form? Or some abiotic process?

Strange 'blinking star' near Milky Way's center could be new class of cosmic object | Live Science
None of the theories proposed can explain it.

EarthSky | Mega comet inbound from Oort Cloud

Rare 'hypernova' explosion detected on fringes of the Milky Way for the first time | Live Science
The catastrophic blast was 10 times stronger and brighter than a typical supernova.

The hunt for extraterrestrial life is about to enter a new era | New Scientist
New giant telescopes will give the hunt a dramatic boost.

EarthSky | Tiangong: China's new space station. What to expect

China wants to launch asteroid-deflecting rockets to save Earth from Armageddon | Live Science

Rare 'teardrop' star and its invisible partner are doomed to explode in a massive supernova | Live Science
This star system is the closest Type Ia supernova candidate ever found.

'Alien burp' may have been detected by NASA's Curiosity rover | Live Science
Mars produces localized methane burps. Is the cause biological or non-biological?

What's Up? - by Michael Poll

August – September 2021:

Visibility of Mercury

Mercury will be visible in the evening sky from about mid- August until nearly the end of September. This is the best chance to see Mercury in the evening sky for the whole of 2021.

Mercury moves into the evening sky after superior conjunction, which is when it is in line with the Sun, but on the far side. After superior conjunction the angle between Mercury and the Sun increases as the planet moves along the ecliptic eastwards from the sun,. The movement away from the Sun is called an elongation, - in the evening sky it is an eastern elongation (Mercury is east of the Sun) and in the morning sky a western elongation (Mercury is west of the Sun). In 2021 there are three elongations in the morning sky and four in the evening sky. At greatest elongation, the elongation from the Sun can vary between 18° and 28°.

Mercury is at superior conjunction on August 1st 2021. For some days after superior conjunction it is still too close to the sun to be observed, but by mid-August it will be setting about an hour after the sun – on August 18th sunset is at 17h 50 and Mercury sets at 19h 00 and the elongation is 16°.

Mercury reaches its greatest angular distance from the Sun when the angle Earth-Mercury- Sun is 90° - this is called "greatest elongation" and with the current elongation this occurs on September 14th when, as viewed from the Earth, Mercury is 27° east of the sun, and sets almost exactly 2 hours after the Sun. **(Figure1)**. Mercury would be moving anticlockwise in this diagram.

On Page 72 of the 2021 ASSA Handbook, it can be seen that elongations of Mercury show a four month cycle in the morning sky alternating with a four month cycle in the evening sky (look at the "Mercury rises" and the "Mercury sets" lines). The four month cycle is a reflection of Mercury's synodic period of 116 days (the synodic period is the time taken for any two planets to return to the same relative positions). Note that the synodic period of Mercury with the Earth is a few days shorter than four months (116 days vs 120 days) so that the equivalent elongations the following year tend to be a few days earlier.

Some appearances of Mercury in the evening or morning sky are more favourable for observation than others. The period of visibility can vary from about 16 – 24 days – but what makes a "good" elongation?

- Mercury rises long before twilight starts (morning sky)
- Mercury sets a long time after sunset - setting after twilight ends (evening sky)
- The longer it rises before sunrise, or the later it sets after sunset, the better - Mercury can then be seen at a reasonable altitude in a dark sky.

In the Southern Hemisphere, the best evening elongations are in September and October and the best morning ones are in March and April. A poor one in the evening in January is followed by a good one in the mornings of March and April, and a good one in the evening of September and October is followed by a bad one in the mornings of November and December. One way to assess whether an elongation is a "good" one or a "bad" one is to check the ASSA Handbook and look for the occasions when the "Mercury rises" or "Mercury sets" line dips out of twilight into a dark sky, and the further it dips, the better.

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The most favourable elongations occur when greatest elongation occurs when the ecliptic is steeply inclined to the horizon, and Mercury is at or near aphelion. The visibility of Mercury is rather more affected by the angle of the ecliptic to the horizon than the actual elongation.

What is going on ? One needs to look at the angle that the ecliptic makes with the horizon around sunrise or sunset at different times of the year, the eccentricity of Mercury's orbit and the aphelion and perihelion dates.

Ecliptic angle

In the Southern Hemisphere, the ecliptic makes its steepest angle to the horizon in the evening when the September equinox is setting. (The September equinox is the point in the sky where the ecliptic crosses the celestial equator heading south. The point is in Virgo at 12h Right Ascension and 0° Declination). The equinox point sets at 20h00 on August 21st, 18h00 on September 21st and 16h00 on October 21st, so from about mid-August and into October, the ecliptic stands almost upright in the west at sunset. This is the main reason that evening elongations of Mercury are more favourable in the second part of the year. **(Figure 2** – in 2021 the September equinox is on the 22nd at 21h21**)**

Morning elongations are more favourable in the Southern Hemisphere around February, March and April because the March equinox rises around sunrise about this time, so the ecliptic is almost vertical to the eastern horizon. (The March equinox is in Pisces but is known as the First Point of Aries and it is at 00h RA and 0° declination).

Eccentricity of the orbit

Figure 3 shows the relative positions of the orbits of the Earth and Mercury, with the views of Mercury's orbit as seen from the Earth early and late in the year. For practical purposes the orbits are fixed in relation to each other. The Earth arrives at position $\mathbf{E_1}$ around mid-February, $\mathbf{E_2}$ in early April, $\mathbf{E_3}$ early in August and $\mathbf{E_4}$ late in September. In 2021 Mercury arrives at its perihelion on April 27th and July 24th, and at aphelion on June 10th and **September 6th.** This last date is the one of interest for the August – September 2021 elongation – it will occur during the period that the Earth is passing through $\mathbf{E_3}$

Mercury has the most eccentric orbit of the planets – which makes it about 70 000 000 km from the sun at aphelion and 46 000 000 km from the sun at perihelion. Thus, if the Earth is in the right position at the right time, Mercury can be observed when it is at the greater angular distance from the sun at aphelion compared with perihelion. However it is rare for Mercury to be at exactly aphelion when the earth is at E_2 or E_3 but there is a sort of window where Earth is near $\mathbf{E_2}$ or $\mathbf{E_3}$ and Mercury is near aphelion. Aphelion and the Earth passing through E_3 both occur in September in 2021.

Moon and Mercury

On August 9th the 26 hour old Moon will be above right of Mercury, but it will be difficult to see the planet in the twilight, as sets only 35 minutes after the Sun. It will be easier to see the Moon next to Mercury in September – on September 8th the 40 hour old Moon will be below right of Mercury and on the 9th the waxing crescent will be above right of Mercury.

Mercury near bright objects

As it moves around the evening sky Mercury passes other objects along the zodiac – on the evenings of August 18th and 19th it is near Mars. Mercury is at magnitude -0.5 and Mars is at magnitude 1.8, but with the effect of light absorption by the

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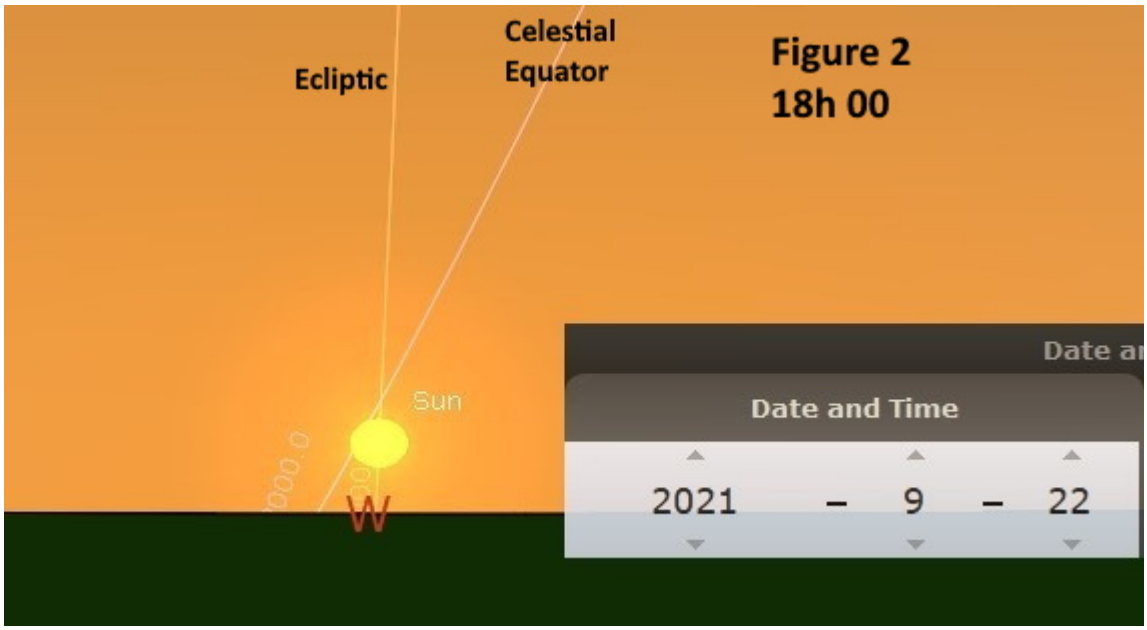
atmosphere and the twilight, Mars may be difficult to see. Mercury will be near the star Spica (the brightest star in Virgo) on September 20th, 21st and 22nd , being closest on the 21st.

Other selected events to note for August 2021
August 2nd Saturn is at opposition
August 13th the Moon is near Spica
August 16th the Moon is near Antares: they are closest at 20h 35 when they are 4.5° apart.
August 20th Jupiter is at opposition
August 21st the Moon is between Jupiter and Saturn **Ω**



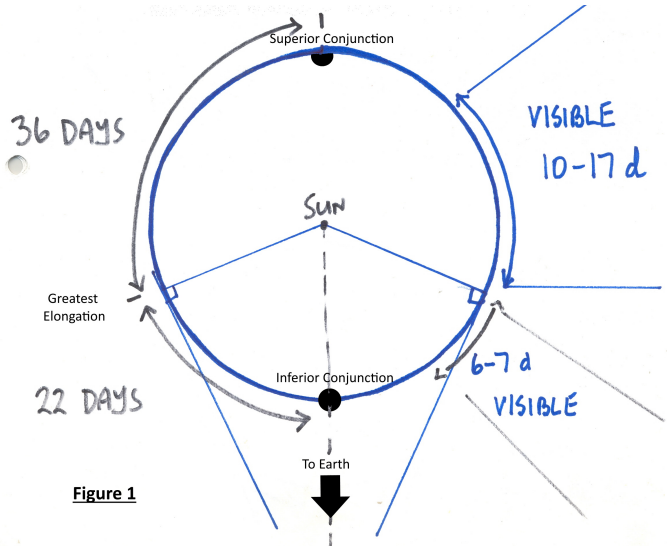


Figure 1

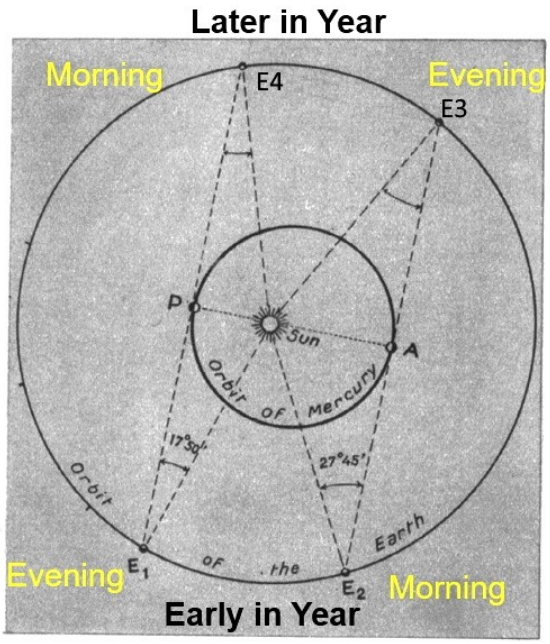


Fig. 350 — Relationship between the orbits of Mercury and the Earth
Figure 3

Observing: A Double Bubble like no other - by Magda Streicher

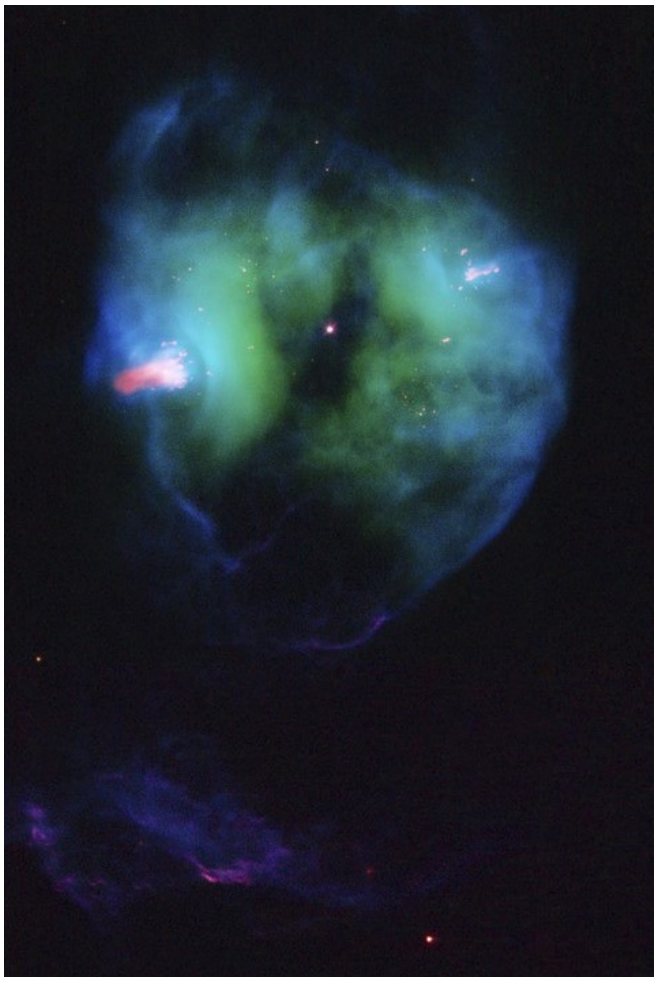
The constellation Gemini is home to what is probably one of the most outstanding deep sky objects. Not all that well known is the planetary nebula NGC 2371-2, also known as the Double Bubble or the Double Knotted Nebula. William Herschel discovered this strange double nebulous structure, was confused by it and simply classed it as a deep sky object.

This twin nebula is situated only 3° south-west of Alpha Geminorum (Castor), and from its appearance would not immediately strike one as being a planetary nebula.

The nebulae could also be seen as an hourglass, or perhaps as peanut-shaped. It displays two circular patches of nebulosity, barely touching each other, with a thin dark lane between them. With averted vision, and in very dark sky conditions, I could just make out the twinkling magnitude 13 central star. (Averted vision is to gaze off to one side of the field of view to use your eyes' rods to detect faint light specks of the object in view). The south-western lobe is slightly brighter than the north-eastern one. Both puffs of nebulae are surrounded by a hazy envelope which appeared extended with the use of an oxygen (O^{III}) filter. This unique object is bathed in a soft grey colour.

There are strange puffs between the stars that never fail to amaze me. **Ω**

NAME	TYPE	RA	DEC	MAG	SIZE
Object	Type	RA	DEC	Mag	Size
NGC 2371 NGC 2372	Planetary nebulae	07 h 25.6 m	- 29° 29.2'	11.3	55" x 45"



Astrophotos with annotations - by Johan Moolman

NGC 2467, Sh2-311, nicknamed the "Skull and Crossbones Nebula".

It is a star-forming region whose appearance has occasionally also been likened to that of a colourful mandrill. (Large West-African monkey).

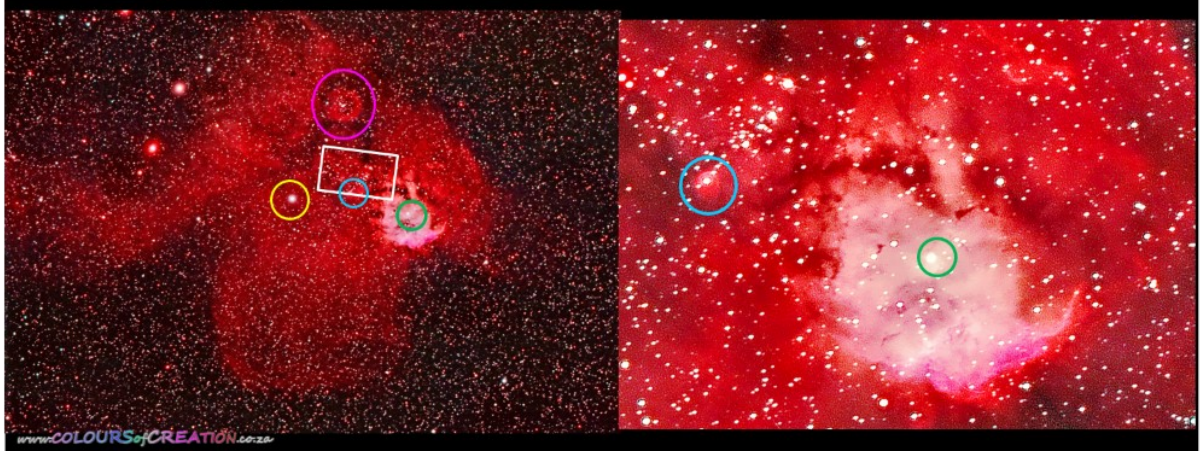
Wikipedia, Sanjay Acharya

With thanks to Percy Jacobs

Multiple stacks (3 hours: 180 x 60 sec subs, guided). Takahashi TOA 150 apochromatic refractor, f/7.2, FL 1100mm; Nikon D850 – modified; IDAS V4 LPS filter; Losmandy G11-GT mount. Software: BackYardNIKON; PHD, DSS, PixInsight, Paint.NET. (Pretoria).

Many planetarium programs contain confusing information about NGC 2467. Some only include the cluster of stars, others contain two objects (one for the cluster and one for the nebula). NGC 2467 doesn't only represent a single cluster, there are in fact two clusters in the complex.

The region is dominated by a massive young star, HD 64315 (green circle) that is helping to shape the structure of the whole nebular region. It is a massive, young O6 star (aka SAO 174700, V402 Pup). This star seems to be the source of ultraviolet radiation exciting the gas in NGC 2467. Two stellar clusters, referred to above, are: Haffner 19 - located "inside" one "eye" of the Mandrill (pink circle) - exciting a sphere of gas called a Strömgren sphere - of which the *Rosetta Nebula* is the most famous example. Secondly, Haffner 18 (white rectangle) which contains the very young star FM3060a which has just come into existence and is still surrounded by its birth cocoon of gas (blue circle). Star HD64455 (yellow circle) marks the other "eye" on the left. Like the familiar *Orion Nebula*, NGC 2467 is a huge cloud of gas — mostly hydrogen — that serves as an incubator for new stars. *(Wikipedia)*



NOTICE BOARD

UFO report by US intelligence agencies.
EarthSky | US intelligence report: 140 unexplained UFOs, no aliens The long awaited report presented no clear evidence for alien spacecraft. But it also didn't rule out this possibility. It presented five theories to explain these unexplained UFO cases. Alien spacecraft is but one of these theories.

Planet-size UFO debunked.
Mysterious Planet-Size Object Spotted Near Mercury | Live Science

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

EarthSky | See 1st new images of Ganymede in over 20 years
The last time we saw Jupiter's largest moon Ganymede up close was over 2 decades ago, when the Galileo spacecraft flew by it in May 2000. Now, NASA has released some amazing new close-ups of the giant moon, taken by orbiter Juno on June 7.

Feature of the month: Cosmic filaments – by Pierre Lourens

Cosmic filaments are gigantic tubes of which the walls consist of galaxies and dark matter. The cosmic filaments are separated by giant voids. They are structures so vast that entire galaxies are like specks of dust in their walls. And they are vastly larger than clusters of galaxies. Astronomers discovered that cosmic filaments rotate like giant corkscrews. As they rotate, they pull galaxies and dark matter into their walls and toward galaxy clusters at each end. **Ω**

Watch an animation of a rotating cosmic filament at:
Cosmic filaments may be the biggest spinning objects in space | Science News

Read more at:
Astronomers discover largest-known spinning structures in the universe | Live Science

Astronomy basics: Magnetars

EarthSky | What is a magnetar?

Sad news

It is with sadness that I inform you that one of our members, José da Silva, has passed away. He was a victim of the Covid-19 virus.

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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