



## NEWSLETTER MARCH 2023

### NEXT MEETING

**Venue:** Christian Brothers College (CBC), Mount Edmund, Pretoria Road, Silverton, Pretoria.

**Date and time:** Wednesday 22 March at 19h15.

**Programme:**

- **What's Up in April** by Johan Jordaan.
- **Main talk:** "Astrophotography with a DSLR on a tripod " by prof Barbara Cunow.
- Socializing over tea/coffee and biscuits.

The chairperson at the meeting will be Neville Young.

### NEXT OBSERVING EVENING

Friday 17 March 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. See ["A note about the observing evening on 17 March"](#) on page 8.

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## Astronomy related articles on the Internet

[Machine learning algorithm finds 8 radio signals that may have come from aliens \(interestingengineering.com\)](https://interestingengineering.com)

Let's see what happens.

[NASA's Habitable Worlds Observatory to find alien life - Big Think](#)

NASA's top priority for the next big telescope after the JWST is being designed: the **Habitable Worlds Observatory**. It has the lofty goal of finding signs of life on Earth-like planets. But its planned start of operation will only be in the 2040s.

[The 10 most Earth-like exoplanets | Space](#)

[Lots of Tatooine-like planets around binary stars may be habitable \(sciencenews.org\)](#)

[EarthSky | 2 alien water worlds with oceans 500 times deeper than Earth's](#)

[Exoplanet-catalog – Exoplanet Exploration: Planets Beyond our Solar System HD 189733 b \(nasa.gov\)](#)

There are extreme conditions on this exoplanet.

[EarthSky | Great Meteor Procession 110 years ago](#)

[Active volcanoes on Venus found in Magellan data \(earthsky.org\)](#)

[Rho Ophiuchi is filled with glorious color \(earthsky.org\)](#)

[Sun activity: Auroras galore \(earthsky.org\)](#)

There was a massive coronal mass ejection from the Sun – but fortunately from its other side.

[Why Carl Sagan believed science is a source of spirituality - Big Think](#)

Albert Einstein and Carl Sagan thought that science and spirituality were compatible.

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

[EarthSky | How does Earth look from outer space?](#)

[Most detailed geological model reveals Earth's past 100 million years - The University of Sydney](#)

## Astronomy basics: Basics of Astrophysics series: all the 30 articles

[Basics Of Astrophysics Series: All The 30 Articles | The Secrets Of The Universe \(secretsofuniverse.in\)](#)

**Immediately below:** An artist's depiction of an Earth-like exoplanet in the habitable zone of a red dwarf star. The planet-wide liquid water ocean, the clouds and the atmosphere causing the haze are all imaginary.



**Below:** An artist's depiction of the view from an imaginary moon of an exoplanet the size of Jupiter. (Such exoplanets have been found.) The exoplanet orbits a star near a star cluster. (In the solar system, Jupiter has 81 moons, Saturn 83, Uranus 27 and Neptune 14. Therefore it is highly likely that giant exoplanets also have moons.)



## What's up in April 2023 - by Johan Jordaan

### INTRODUCTION

April is the best time of year to see a number of famous galaxies, nebulae and star clusters located in the constellations Chamaeleon, Antlia, Crater, Hydra, Leo, Leo Minor, Sextans and Ursa Major. The constellation Leo, Leo Minor and Hydra are outlined later in this What's up. The early evening sky is featured below. The challenge for the month is provided at the end of this What's up.

### OUTLAY OF THE EARLY EVENING SKY ON 15 APRIL 2023

A new feature of the 2023 Sky Guide Southern Africa is the stars and planets for each month under "Celestial almanac: dates and events". Below is the same for April's evening twilight but listed a bit more detailed. The Sky Guide now provides us with a conceptual map to find the constellations and their deep sky objects.

- Crux constellation and the pointers is wonderfully bright in the south-east
- The False Cross is visible high in the south
- Achernar is low in the south-west
- Canopus is positioned far above Achernar
- Sirius lies north-west of Canopus
- The Milky Way spans from south-east through the Pointer, Crux, False Cross, immediately north of Canis Major and Betelgeuse
- Below Sirius lies Orion and Aldebaran
- In the north is Procyon below the ecliptic
- The constellation Gemini with Castor and Pollux are above Procyon to the north
- Regulus is on the middle ecliptic to the east of north
- Spica is far east on the ecliptic
- Mars is higher up in the north

Source: 2023 Sky Guide Southern Africa

### MOON PHASES

6 April: **Full moon** near Spica

13 April: **Last Quarter Moon** near Pluto.

16 April: **Moon at perigee** (04:24, 367.966km)

20 April: **New Moon** (Pink Moon: **pink phlox wildflowers** that are **native to North America** and that often bloom around the time of April's full moon)

27 April: **First Quarter Moon**.

28 April: **Moon at apogee** (08:45, 404 299 km).

29 April: **Moon near Regulus**.

Source: 2023 Sky Guide Southern Africa

The best dates to do deep sky observations is from 13 April (Last Quarter Moon) and 27 April (First Quarter Moon).

### WHEN TO SEE THE PLANETS IN APRIL 2023

Only the following three planets are clearly visible in April:

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### **Mercury**

Mercury will be the brightest and easiest to spot in the evening sky from April 2 to 18. Mercury sets two hours after sunset on 11 April.

### **Venus**

Venus is always brilliant, and shining with a steady, silvery light. Can be seen on evenings in the western sky at dusk from Jan. 1 to Aug. 4. It will be setting four hours after sunset at month's end. Near the Pleiades on 10 April.

### **Mars**

Shining like a "star" with a yellow-orange hue, Mars can vary considerably in brightness. Fading evening planet in April. 9 arc minutes from Mabsuta (Epsilon (ε) Geminorum) on 14 April. Small when seen with a telescope.

## **CONSTELLATIONS AND THEIR DEEP SKY OBJECTS**

The top six constellations best observed in April are Chamaeleon, Antlia, Hydra, Crater, Leo, Leo Minor, and Ursa Major.

The reason for the above selection is that in Ursa Major notable deep sky objects are mostly hidden behind the northern horizon. None of the constellations Antlia, Crater, Sextant and Chamaeleon contain Messier objects. Their NGC objects are faint. Apart from Crater, most of the constellations are themselves not easily visible.

Leo Minor also does not contain any Messier objects, but is addressed because of several interesting objects, like Hanny's Voorwerp, all of which are very faint.

A more comprehensive description with deep sky images of these constellations are available on request from Johan Jordaan at [jjordaan121@gmail.com](mailto:jjordaan121@gmail.com).

Some of the best known deep sky objects visible in April include the Cigar Galaxy (M82), the Pinwheel Galaxy (M101), the Owl Nebula (M97), the Leo Triplet of galaxies (M65, M66 and NGC 3628) and the Southern Pinwheel Galaxy (M83).

### **Leo**

Ursa Major's zodiac neighbour Leo is slightly smaller, but just as rich in deep sky objects. Occupying an area of 947 square degrees, Leo is the 12th largest constellation in the sky and its brightest star, Regulus, is the 21st brightest star.

Leo is easily identified because the six bright stars that mark the lion's head form a prominent spring asterism known as the Sickle. The Sickle, which resembles a backwards question mark, ends with Regulus, the star that marks the lion's heart. The constellation's second brightest star, Denebola, marks the lion's tail. Denebola and the star Vindemiatrix in the Virgo constellation are used to locate the centre of the Virgo Cluster, the closest large galaxy cluster to the Milky Way.

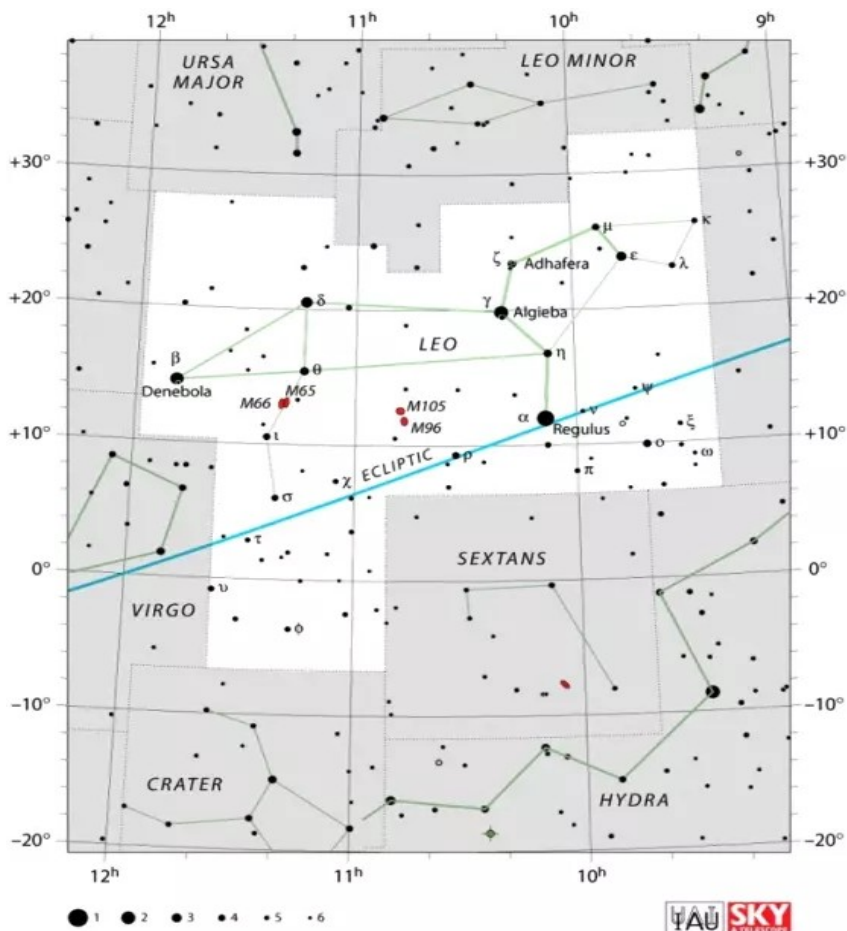
Deep sky objects: These include the Leo Triplet (the M66 Group), a group of galaxies that consists of the bright spiral galaxies Messier 65, Messier 66 and NGC 3628, and the Leo I Group (M96 Group), that includes three bright Messier galaxies: the spirals Messier 95 and Messier 96 and the elliptical galaxy Messier 105.

### **Leo Minor**

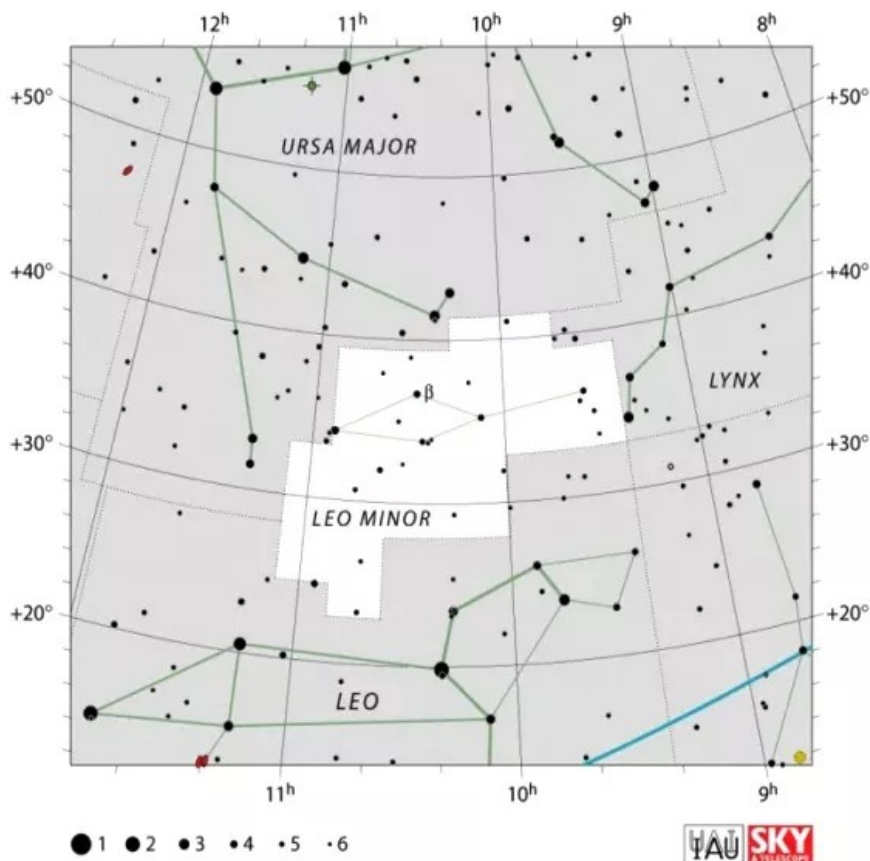
Leo Minor, the smaller lion, is as the name suggests one of the smaller star constellations. It was created in the late 17th century from the stars between the considerably larger Ursa Major and Leo constellations.

Leo Minor contains a quite unique deep sky object at an approximate distance of 650 million light-years: Nicknamed the Green Blob, Hanny's Voorwerp is a quasar ionization echo, an ionized cloud the size of a small galaxy, illuminated by the radiation from the giant black hole at the heart of the spiral galaxy IC 2497. (Continued on next page.)

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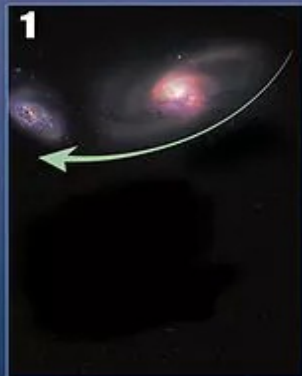


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## Hanny's Voorwerp\* — A Space Oddity

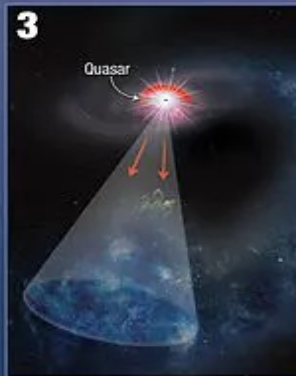
(Continued from previous page.)



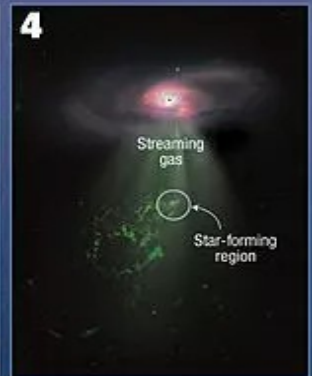
1 Spiral galaxy IC 2497 gravitationally interacts with a bypassing galaxy.



2 A large tidal tail of gas is pulled out of the spiral galaxy.



3 Engorged with gas, a black hole at the center of IC 2497 "turns on" as a quasar and emits a powerful cone of light, which ionizes a portion of the tidal tail, creating Hanny's Voorwerp.



4 Gas streaming out from the galaxy's center impacts the tidal tail and triggers star formation.

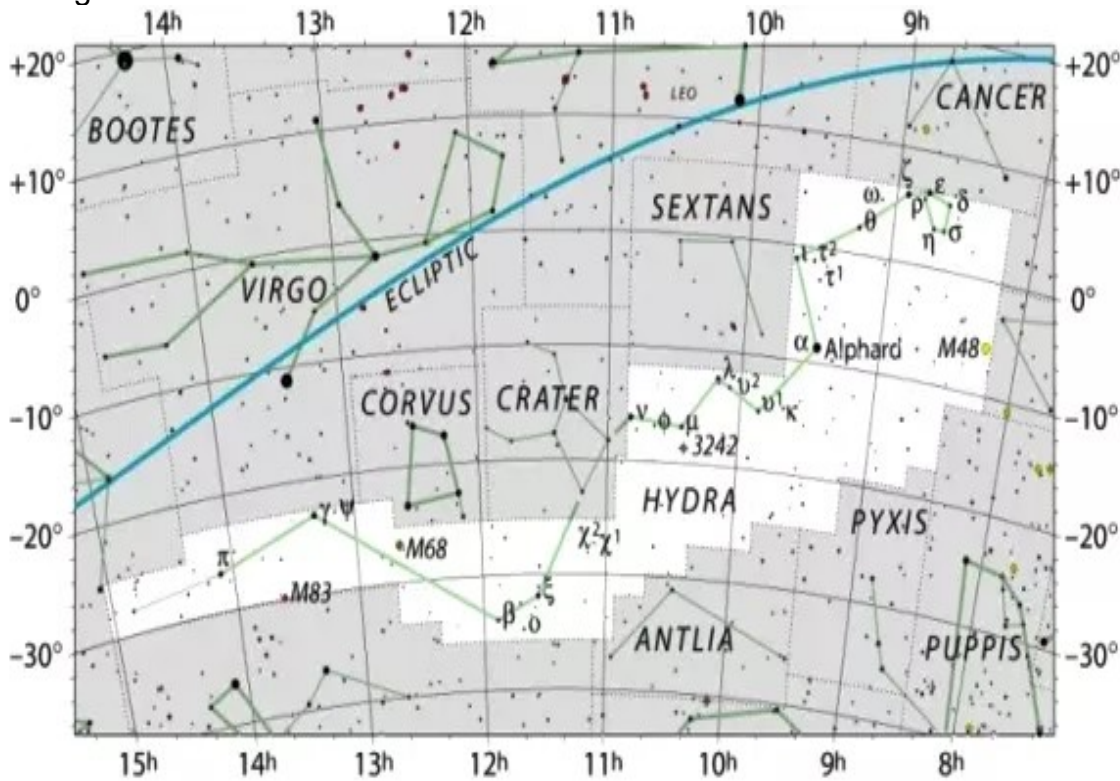
\*Hanny's Object

**Above:** Hanny's Object. Image: NASA, ESA, and A. Feild (STScI)

Other notable deep sky objects in Leo Minor include the spiral galaxy NGC 3432, interacting with the dwarf galaxy UGC 5983, the colliding pair Arp 107, and the spiral galaxies NGC 3344, NGC 3486, NGC 3504 and NGC 3021.

## Hydra

Representing the mythical Lernaean Hydra, the southern constellation Hydra is the largest and longest of all the modern 88 constellations. It only has two stars brighter than magnitude 3.0 and its brightest star, the orange giant Alphard, is only moderately bright at magnitude 2.0.



● 0 ● 1 ● 2 ● 3 ● 4 ● 5 ● 6

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Hydra contains a number of interesting deep sky objects. These include three Messier objects: the Southern Pinwheel Galaxy (M83), a bright, face-on spiral galaxy, the globular cluster Messier 68 and the open cluster Messier 48. Other notable objects include the Ghost of Jupiter nebula (NGC 3242), a planetary nebula sometimes also known as the Eye Nebula, Tombaugh's Globular Cluster (NGC 5694) and the overlapping but physically unrelated pair of galaxies catalogued as NGC 3314. NGC 3314 belongs to the Hydra Cluster, a group of 157 relatively bright galaxies whose largest members are the elliptical galaxies NGC 3309 and NGC 3311 and the large spiral galaxy NGC 3312.

Source: [April Constellations – Constellation Guide \(constellation-guide.com\)](http://constellation-guide.com)

### **CHALLENGE FOR THE MONTH**

Observers can give us outlays of the positions of the Moon after sunset on 23, 26 and 29 April 2023 (Moon near Venus, Moon near Pollux, Moon near Regulus). You can e-mail your outlays to Johan Smit at [JohanS@firsttech.co.za](mailto:JohanS@firsttech.co.za) or Johan Jordaan at [jjordaan121@gmail.com](mailto:jjordaan121@gmail.com).  $\Omega$

### **A note about the observing evening on 17 March**

You and your friends and family are very welcome to join us.

A virtual meeting room will again be available for those who cannot attend in person.

We will try and join from the site at CBC too, but that depends on, by now, well known problems with power and connectivity.

The virtual meeting link will be:

<https://meet.jit.si/ASSAPretoriaVirtualObserving>

## Feature of the month: Super Earths – by Pierre Lourens

A super Earth is any rocky planet that is bigger than Earth and smaller than Neptune. Astronomers are sure that such planets are abundant in the Galaxy, because one third of all exoplanets discovered so far are super Earths. See:

[Super-Earths are bigger, more common and more habitable than Earth itself – and astronomers are discovering more of the billions they think are out there \(theconversation.com\)](https://theconversation.com/super-earths-are-bigger-more-common-and-more-habitable-than-earth-itself-and-astronomers-are-discovering-more-of-the-billions-they-think-are-out-there-125444)

In this article, I will discuss the futuristic idea of colonization of super Earths. Imagine that we can undertake interstellar travel and can pick and choose which of the many super Earths we want to colonize. (There will surely be a hell of a lot of real estate to choose from!) Before colonization, habitability (specifically for humans) must be considered. A moral issue will also be discussed below. Which are the habitable super Earths from which we will choose? When considering habitability of a super Earth, the following factors must be taken into account:

1. Surface gravity.
2. Surface area.
3. Surface temperature.
4. Presence of an atmosphere and its composition.
5. Land surface.
6. Liquid water oceans.
7. Percentage of land on the surface.
8. Ultraviolet radiation on the surface.

These factors will now be discussed one by one.

1. **Surface gravity.** One thing to look at is gravity on its surface. The gravitational acceleration that a falling object undergoes near the surface of a planet, is a measure of the strength of the gravitational attraction there. Consider the following simple formula:

$$g_P / g_E = (\rho_P / \rho_E) \cdot (R_P / R_E)$$

The symbols have the following meanings:

**$g_P$**  : Gravitational acceleration on the surface of the planet.

**$g_E$**  : Gravitational acceleration on the surface of Earth.

**$\rho_P$**  : Average density of the planet.

**$\rho_E$**  : Average density of Earth.

**$R_P$**  : Radius of the planet.

**$R_E$**  : Radius of Earth.

In the following table, values of  $\rho_P / \rho_E$  and of  $R_P / R_E$  are assumed and the values of  $g_P / g_E$ , calculated using the formula above, are given.

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An artist's depiction of a habitable super Earth

$\rho_P / \rho_E$	$R_P / R_E$	$g_P / g_E$
1.0	1.2	1.2
1.0	1.4	1.4
1.0	1.6	1.6
1.0	1.8	1.8
1.0	2.0	2.0
0.833	1.2	1.0
0.714	1.4	1.0
0.625	1.6	1.0
0.556	1.8	1.0
0.5	2.0	1.0



The first five rows show that if the average density of the super Earth is the same as that on Earth, the surface gravity will increase as the radius of the super Earth increases. E. g., when the radius is 1.6 times that of Earth, the surface gravity is 1.6 times that on Earth, which means that any object on the surface will weigh 1.6 times as much as on Earth. This will be very uncomfortable for us Earthlings! To be habitable, it must have surface gravity not much more than that of Earth.

The next five rows show that, if the average density is low enough, the surface gravity on a super Earth can still be the same as that on Earth.

A good choice for colonization would then be a super Earth with the following ratios:

$$\rho_P / \rho_E = 0.5$$

$$R_P / R_E = 2.0$$

so that

$$g_P / g_E = 1.0 \text{ (Surface gravity same as on Earth.)}$$

2. **Surface area.** Consider the following simple formula:

$$A_P / A_E = (R_P / R_E)^2$$

The symbols have the following meanings:

$A_P$  : Surface area of the planet.

$A_E$  : Surface area of Earth.

$R_P$  and  $R_E$  have the same meanings as above.

In the following table, values of  $R_P / R_E$  are assumed and the values of  $A_P / A_E$ , calculated using the last formula above, are given.

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$R_P / R_E$	$A_P / A_E$
1.2	1.44
1.4	1.96
1.6	2.56
1.8	3.24
2.0	4.00

The surface area should be large, so as to provide lots of living space. Then  $R_P / R_E$  must be large to ensure that  $A_P / A_E$  is large. But if  $R_P / R_E$  is too large, then  $g_P / g_E$  might be too large.

With  $R_P / R_E = 2.0$  as above,  $A_P / A_E = 4.0$  (Surface area 4 times that of Earth.)

3. **Surface temperature.** It must also have a liveable average surface temperature of about 25° C.
4. **Presence of an atmosphere and its composition.** It must also have a breathable atmosphere with about the same percentage of oxygen as in Earth's atmosphere (in which it is 20.9%) and must contain no toxic gases like carbon monoxide, chlorine, nitrogen dioxide or phosgene.
5. **Land surface.** It must have land surface for the colonists to live on.
6. **Liquid water oceans.** The presence of these would result in a hydrological cycle with rain and rivers, like on Earth.
7. **Percentage of land on the surface.** The percentage of land on the surface should also be neither too small nor too large. If it is too small, there will not be much living space. (If this percentage is zero, it means that the super Earth has a planet-wide ocean, and then we will exclude it from colonization.) If it is too close to 100%, little rain will fall on the land surface and the land surface will mostly be desert. (On Earth this percentage is 29%.)
8. **UV radiation on the surface.** There must be ozone in the atmosphere that absorbs most UV radiation from the parent star, or the parent star must not emit much UV radiation.

#### **A moral issue.**

For colonization, the super Earth should be sterile. If it has life forms on it, it would be immoral to colonize it. The planet belongs to the life forms on it, even if they are only bacteria. The late Carl Sagan stated this point of view in one of his books, and I agree with it.  $\Omega$

## NOTICE BOARD

### Call for volunteers for the following planned events.

- **Saturday 13 May:** Event at Craig Kloke's church. I (Johan Smit) have taken the liberty to volunteer ASSA Pretoria Centre. I am sure that we will gather enough volunteers for this event.
- **Saturday 20 May:** Mountain Club event at Wilgepoort, situated to the NE of Bronkhorstspuit. I have in principle agreed that ASSA Pretoria Centre can be involved, but did not promise anything.
- **Likely June or July:** Pretoria Zoo (Tentative): They phoned me (Johan Smit) asking whether we would again be interested in joining them for a stargazing event some time during the winter,. But I have no details right now.

### **Astro tourism project.**

The tentative dates are 29 May to 2 June. SAAO is planning to start an astro tourism project in Carnarvon. They asked for volunteers to teach their guides. Travel and accommodation will be covered by SAAO. Due to an already busy May and the Free State / Karoo star parties in June, I (Johan Smit) have not volunteered ASSA Pretoria Centre.

I see this as a commercial type of event and ASSA Pretoria Centre will likely not get involved officially. But, if any of us would like to join this event in their private capacity, let me know and I will forward the invite to you.

**Zooniverse: Name that Neutrino!** Help decode signals from outer space with your PC.

<https://www.zooniverse.org/projects/icecubeobservatory/name-that-neutrino>

<https://icecube.wisc.edu/>

**UFO's again.** Scientists try to get serious about studying UFO's. Good luck with that! One might conclude that we are witnessing a bold new era of UAP studies, in which robust scientific investigation at last supersedes decades of fruitless speculation and stigmatization. Then again, success is far from guaranteed. If the push for more and better studies yields no meaningful breakthroughs, this "bold new era" could instead be remembered as the time when a serious re-engagement with UAP's went nowhere fast. The American Pentagon has a group (the so-called "men in black") that investigates unexplained UAP's. NASA has also established a group that does this. There are also private groups in the USA that do this.

A series of documentaries about scientific investigation of unexplained UAP's was recently broadcast on channel number 121 on DSTV. It will likely be broadcast again in the future. (Don't confuse this with the series about the theories of ancient alien theorists named "Ancient aliens". The latter series was recently broadcast on channel number 186 on DSTV and is the series that was mentioned in the January 2023 newsletter.)

[Scientists Try to Get Serious about Studying UFOs. Good Luck with That - Scientific American](#)

**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.

### Observing: A possible birth cluster? - by Magda Streicher

It is probably a fact that our Sun was born together with other similar members in a molecular dust cloud about 4.6 billion years ago, but can astronomers find the cluster members or even their remains? The best they can do is to locate stars with a comparable orbit and trace them back to a possible birthplace, which is a daunting task. A way to narrow the search, according to Simon Portegies Zwart of the Netherlands, is to look for nearby G-type stars that also have a similar chemical make-up and are the same age as our Sun. Robert Zimmerman wrote that to determine the environment in which the birthplace of our Sun would be, is like trying to find a mote of dust that has been tossed into a pile of dirt.

In the constellation Cancer we find the open cluster Messier 67, which contains more or less 15 000 stars, about 3 000 light years away, with an estimated age of around 4.5 billion years. What intrigues me every time I pay the cluster a visit is that it could be part of our Sun's family according to several studies that have been conducted. Messier 67 stars have a similar age and chemical composition and could well be the cluster family members of our Sun. One particular 14.5 magnitude star in the north-western area of Messier 67 is even a near-identical solar twin, a strong contender. Even if the Sun is not a member of this cluster it is an excellent stellar laboratory to study in which our Sun may possibly have been born. However, it is a beautiful, rich swarm of various magnitude stars containing lovely strings and a few dark lanes in its midst. An outstanding yellowish magnitude 7.8 star is situated on the north-eastern edge, with a somewhat broken-down impression on the western part. Go back in time and ponder the existence of a possible birth place of our Sun.  $\Omega$

(Magda Streicher's e-mail address: [magdalena@mweb.co.za](mailto:magdalena@mweb.co.za))

OBJECT	TYPE	RA	DEC	MAG	SIZE
NGC 2682 Messier 67	Open cluster	08 h 50.8 m	+11° 48.8'	6.9	30'



## Web links for the astronomy enthusiast

- ◆ **The website for all information about the ASSA and the ASSA Centres:**  
<https://assa.sao.ac.za/>
- ◆ **ASSA Specialist Sections:**  
ASSA has various areas of interest. Join and participate!  
<https://assa.sao.ac.za/sections/>
- ◆ **ASSA Publications to download and enjoy:**  
MNASSA: <https://www.mnassa.org.za/>  
Nightfall: <http://assa.sao.ac.za/sections/deep-sky/nightfall/>  
To receive as part of ASSA membership benefits - *Sky Guide*, the astronomical handbook for Southern Africa: <http://assa.sao.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](https://www.facebook.com/Astrosocsa/?_rdc=1&_rdr)  
Youtube: [https://www.youtube.com/channel/UCJ4b1fhmPvYTOsy15YP-\\_JA](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 \(ufs.ac.za\)](http://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 “2023 Sky Guide Southern Africa”. Ω**

### Pretoria Centre committee

Chairman	Johan Smit	072 806 2939	<a href="mailto:johanchsmit@gmail.com">johanchsmit@gmail.com</a>
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Treasurer and Membership Secretary	Michelle Ferreira	073 173 0168	<a href="mailto:michellem.ferreira@standardbank.co.za">michellem.ferreira@standardbank.co.za</a>
Curator of Instruments	Johan Jordaan	082 373 3395	<a href="mailto:jjordaan121@gmail.com">jjordaan121@gmail.com</a>
Additional member:	Neville Young	083 303 2840	<a href="mailto:nevyoung@gmail.com">nevyoung@gmail.com</a>