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

NEWSLETTER NOVEMBER 2024

NEXT MEETING

Venue: Christian Brothers College (CBC), Mount Edmund, Pretoria Road, Silverton, Pretoria.
Date and time: Wednesday 27 November at 19h00.
Programme:

- "What's up in December 2024 and January 2025" by Michael Poll.
- Main talk: "DIY 3D printed star tracker for astrophotography" by Mauritz Geyser *****.
- Socializing over tea/coffee and biscuits.

The chairperson at the meeting will be Michael Poll.

***** Synopsis: The design and 3D printing of a star tracker for wide-angle astrophotography.

NEXT OBSERVING EVENING

Friday 22 November from sunset onwards near the Pretoria Centre Observatory, which is also situated at CBC. Turn left immediately after entering the main gate. Carry straight on through the car park and proceed down the tarred road that drifts to the left out of the car park and then swerves to the right. About 50 to 100 metres after the last row of studs there is a cricket sight-screen on the right. Observing will be on the cricket pitch just past the sight-screen.
Please note that we have been instructed that no one is to drive on to the sports fields because of possible damage to the irrigation systems there.

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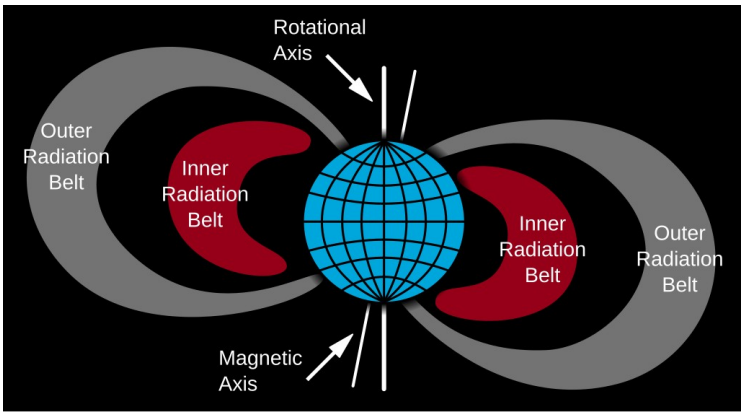
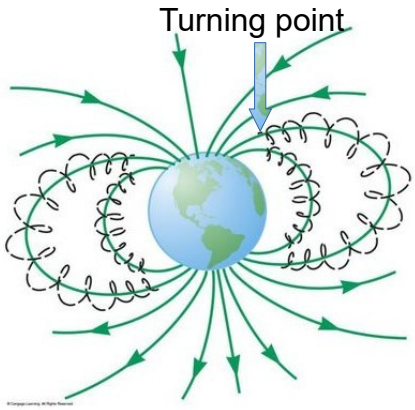
Editor's chatter: The Van Allen belts

The Sun consists mostly of hydrogen (H) and helium (He). In the photosphere, the composition by mass is 73.46% H and 24.85% He. At the high temperatures inside the Sun, the particles collide frequently and violently and the one electron of each H atom is knocked off, so that the bare nucleus (a single proton) and the electron move around freely. The two electrons of each He atom are also knocked off, so that the bare He nucleus (consisting of two protons and two neutrons and also called an alpha particle) and the two electrons move around freely. This mixture of bare nuclei and free electrons is called a plasma.

Violent activity on the surface of the Sun blast out an intermittent stream of solar plasma in all directions. This stream is called the "solar wind". When the solar wind encounters Earth, most of it is deflected by Earth's magnetic field. Earth's magnetic field thus protects the atmosphere from destruction by the solar wind! Some of the particles are trapped in Earth's magnetic field. Mostly free electrons and protons are trapped. Other nuclei, such as alpha particles, are less often trapped. Most of the trapped particles are thought to come from the solar wind while others arrive as cosmic rays.

The Van Allen belts are two doughnut-shaped belts around Earth's magnetic axis, as shown in cross section in the image below left. The particles are trapped in these two belts. These particles move back and forth in spiral-shaped orbits, the free electrons in the outer belt and the protons in the inner belt, as shown in the image below right.





When a trapped particle comes near a magnetic pole (where it penetrates deeper into the atmosphere), it turns around and starts spiralling back to the other magnetic pole, but sometimes it hits a molecule of the atmosphere near such a turning point, and excites the molecule. Such excited molecules then radiate photons of light. This is the cause of the beautiful auroras. See

[12 spectacular pictures of the aurora from space (msn.com)]

When there is more violent activity on the surface of the Sun, the solar wind is more intense and more particles are trapped in the belts. This results in more spectacular auroras.

The belts endanger satellites, which must have their sensitive components protected with adequate shielding if they spend significant time near the belts. **Ω**

Astronomy related articles on the Internet

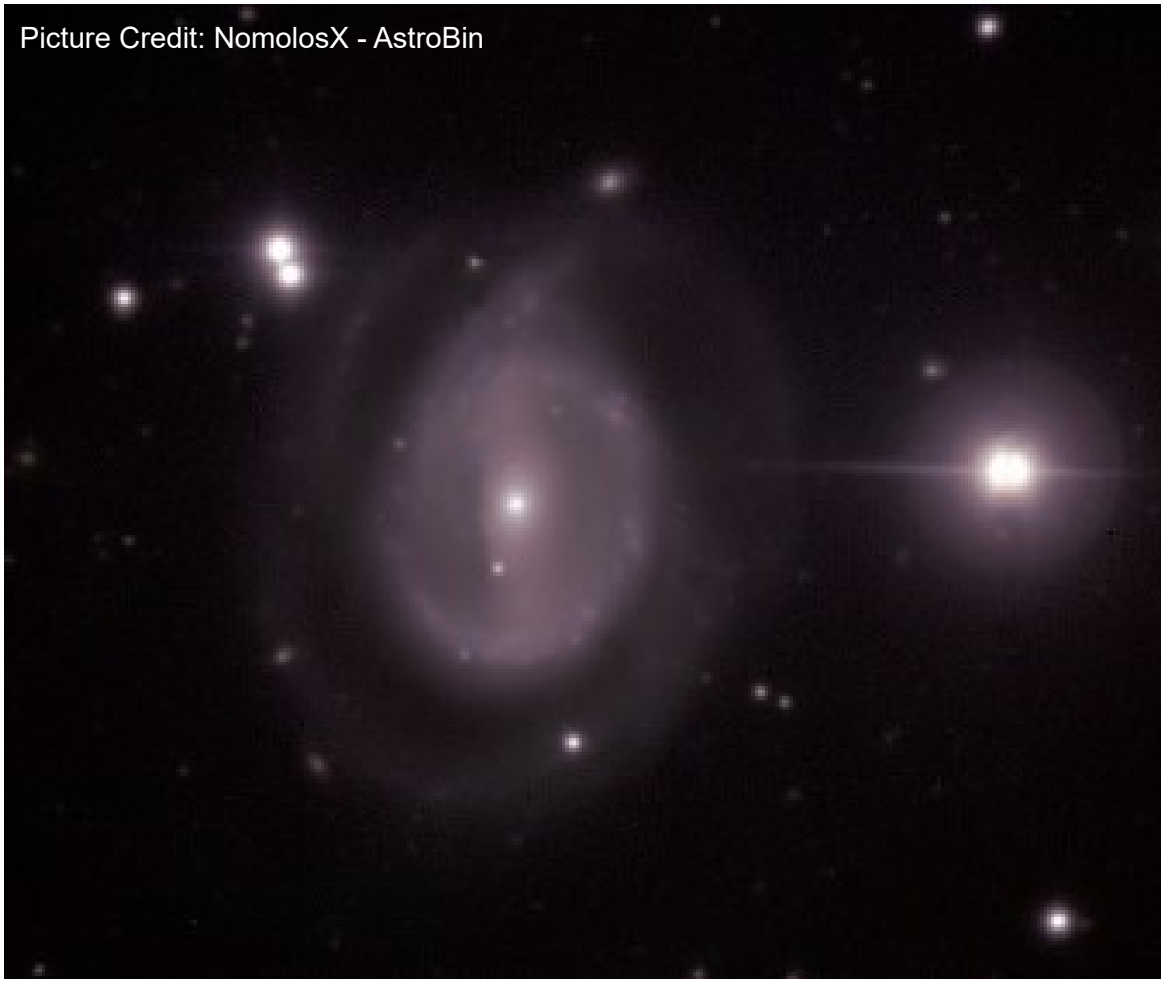
- Massive ocean beneath Earth's crust. Massive ocean discovered beneath the Earth's crust containing more water than on the surface (msn.com)
- Spacecraft BepiColombo is studying the interaction between the solar wind and Mercury's magnetic field. BepiColombo spacecraft's flyby of Mercury begins unraveling the planet's magnetic mystery | Space
- Eleven objects were discovered at distances beyond the known Kuiper Belt. 2nd Kuiper Belt? Our solar system may be much larger than thought | Space
- Large black hole jet. Black hole blasts largest jet ever seen at 23 million light-years long | Space
- Orbiting space junk. Fighting space junk: More than 100 partners sign Europe's 'Zero Debris Charter' | Space
- Probe to visit asteroid. SpaceX rocket launches Europe's Hera planetary defense probe to visit asteroid smacked by NASA | Space
- Alien life. Does alien life need a planet to survive? Scientists propose intriguing possibility | Space
- NASA's spacecraft with a solar sail. NASA's solar-sailing spacecraft has a bent boom and is still tumbling in Earth orbit (photo) | Space
- Neutron stars collided, created black hole. Hubble watches neutron stars collide and explode to create black hole and 'birth atoms' | Space
- Europa Clipper and JUICE are on their way to study Europa, Ganymede and Callisto. All three have water ice crusts with oceans of liquid water (that could support life) underneath their crusts. Jupiter’s moons hide giant subsurface oceans − Europa Clipper is one of 2 missions on their way to see if these moons could support life | Space
- Star formation in ancient galaxy. Astronomers spot unusually synchronized star formation in ancient galaxy for 1st time | Space
- Small planet orbiting Barnard’s star discovered. Scientists discover a ‘tiny Earth’ five light-years away from our planet

Observing: NGC 53 - Behold the southern skies – by Magda Streicher

The constellation Tucana, famous for being part of and associated with the Small Magellanic Cloud, surprised us with a galaxy in a rather impressive star field. NGC 53 is a very small, extremely faint, roundish to oval hazy patch with a smooth surface brightness. With higher magnification and averted vision, the galaxy displays an oval envelope that becomes slowly brighter to a stellar nucleus. High resolution pictures show the tiny galaxy PGC 977 in the process of merging with NGC 53, forming a hazy short extension towards the northern edge of the larger galaxy. Striking and special are the look-alike double stars that share the space around the faint galaxy NGC 53, that appears a little lost in the field of view.

The constellation Tucana is host to an amazing number of listed LEDA and PGC galaxies, although most of them are extremely faint. The Lyon-Meudon Extragalactic Database (LEDA) is a database of galaxies, created in 1983 at the Lyon Observatory. The Principal Galaxies Catalogue (PGC), published in 1989, was based on the Lyon-Meudon Extragalactic Database and contained cross-identifications for it. LEDA originally contained information on more than 60 parameters for about 100 000 galaxies, and now contains information on over 3 million celestial objects, of which about 1.5 million are galaxies. **Ω**

OBJECT	TYPE	RA	DEC	MAG	SIZE
NGC 53	Galaxy	00 h 14.7 m	- 60° 19.8’	13	2’ x 1.4’



Report for the observing evening on October 18th 2024 – by Michael Poll

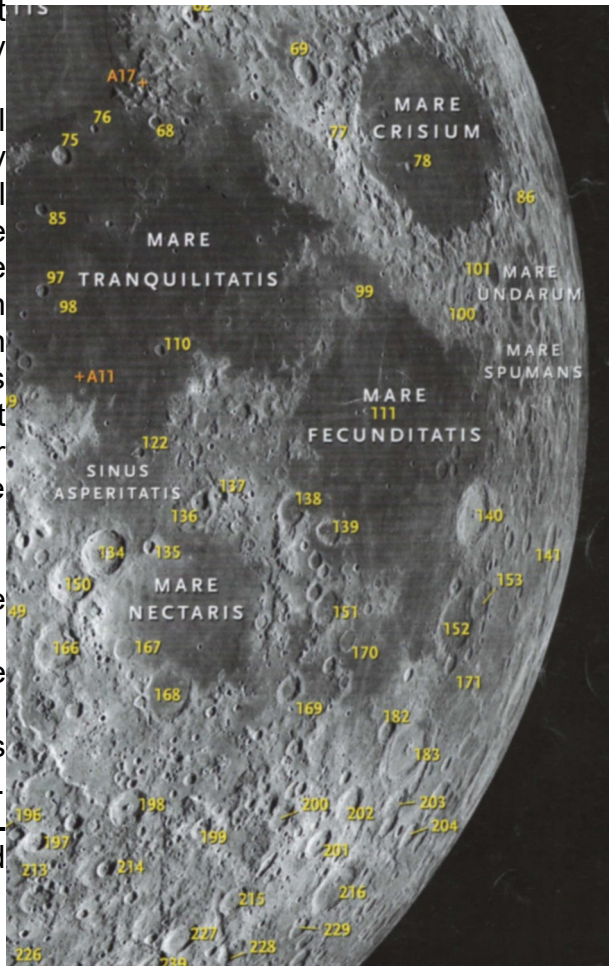
A pleasant warm evening with no clouds and a sky which might be as good as it can get at our observing site at CBC. Nevertheless, for example, the stars of the Square of Pegasus with magnitudes ranging from 2.1 to 2.5 were barely visible to the naked eye. Nine people attended including a couple of visitors from Johannesburg from the telescope making class.

Venus and Saturn were the planets on view, Venus showing a gibbous phase, and Saturn's nearly edge on rings showing as two little spikes sticking out at the sides. Titan was also easily seen.

Michael revisited a few double stars – Alpha Centauri (of course) and Beta Cygni (of course) and, as well as Epsilon Lyrae, a couple of the "other" double stars in Lyra.

Epsilon is the "double-double" - the first split shows a pair 208" apart. The other star of the equilateral triangle that includes Epsilon and Vega is Zeta (ζ) Lyrae. Zeta's two stars are of magnitudes 4.4 and 6.0 respectively and are 44" apart. (See image on next page.) Zeta was first recorded as a binary by William Herschel (who else?) on August 29th 1779.

An extended line drawn from Vega through Zeta and carried on for the same distance points to Delta (δ) Lyrae, also a (line of sight) double. Ian Ridpath describes this as a "naked eye" double, and this could well be correct if we could but see the star, but on this evening it was not visible to the naked eye – also a good sky would be required because of the relative faintness of Delta². The components about twice as far apart as Epsilon, but they are unequal – Delta¹ is a blue-white star at magnitude 5.6 and Delta² is a red giant at magnitude 4.2 (remember that the separate components of a double star are named in order of Right Ascension, not brightness). The colour difference was easily seen in the telescope.



Just before 8.00pm the just past full Moon rose. This gave a chance to identify some craters along the lunar east (celestial west) limb. These are the craters that one would see at crescent "New" Moon, but by the time the New Moon is fat enough and high enough in the evening sky after New Moon the Sun is too high in the lunar sky and details of these features are lost, so, oddly enough, it seems that these features may be seen better shortly after Full Moon. The features in the table on the next page were noted.

Notes:

Map Number: Refers to the numbers on the attached map.

"L" Number: Refers to the number in the Lunar 100.

Langrenus Vendelinus Petavius Furnerius form a distinct row along the south east limb. The other craters are neighbours. Petavius **(L 16)** is described as crater with a domed and fractured floor.

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Map no	L no	Name	Diameter km	Named for		
140		Langrenus	132	Michel Florent van Langren	1600 - 1675	Belgian engineer & mathematician. Drew first map of Moon with names and formations
153		Lamé	84	Gabriel Lamé	1795 - 1870	French mathematician
152		Vendelinus	147	Godefroid Wendelin	1580 - 1667	Belgian astronomer
171		Holden	47	Edward Holden	1846 - 1914	American astronomer. First Director of Lick Observatory
182		Wrottesely	57	John, First Baron Wrottesley	1798 - 1867	English astronomer. Compiled a catalogue of double stars
183	L16	Petavius	177	Denis Petau	1583 - 1652	French theologian & historian. Studied chronology
216		Furnerius	125	Georges Furner	died circa 1643	French Jesuit. Professor of mathematics in Paris
201		Stevinus	75	Simon Stevin	1548 - 1620	Belgian born mathematician, optician, soldier & engineer
202		Snellius	83	Willibrord van Roijen Snell	1591 - 1626	Dutch astronomer & geodesist. Snell’s Law in optics

Zeta Lyrae. **Image Credit : David Chifiruic, Romania**

Summary of "What's up in December 2024 and January 2025" to be presented on November 27th 2024 - by Michael Poll

In 2012 I gave an astronomy presentation in Greytown (Natal), and there was the proverbial "little old lady" at the back who asked a number of shrewd questions. For the next 10 years or so we corresponded by SMS because the questions continued, often showing a deep insight into what she could see in the sky – although new to the game at around 80 years old, she was an astute observer. Sadly, Inge died recently aged 90, but to the end she was still keen on "looking up".

I used to send her the Skymap every month, her friend printed it out for her. One thing that she found confusing on Skymaps was, for example, the following:

2024 August 6th Moon near Mercury at 7h UT (20° from Sun, evening sky).
2024 October 26th Moon near Regulus at 17h UT (64° from Sun, morning sky).

The question was: "*Why does it give a morning time when visibility is in the evening, and why does it give an evening time when visibility is in the morning?*"

The reason for this seeming anomaly is that the time given is the time of apparent closest approach, which may not be visible locally. On August 6th we would see the objects "close together" that evening or the previous evening, and on December 26th we would see the objects "close together" early that morning or the following morning. We would understand **2024 October 5th: Moon near Venus at 19h UT (evening sky)**, because the time given matches the time of day.

This presentation uses Stellarium screenshots of the Moon near the planets and bright stars on the particular dates to highlight the explanation.

Mostly Evening Sky events but Morning Sky where indicated.

Moon Near Planets

The Moon will be:
Near Venus on December 4th 2024 and January 3rd 2025.
Near Saturn on December 8th 2024 and January 4th 2025.
Near Jupiter on December 14th 2024 and January 10th 2025.
Near Mars on December 17th & 18th 2024 and on January 14th 2025.
Near Mercury on December 29th 2024 (morning sky).

Moon near bright(ish) stars:

Near the Pleaides on December 13th 2024 and January 10th 2025.
Near Spica on December 25th 2024 and January 21st (morning sky).
Near Pollux on December 17th 2024 and January 13th 2025.
Near Antares on December 29th 2024 and January 25th 2025 (morning sky)
Near Regulus on January 16th 2025.

Planets near stars

January 23rd 2025 Mars near Pollux.

Planets near planets

January 18th 2025 Venus near Saturn.

Planetary points

Mars

December 7th 2024 Mars stationary.
January 16th 2025 Mars at Opposition: magnitude -1.38.
February 24th 2025 Mars stationary.
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Jupiter
(October 9th 2024 Jupiter stationary.)
December 7th Jupiter at opposition: Magnitude -2.8.
February 4th 2025 Jupiter stationary.

Mercury
December 25th 2024 Mercury at greatest elongation west: 22.0°.

Venus
January 10th 2024 Venus greatest elongation east: 47.2° Magnitude -4.56.

Other dates
December 14th 2024 Geminid meteor shower.
December 21st 2024 at 11h 20 Summer solstice.
December 31st 2024 at 00h00 Sirius almost directly overhead at midnight.
January 4th 2025 14h00 Earth at perihelion: 0.98333 AU from the Sun.

The presentation will also discuss the multiple star Sigma Orionis and the cluster NGC 3532. **Ω**

NOTICE BOARD

Help search for protostars, aka Herbig-Haro objects.
Baby Star Search — Zooniverse

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.

Astronomy related images, video clips and documentaries on the Internet

- Nebulae. The most breathtaking nebulae in the universe (msn.com)
- Images captured by the JWST.
Astounding images captured by the James Webb Space Telescope (msn.com)
- Infrared map.
Scientists reveal the most detailed infrared map ever of the Milky Way (msn.com)
- Imaginary views of alien worlds.
THE SIGHTS OF SPACE: A Voyage to Spectacular Alien Worlds (youtube.com)
- Photographs of the supermoon on 17 October.
14 stunning pictures of last night's supermoon from around the world (msn.com)
- Eruption from the Sun. Watch a 100,000-mile-high tower of plasma erupt from the sun in this stunning video | Space
- China reveals ambitious space exploration plans.
China will explore the moon, Mars, asteroids and Jupiter over the next decade | Space
- Europe makes moves to rendezvous with asteroid Apophis in 2029.
Europe makes moves to rendezvous with asteroid Apophis in 2029 | Space
- T Coronae Borealis again. (Koos van Zyl spoke about this at the August meeting.)
A rare stellar explosion is coming: the first in 80 years

The story of Comet C/2023 A3 Tsuchinshan-ATLAS - by Johan Jordaan

Discovery

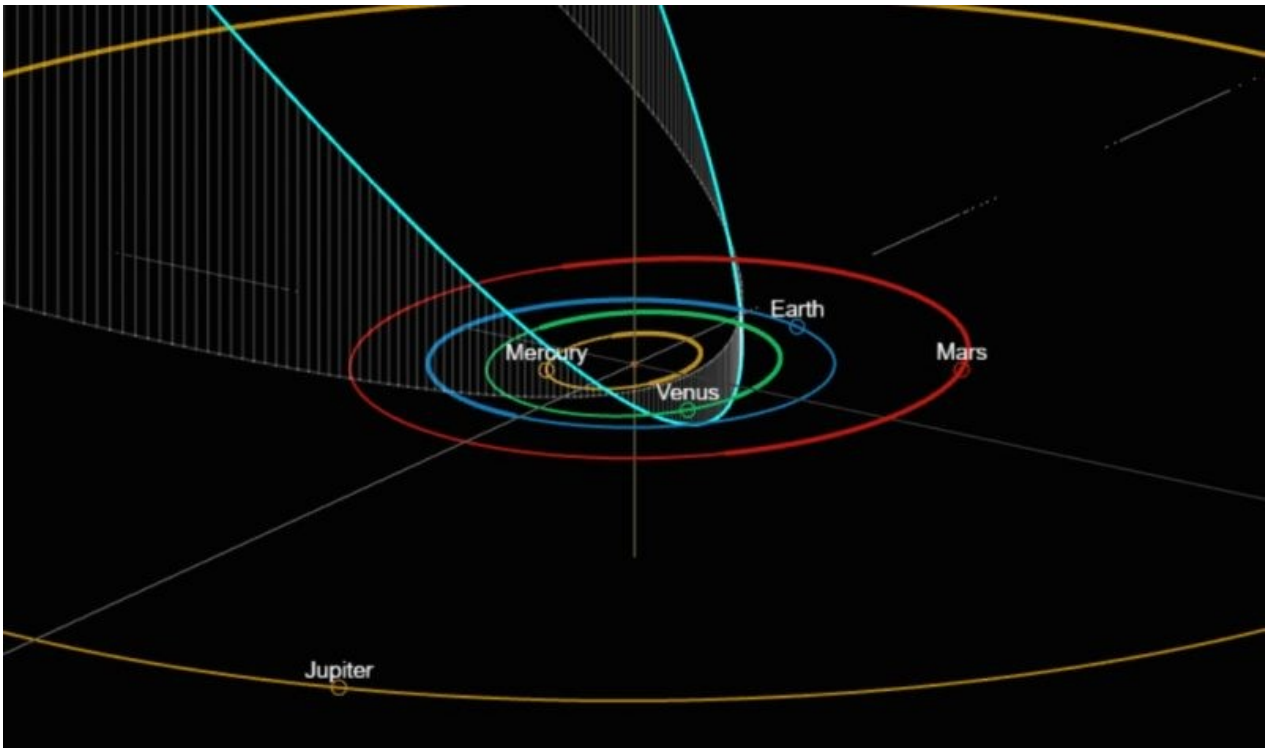
The comet's name (Tsuchinshan–ATLAS) comes from the two observatories that discovered it: This remote object, discovered on Jan. 9, 2023, at the Purple Mountain Observatory (Tsuchinshan) in China, was originally believed to be an asteroid before it was found to be actually a comet on Feb. 22, 2023 by the Asteroid Terrestrial-Impact Last Alert System (ATLAS) search program in South Africa. The orbit computed then showed that the comet comes from the Oort Cloud and would dive deep into the inner solar system a year and a half later.

Interesting information about Comet Tsuchinshan-ATLAS

- Long period comet with an orbital period of 80 000 years
- It is the brightest comet in 27 years
- Maximum brightness of magnitude 2.5
- Nearest position to the Sun on 27 Sep. 2024 – distance of 36 million km
- Nearest to the Earth on 11 Oct. 2024 – distance of 44 million km
- Diameter 2-3 km
- The coma of the comet's head has a diameter of 209 000 km
- Length of tail: 6 degrees or 29 million km
- Temperature variance:
  In Oort Cloud: - 268.15 ºC (near absolute zero)
  Around the Sun: 427 ºC
- Speed: approximately 169 000 km/hr, 4 million km per day.

Right: Johan Jordaan doing stargazing.

The visibility of Tsuchinshan–ATLAS: Before sunrise in the East till 27 September and in the west to the right of Scorpius after sunset from 12 to 30 Oktober 2024.



Comet C/2023 A3 (Tsuchinshan–ATLAS). The turquoise line shows the orbit in the inner part of our solar system Source: Earthsky.org. (Continued on next page.)

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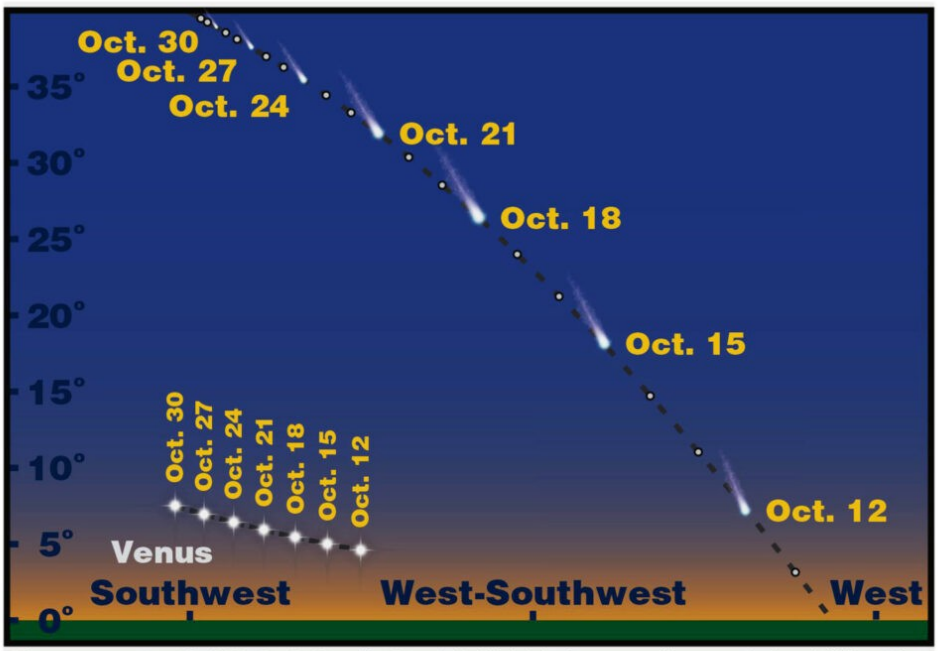

Th sky chart above provides a simulated view of the sky looking toward the western horizon. It shows the changing positions of Comet Tsuchinshan-ATLAS and planet Venus, from October 11 to November 1, 2024. (Image credit: Rod Nerdahl)

Comet T-ATLAS as imaged from Tivoli Farm, Namibia on September 22nd (note the fan of the comet's second tail off to the left). Credit: Gerald Rhemann.

Report for the monthly meeting held on 23 October 2024 - by Danie Barnardo

The proceedings were started by Danie Barnardo, who presented “What’s up in November 2024”.

The main talk for the evening was presented by Johan Jordaan, who outlined his experiences with a talk titled “Exploring cellphone astrophotography”. He started by stating that this type of astrophotography has lots of variations: a cellphone on a tripod (wide angle); different lenses that can be fitted to the cellphone camera; the cellphone mounted on a telescope; or even even hand-held.

Next he stated that this type of astrophotography has a number of advantages: cellphones’ cameras have quite surprising properties: a fast lens with f ratios of the order of 1.5 to 2; the fact that results can be viewed instantly; images can be shared easily on WhatsApp, e-mail, WPS Cloud, LinkedIn or Facebook; and the ability to automatically stack a number of images on some higher-end cellphones. Next, he outlined his approach, which included a conceptual roadmap; the dynamics of astrophotography with a cellphone and lastly, some steps to immediate success.

His roadmap included three levels of cellphone astrophotography: Entry Level, which serves to record what you see during a viewing session; an Intermediate Level, to show family and friends what an enjoyable hobby amateur astronomy can be; and lastly an Advanced Level, during which high definition, publishable results are possible.

He indicated that a valuable source of information on cellphone astrophotography is a NASA publication: “A Guide to Smartphone Astrophotography” by Dr. Sten Odenwald. This publication can be downloaded from the NASA website at: https://science.nasa.gov/learn/heat/resource/a-guide-to-smartphone-astrophotography/.

He next showed some images he took during a viewing evening (Entry Level) and also showed some images from the abovementioned publication (Intermediate and Advanced Level), to illustrate what is possible.

Subsequently he dwelt on the different apps available for cellphones, some of which can be downloaded from online app stores for Android cellphones, as well as iPhones, which can assist in greater control over your images. This will depend on your specific type of cellphone, as well as whether you are prepared to pay for the more advanced apps.

He also dwelt on some of the technical issues involved and concluded with the following remarks:

- An iPhone or Android camera is a genuinely powerful tool to explore the world around you, capture memories, and express your artistic vision.
- With a bit of practice, you can capture amazing photos of the night sky. The Moon, stars, star clusters, globular clusters and even nebulae are easily captured.
- Cell phone photography should be simple and easy.
- Feel free to experiment and find what works best for you - You might be surprised at what you can create.
- And remember, the best camera is the one you have with you! **Ω**

Astronomy basics: The life cycle of a neutron star

The life cycle of a neutron star - David Lunney - YouTube

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 Southern Africa,* 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
- **Planetaria:**
  WITS Planetarium (Johannesburg): Welcome to Wits Planetarium
  Naval Hill Planetarium (Bloemfontein): Planetarium Home (ufs.ac.za)
  Iziko Planetarium (Cape Town): Planetarium and Digital Dome - Iziko Museums
  Sutherland Planetarium (Sutherland): Sutherland Planetarium
- **More web links can be found on page 118 of "2024 SKY GUIDE Southern Africa". Ω**

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