



**ASTRONOMICAL SOCIETY OF SOUTHERN AFRICA**

# Durban 'nDaba

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## Member Submissions Disclaimer

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# Chairman's Chatter

June 2022



Dear ASSA members.

Winter is upon us which means more frequent clear skies. I highly suggest making the most of the 3 months with this being the clearest period in which to view the heavens above.

There were a few astronomical events that we were treated to within the last few weeks, including the planetary alignment and the Lunar eclipse. If you have any images captured and would like to share with the rest of the community, please post them on the Astronomy Durban WhatsApp group and read the article on a lunar eclipse on page 28 with photos from members of the event.

In addition, our member Clare Odhav wrote a wonderful report on the ASSA and Monteseel Conservancy Public Outreach event on 20 April 2022, which can be found on page 37.

We are looking to host an astronomy course this year which will be held at St Henry's Marist Brothers College once a week. The course would only take place provided we have sufficient numbers do to so. If you or anyone you know may be interested in joining, please email me on [amith@astronomydurban.co.za](mailto:amith@astronomydurban.co.za).

We will be hosting our AGM on 13 July 2022 at the school. For those of you that are able to come through, please urgently advise who will be attending for catering purposes by 20th June. Kindly respond to [secretary@astronomydurban.co.za](mailto:secretary@astronomydurban.co.za) Would really love to meet all our new members in person at the AGM.

For those unable to attend - a zoom or jitsi meeting will be broadcast which details will be forwarded before the meeting.

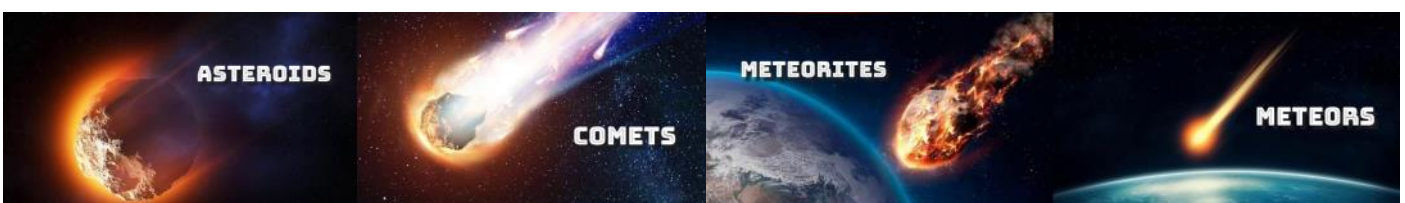
Nominations for committee members are open, so if you would like to join or nominate a member, please feel free to put the names forward. A treasurer is still being sought and other new participating members for the committee.

Please be advised that the new subscription fees for the forthcoming financial year will be R190.00 for single members and R230.00 for the family members; payable after 2022-07-01. Those that have joined later in the year will be advised as to their balances owing and credit grated. The financial year is from the 1st July 2022 to 30 June 2023.

I look forward to seeing everyone in person once again.

As always, stay safe and wishing you all clear skies.

Amith Rajpal.



# Astronomy Delights: Lupus

By Magda Streicher

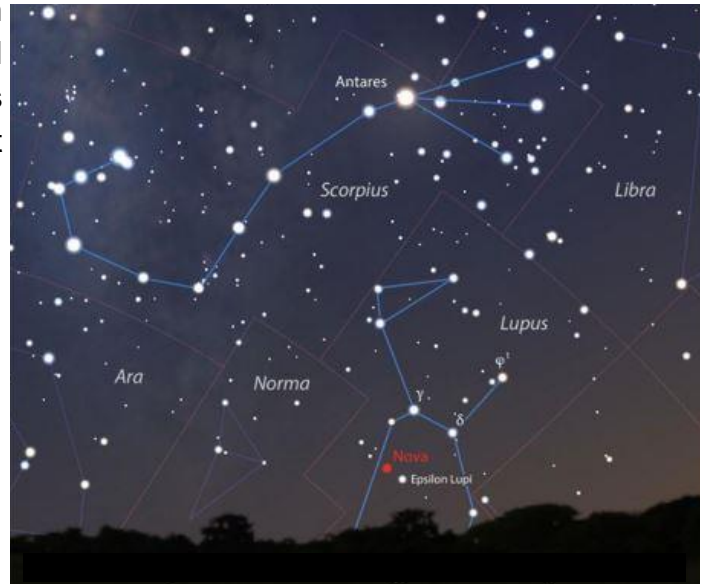
*This is a story to tell. One weekend the Coopers came to visit me on the farm in the northern part of South Africa. For Tim it was literally heaven on earth under the dark night sky offering ideal circumstances to study meteors. My observatory is perched on the top of a building in an area consisting of mainly Mopani and Baobab trees that graciously drape the horizon. Ascending the steps, you are treated to a breath-taking view of the heavens.*



That Saturday night Tim had settled down comfortably on a camp bed, busy plotting meteors. The evening was exceptionally quiet, very dark and cold.

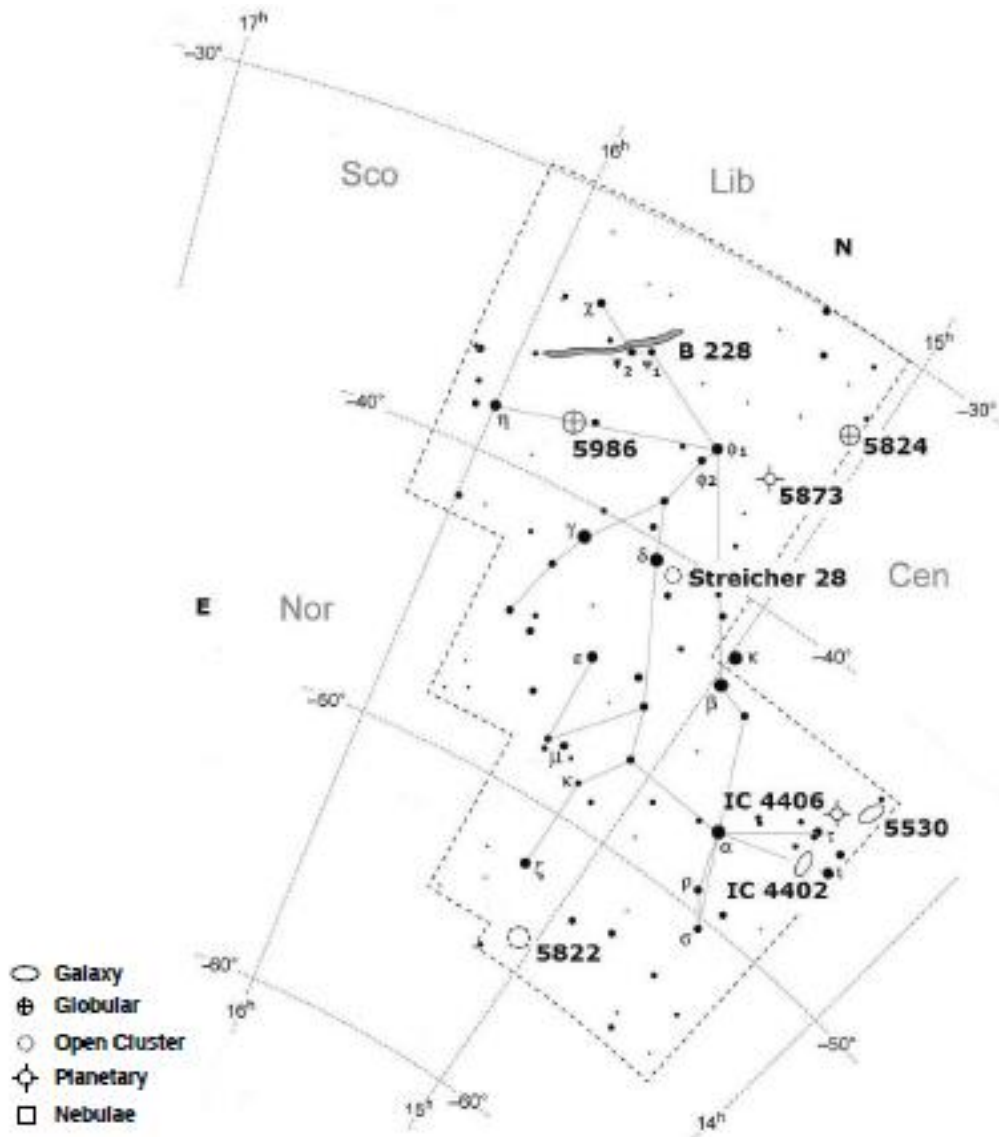
Suddenly, without warning, the most unearthly sound that I've ever heard in the bush veld echoed through the night. The horrific growls and howls got louder and nearer; nerve-wrecking is putting it mildly. Terrifying, with cold chills running down your back, is closer to the truth. Fortunately for me I was upstairs in my observatory, but poor Tim was down below in what might be ground zero! "What is that?" Tim enquired in a brave voice. "It sounds like a leopard catching a buck". To which I replied: "No, Timmy, it is much, much more dangerous!" Great was our relief when the wrestling match began to disappear into the distance. The altercation was between two brown Hyena's also sometimes referred to as wolves, wrestling over a bone or perhaps a four-legged lady.

The Greeks and Romans saw the constellation Lupus as the Wolf but for the Arabians (and Timmy!) it was their Leopard or Panther. This very ancient constellation known as Lupus is just east of Centaurus and south of Scorpius.



The star zeta Lupi in the southern part is a wide double star which boasts an orange, magnitude 3.4 primary and a magnitude 7 golden yellow companion. Sigma Lupii, by the looks of it hanging like a drop of water from what could be indicated as the starry wolf's tongue.

# ...Lupus

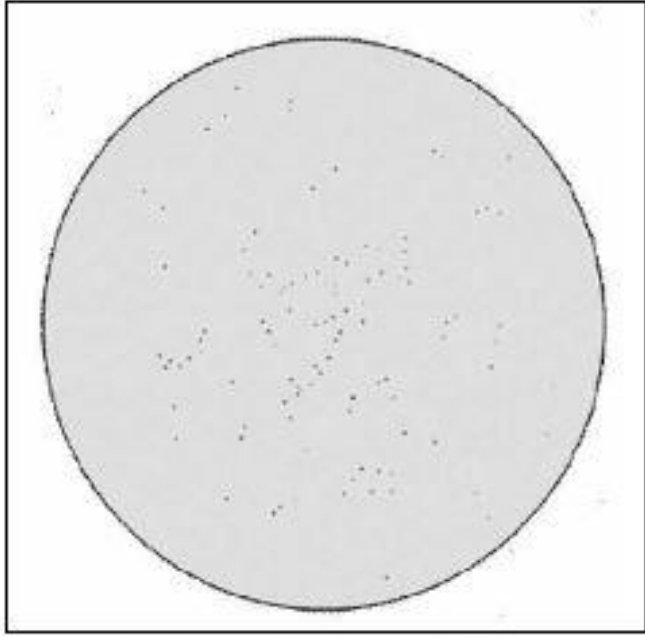


The constellation of Lupus



Brown Hyena – Photograph: Schalk Lourens *Aardwolf tot Ystervark*

## ...Lupus



ABOVE: NGC 5822—Open Cluster

Approximately 2.5 degrees further south brings us to our first deep sky object, **NGC 5822**, one of the most beautifully sprinkled open clusters. Short curved strings of stars intermingle with each other. It is open spaced and has faint members that run out to mingle well with the surrounding star field. The cluster resembles a distant town in the dark of night with its flickering streetlights, as seen from above. About a degree south-west is a small patch of faint stars, discovered by Auke Slotegraaf with his 11×80 tripod mounted binoculars while sweeping the Circinus/Lupus area. Auke's cluster, forms a close gathering of a few stars in a north-east to south-west direction.

The star alpha Lupi in the western part of the constellation was originally thought to be a triple system. The primary is a brilliant blue-white magnitude 2.3 star with a very faint magnitude 13.4 companion, separated by 27.3" at position angle (PA) 232°. The original third component is a field star, deep orange with a magnitude 6.8, situated to the north of the double star. Its contrasting colour with the blue-white coloured alpha Lupi nearby is an interesting sight.

Edge-on galaxies are some of my favorite objects to study. **IC 4402**, a lovely Type-Sb, which appears in a north-west to south-east direction, is just 23' east of iota Lupi close to the border with Centaurus. The galaxy that terminates in sharp pointed ends has a small relatively bright nucleus. Right on the Centaurus border, 2.6 degrees north from iota Lupi, the spiral galaxy **NGC 5530** found a home.

RIGHT: Galaxy IC 4402 Image: Wikipedia



This galaxy appears as an oval haze with a very prominent bright star-like nucleus. The unusual brightness results from the near position of a magnitude 13 star. With higher magnification, a few faint stars can be seen on its dusty surface. John Herschel was very excited about this object when he described it as "perfectly sharp in the centre with a very dilute, gradually fading atmosphere". When it was photographed from Helwan Observatory, Egypt, in 1935 for the first time, it was identified as a spiral nebula.

LEFT: NGC 5530 Image: Carnegie-Irvine Galaxy Survey

## ...Lupus



As a bonus the planetary nebula **IC 4406** is just a degree south-east of NGC 5530. This planetary displays a hazy, boxy glow in an east-west direction with a fading northern axis. With even higher magnification, a pair of lobes can be seen tapering towards the middle area. This planetary is in the final stage of it's life, resembling a doughnut shape from the side.

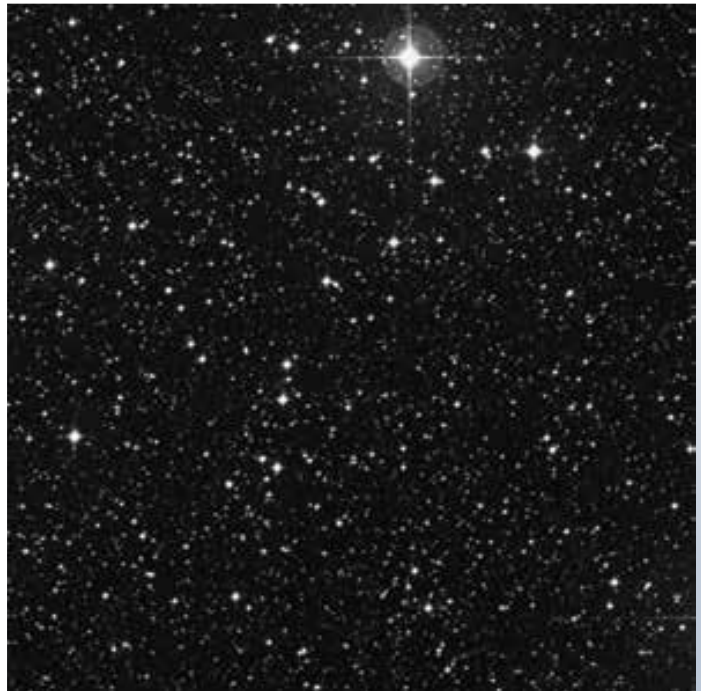
Robert Innes rediscovered this planetary nebula with the 7-inch Metz refractor from the Cape of Good Hope on 14 August 1901, but it was already found in 1899 by DeLisle Stewart on an Arequipa plate.

LEFT: IC 4406 Image: Wikipedia

Well-known to the northern hemisphere amateurs and situated in the constellation Camelopardalis, is the asterism Kemble Cascade. In the central region of the starry wolf constellation, I came across a similar group impression. **STREICHER 28** also resembles a cascade but on a much smaller and fainter scale and is situated 30' south-west of delta Lupi. The brightest star in this group is magnitude 8.6, with fainter stars in a downward string running for almost 10' in a north-west to southeast direction.

RIGHT: STREICHER 28 - Image: DSS

Little did I know at the time when I admired this asterism that the ancient 1006 supernova is situated only 3 degrees towards the west. Not that there is anything to see! On 1 May 1006 AD a spectacularly bright star appeared suddenly in this constellation, visible for several months before becoming lost in the glare of daylight. Observers in China, Japan, Egypt, Iraq, Italy and Switzerland recorded observations of this strange star. The remains of that supernova are all but invisible today, however, studies show the exploded star to be around 7000 light-years distant and are believed to be a Type-Ia supernova.



The planetary nebula **NGC 5873** is situated 2.4 degrees south-west of the double star phi Lupi. It is arranged in a perfect triangle with two magnitude 11.5 field stars. This small planetary nebula, almost 16 000 light-years away, appears stellar and slightly out of focus. With averted vision, it displays a light frosted blue-grey colour. NGC 5873 was the first deep-sky object found from South America. Ralph Copeland saw the planetary nebula by visual spectroscopy in 1883 at Lake Titicaca, Peru.

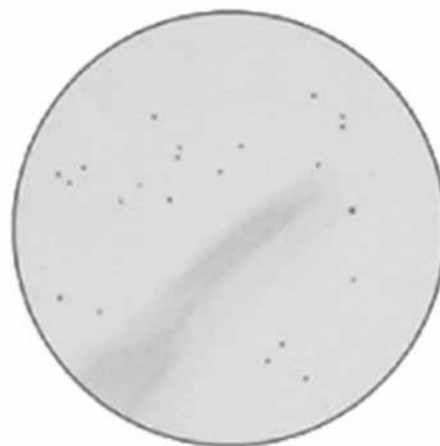
## ...Lupus

In the far northern corner of the constellation, on the border with Centaurus, the globular cluster **NGC 5824**, also known as Bennett 67, can be found. Easy visible, this object reminds me of a streetlight on a rainy and misty night. Small in size and relatively bright, it grows gradually brighter to a nearly star-like core. It displays a hazy envelope changing into a flimsy outward haze. Even with high magnification, no stars are resolved, although the edges become faintly granular. It was missed by John Herschel and picked up by Edward Emerson Barnard who described it as a nebula with a stellar nucleus. NGC 5824 was discovered by James Dunlop in 1826.

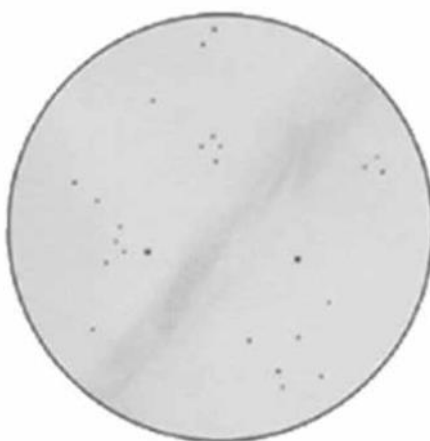


ABOVE NGC 5824 Image NASA / ESA / Hubble

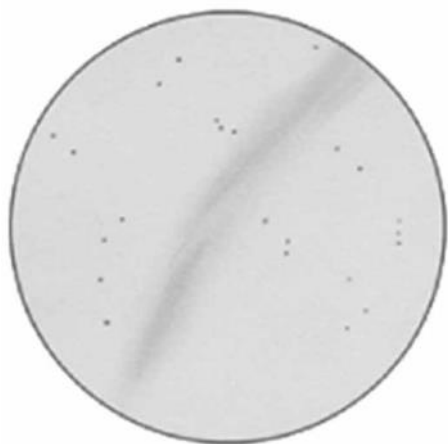
Fortunately, the constellation Lupus houses the dark nebula **BARNARD 228** situated just northeast from psi Lupii. It appears as a long, dark ink-stain in a north-west to south-east direction without any obvious starlight. This long streak of dark nebulosity is more than 5 degrees in length. The north-western part of the nebula looks wider with the conveniently magnitude 7.6 star, HD 143098 show the way.



ABOVE: NW part of B228 Dark Nebula



ABOVE: Middle part of B228 Dark Nebula



ABOVE: SE part of B228 Dark Nebula



RIGHT: B228 Dark Nebula Image: nasa.gov



## ...Lupus

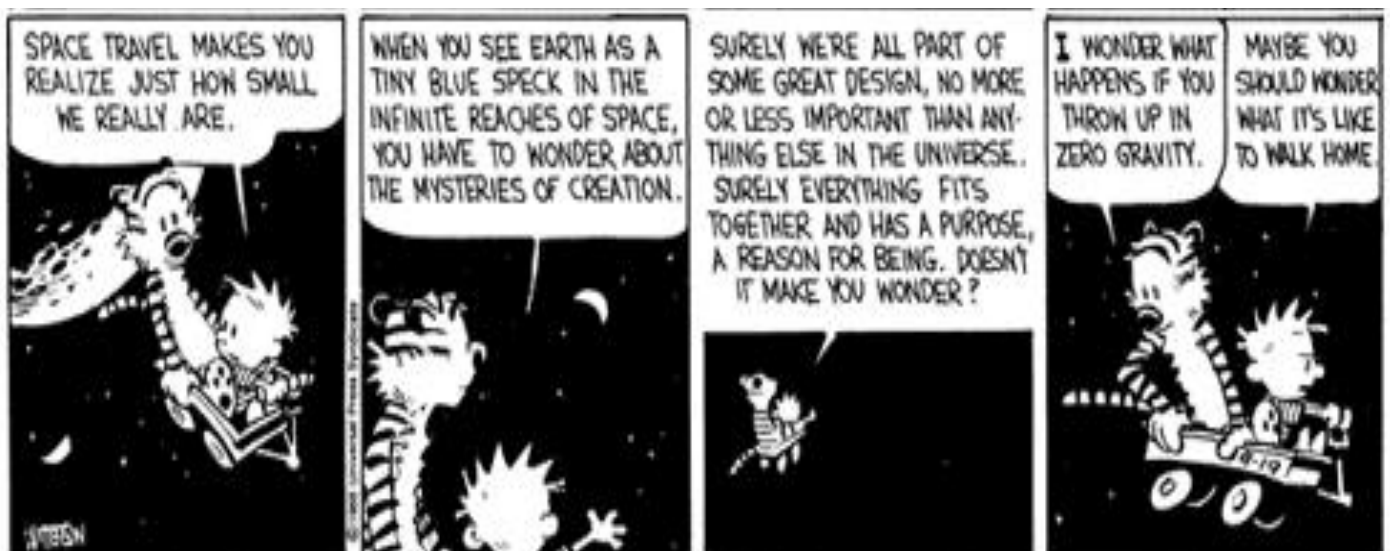
Continue a few degrees south to reach the globular cluster **NGC 5986**, also known as Bennett 70. It is a beautiful bright, relatively large object, standing out well against the background star field. It displays a moderate concentration of stars with a soft envelope around its bright core. Stars are well resolved towards the edges. The globular cluster is slightly elongated in a north-west to south-east direction and about 35 000 light-years away. A lovely magnitude 6 star can be seen 18' towards the south-eastern star field. NGC 5986 was also discovered by James Dunlop in May 1826. Auke Slotegraaf wonders why there are such widely differing sizes given for this globular in various catalogues, varying between 2' and 10'.

*I braved the dark of the African bush with my telescope to enjoy and appreciate the wonderful southern deep sky treasures. The "wolves" who invaded the campsite are long gone but they certainly made the evening spent in the Lupus constellation very memorable!*

OBJECT	TYPE	RA	DEC	MAG	SIZE
NGC 5530	Galaxy	14h18m.5	-43°24'.0	11.1	4.9'×2.2'
IC 4402	Galaxy	14h21m.2	-46°17'.8	12	4.2'×1'
IC 4406	Planetary Nebula	14h22m.4	-44°09'.0	10.2	28"
NGC 5824	Globular Cluster	15h04m.0	-33°04'.0	7.8	6.2'
NGC 5822	Open Cluster	15h05m.2	-54°21'.0	6.5	39'
NGC 5873	Planetary Nebula	15h12m.8	-38°08'.0	11	3"
STREICHER 28 DSH J1519.0-4055	Asterism	15h19m.0	-40°55'.7	10.5	16'
BARNARD 228	Dark Nebula	15h45m.5	-34°24'.0	-	5°
NGC 5986	Globular Cluster	15h46m.1	-37°47'.0	7.5	9.8'

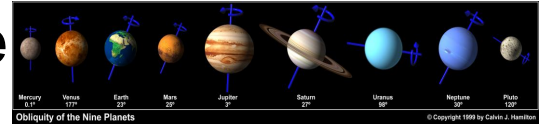


RIGHT: Lupus Photograph: Astronomtrek



# At the Eyepiece

June 2022 by Ray Field



The Sun reaches Solstice on the 21<sup>st</sup> at 11:13 when it is at its most Northerly declination for this year.

The Moon is First quarter on the 7<sup>th</sup>, Full on the 14<sup>th</sup>, Last quarter on the 21<sup>st</sup> and New on the 29<sup>th</sup>. The Moon occults the double star Zubenelgenubi I (76.2 ly) and Zubenelgenubi II (75.80 ly) on the 12<sup>th</sup> and the bright star Nunki (sigma Sagittarius) on the 15<sup>th</sup>. Nunki reappears for Durban on the 15<sup>th</sup> at 19:09 when it is only 11° above the Eastern horizon.

The Moon is near Pollux on the 3<sup>rd</sup>, Regulus on the 5<sup>th</sup>, Spica on the 10<sup>th</sup>, Zubenelgenubi (occultation) on the 12<sup>th</sup>, Antares on the 13<sup>th</sup>, Nunki on the 15<sup>th</sup>, Saturn on the 18<sup>th</sup>, Jupiter on the 21<sup>st</sup>, Mars on the 22<sup>nd</sup>, Venus and the Pleiades (Seven Sisters) on the 26<sup>th</sup>, Mercury on the 27<sup>th</sup> and Pollux again on the 30<sup>th</sup>.

The Moon is at Perigee and nearest Earth on the 15<sup>th</sup> and furthest on the 28<sup>th</sup> at Apogee.

Mercury is near the Moon on the 27<sup>th</sup>, Aldebaran on the 23<sup>rd</sup> and at its greatest elongation of 23°12' on the 16<sup>th</sup>, when it's above the Eastern horizon in the morning sky. Mercury looks like a pinkish "star" when at its brightest and then this month it should be visible to the naked eye in the morning sky at dawn.

Venus, the brightest planet is visible in the morning sky all month, rising at about 04:00 on the 1<sup>st</sup> and rising by 05:00 at the months end.

Mars has surface conditions closer to Earth's than any other planet of the Solar System, but its atmosphere would not support life as we know it on Earth. Sometimes its global dust storms blot out its surface details. The Moon is close to Mars on the 22<sup>nd</sup> in the morning sky. Mars rises 5 hours before daybreak in June. Having a distinct orange-red colour. Mars is known as the "Red" planet and is easily visible to the naked-eye and becomes brightest in December. It will be the third brightest planet for the rest of the year.

Jupiter, the brightest object in the morning, pre-sunrise sky, is near Mars this month and closest at the beginning of the month. The diagrams given on page 31 of the ASSA Sky Guide 2022 for this month show the 4 brightest planets, Mercury, Mars, Venus and Jupiter all in a line, before dawn.

Saturn, in Capricornus all year, remains an early evening object all year after it reaches opposition on the 14<sup>th</sup> August. Visible to the naked eye as a pale yellow "star", it is easy to follow once found.

Uranus is a faint planet, on the verge of visibility to the naked-eye and remains in Aires all year. It is visible in the morning sky in binoculars as a "starlike" point. See page 79 of the ASSA Sky Guide 2022 for more details. I have seen it in an 8" telescope as a small disk under high magnification.

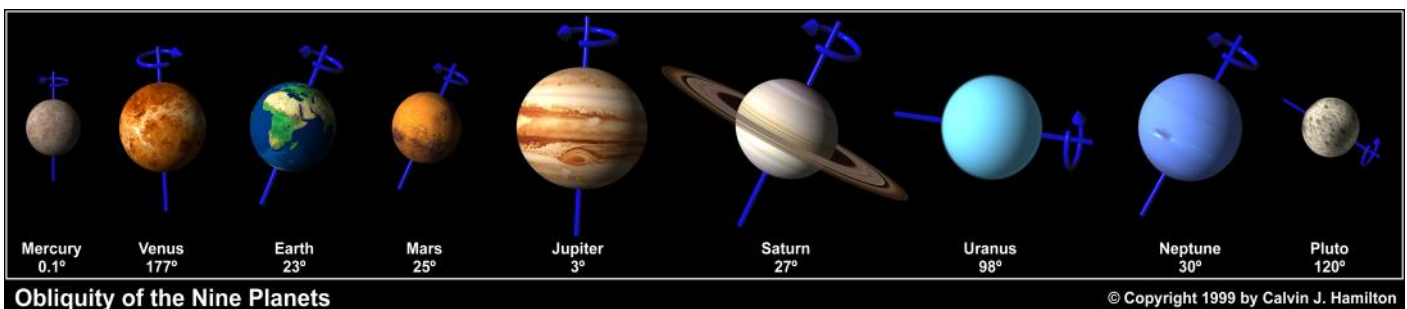
Comets. I know of no "naked-eye" comets for June. For more details on comets, see page 85 of ASSA Sky Guide 2022.

## ...At the Eyepiece

Meteor Showers. The Theta Ophiuchids have a maximum on the 13<sup>th</sup>, with a ZHR of 5. The full Moon will interfere with observations around the 14<sup>th</sup>. See page 86 of ASSA Sky Guide 2022.

The evening sky from Durban for June. The Southern Cross and its Pointers are at their brightest above the Southern horizon. The Southern Milky Way including the "3 Crosses Area" is well placed, as is Scorpius rising in the East, followed by Sagittarius. Arcturus is the bright orange star over the Northern horizon. Spica in Virgo lies above Arcturus. The Coma Berenices (constellation) lies below Virgo but needs a clear moonless night to be noticed at all with the naked eye.

References include ASSA Sky Guide 2022, E.J. Hartung's *Astronomical Objects for Southern Telescopes* and Norton's Star Atlas and Philips' Planisphere for 35° S.



### "You know you're a true astroNUT when..."

- ... the first thing you notice about any new place is how dark it is.
- ... you know the word for astronomy in more than one language. (Very useful for the travelling astroNUT, aside from the words: "food "water "help .)
- ... you wouldn't spend a dime on most things, but you'll splurge when it comes to astronomical equipment.
- ... the cost of your equipment is more than the vehicle you use to transport it.
- ... you frown at those who say, "Ah.. so can you predict my future?" and proceed to lecture them on the difference between astronomy and astrology.
- ... you remembered the dates when you bought your eyepieces, but forgot your mother's/ wife's/ girlfriend's birthday.
- ... you don't need more exercise since carrying all your equipment burns more calories than a 2-hour gym workout.
- ... you hate, deplore, despise and curse at M0 (a.k.a. clouds) at any astronomy event... and...
- ... you have actually developed a personal ritual to chase bad weather away, and are mastering more from other cultures.
- ... you attempt to outdistance bad weather by driving further up North / South / East / West.
- ... you care more about a speck of dust on your optics than the thick layer on your living room floor.
- ... you attempted to locate the main power switch for your district... and...
- ... you ever aimed a stone (or something to the same effect) at a streetlamp.

# Deep Sky Tour: Nebulae in Cygnus

By Joe Bergeron



The North America Nebula (left) and the Pelican Nebula (right).  
Image credit: Terry Hancock via Flickr.

I have talked up the virtues of observing deep sky objects using fairly high magnifications with a reasonably big 8-inch f/10 telescope. This time around, let's veer to the opposite extreme and take a tour of a series of celestial objects that are best seen using small telescopes, low magnifications, and wide fields of view.

Cygnus, the Swan, which is as emblematic of northern-hemisphere summer as any other constellation, holds two of the best examples of wide-field objects which are visible nearly overhead in late northern summer, and low over the northern horizon for southern-hemisphere observers.

## The North America Nebula

The first is the iconic NGC 7000, the North America Nebula, which is easy to find just northeast of the bright star Deneb.

Using my 92mm f/6.75 refractor at 18x with a 35mm Panoptic eyepiece, I get an expansive  $3.8^\circ$  field. This is needed to show the sprawling North America Nebula in its entirety, and it frames it beautifully. Beneath my dark Bortle 3 desert sky, the nebula is visible in an unfiltered view, half lost among the throng of Milky Way stars in this area. An Ultra High Contrast (UHC) filter greatly improves the view, even with these dark skies. The shape of the nebula, which echoes Earth geography so well, can be clearly seen.

## ...Nebulae in Cygnus

The striking shape of the nebula is created by intervening clouds of dark dust which hide some of the glowing nebulosity that lies beyond them. The most obvious example is the round, dark blob that creates the nebula's "Gulf of Mexico". Without these obscuring dark nebulae, the bright nebula would reveal an altogether different shape and appearance. Maybe it would look like some other continent. Who knows?

Keep in mind that the image you see in your eyepiece may be inverted, unless you're using a refractor or Cassegrain telescope with a star diagonal, in which case it will be right side up, but still flipped right to left. This may briefly confuse your perception of the continental character of this nebula.

The brightest and best defined areas of the nebula are Central America, Mexico, the Gulf Coast, and Florida. As you move farther north, both in the sky and according to the layout of the nebula, it gradually fades into the thick starry background as you approach the rapidly thawing 'Arctic'. Lying off the East Coast of the North America Nebula is perhaps the biggest and most monstrous Kaiju of all, a colossal Pelican. These nebulae are cataloged as IC 5070 and IC 5067, and are collectively called the Pelican Nebula. It too can be seen with the aid of a UHC filter, albeit faintly, but its complex shape is hard to make out. A fairly prominent unequal pair of stars in this area could represent the Pelican's eyes, if they could just be nudged over a little bit. This object is much less obvious than the North America Nebula, so don't berate yourself if you don't see it. Of course they are all part of the same nebular complex, separated only by those intervening clouds of dark dust.



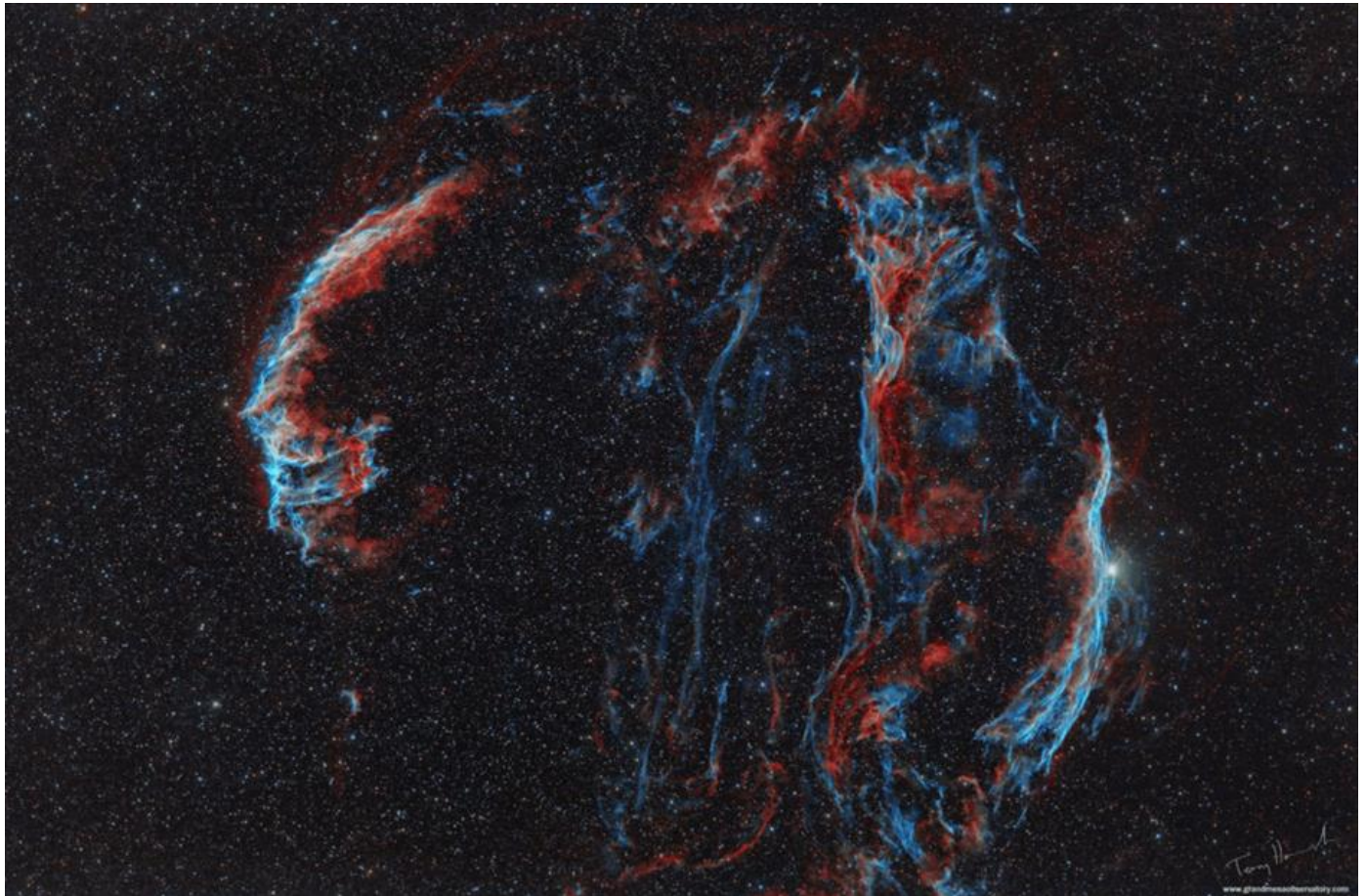
ABOVE: Nebulae IC 5050 and IC 5067 Image: astrobin.com

## The Cygnus Loop

Just off the east wing of the flying Swan lies the faint naked eye star 52 Cygni. This marks the spot of the fabulous Veil Nebula complex. Also known as the Cygnus Loop, here we find a few separate objects, many with their own NGC designations, which are all part of the same thing, the expanding remnant of a giant star which exploded as a supernova roughly five to eight thousand years ago .

With its 3.8° field, my little refractor encompasses the entire Loop with not much room to spare. Again, a UHC or Oxygen III (OIII) filter makes it much easier to see, and it may be a necessity under poorer skies. The two most obvious sections are NGC 6960, known as the Western Veil, the part which apparently runs through the star 52 Cygni, and the opposing Eastern Veil, NGC 6992. Of the two, the arc of 6992 is significantly brighter and easier to see. The "glare" of 4th magnitude 52 Cygni helps make the 6960 section less conspicuous.

## ...Nebulae in Cygnus



ABOVE: The Cygnus Loop The brightest region of the Veil Nebula, NGC 6992 is at left, while the Western Veil, NGC 6960 is at right running through the star 52 Cygni. Pickering's Triangle is just right of center. Image: by Terry Hancock.

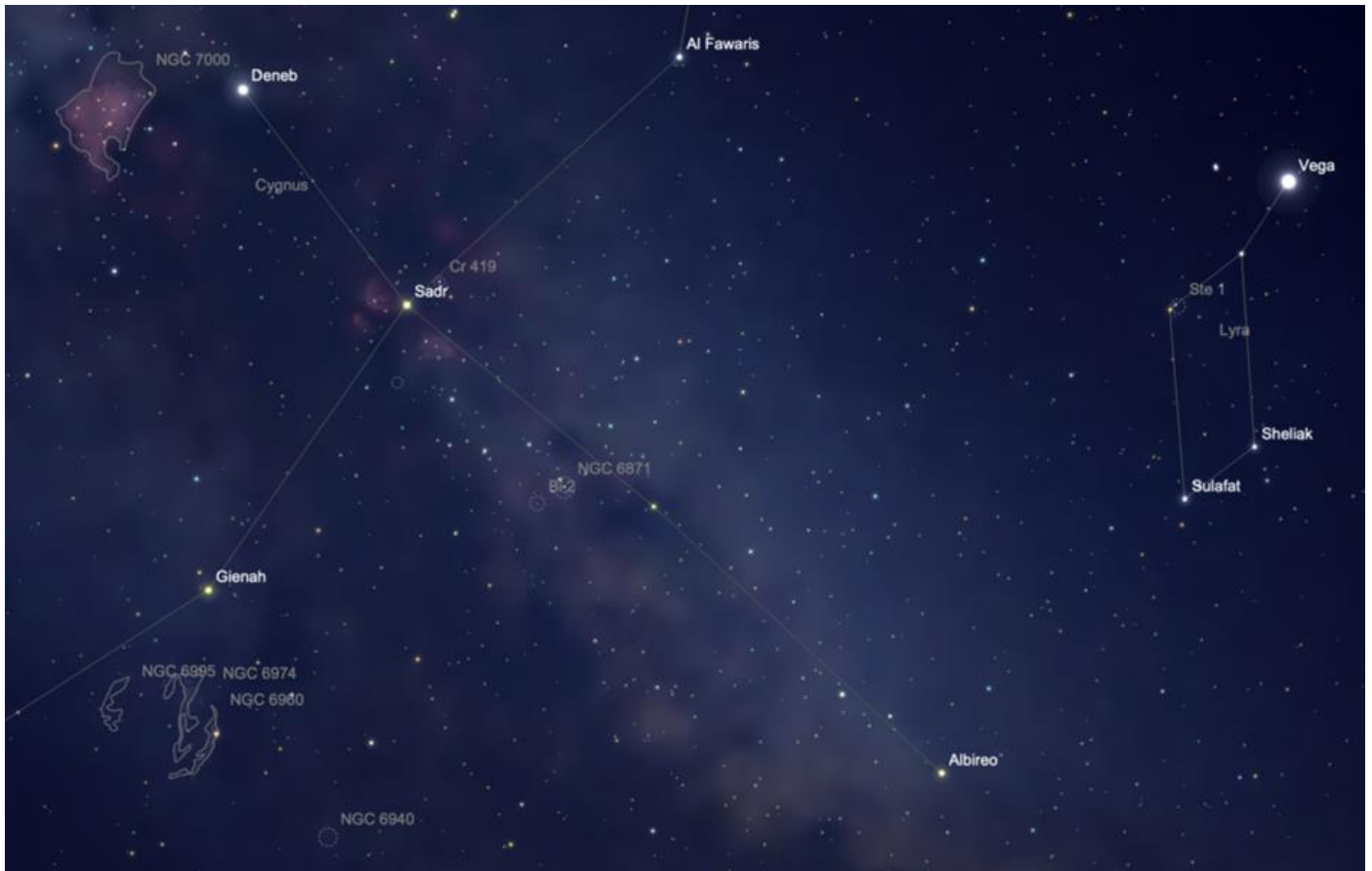
About a degree northeast of 52 Cygni, you may faintly see the section known as Pickering's Triangular Wisp. This bit was actually discovered by a woman named Williamina Fleming, but somehow it came to be named after the man she worked for at Harvard College Observatory, Edward Charles Pickering. Funny how things like that happen. Like the Pelican, you may have trouble making out the actual shape of the Wisp, but you have a good chance of seeing there's something there.

While the Veil is a case where a very low power is needed to see the entire object in one view, adding magnification, and especially aperture, vastly improves the appearance of its individual parts. Going to 28x with my 92mm scope adds significant detail to the Eastern Veil, and shows the forked, hook-like structure on its southern end. But in this case, there is truly no substitute for aperture. A 10-inch scope and a medium power turns both of the Veil's main arcs into twisted skeins of filamentary detail. If you ever have a chance to view the Veil in a really big amateur scope, say 15 inches and above, you'll see one of the most wondrous things in the sky, a bewildering array of threads of light, exactly as you'd see them in a photograph, but dimmer and without color.



ABOVE: Cygnus Loop and Veil Nebula Images: Hubble site

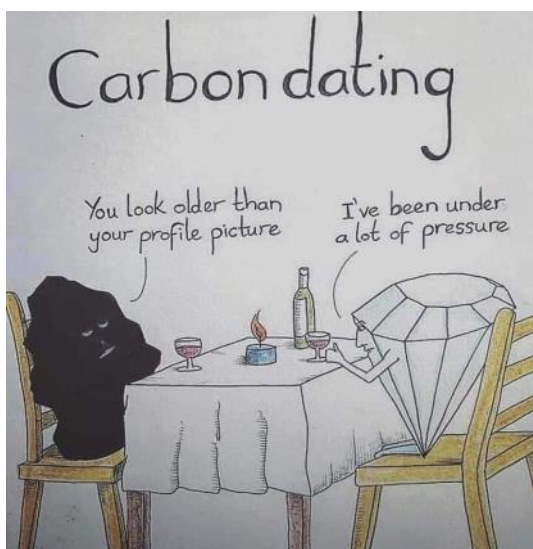
## ...Nebulae in Cygnu



ABOVE: The location of the North America Nebula, NGC 7000 (upper left) and the Cygnus Loop including NGC 6992 and NGC 6960 (lower left).

To me, the most impressive of these features is the “Tornado”, a curved, sharp-edged saber of light that pokes out to the north from 52 Cygni. It’s considered a “rolling vortex”, a rotating structure of glowing gas. The remnants of the exploded star slam into the thin substance of the interstellar medium at 170km/second. The Tornado feature is visible in small telescope, but a big one will show you the weird glow of the thin lines that define the edges of this cosmic whirlwind.

Remember, the Veil is still expanding! Try to observe it within the next thousand years or so. Otherwise it might get too big to be seen as a whole in any reasonable telescope.



# The Cover Image - Omega Centauri

Image by John Gill - Out Going Editor

As many of you know, and to our new ASSA members, I have been photographing the night sky for the past 6 years, weather permitting. I received a surprise gift from my wife, Corinne, commonly known to some as the "Telescope Widow", for my birthday, for which I am extremely grateful as this put me on a path that has grown into my passion. Hence her now



## Tech Specs: New Photo

### Filters

- 30 x Luminance @ gain 60 for 60 seconds
- 30 x Red @ gain 60 for 60 seconds
- 30 x Green @ gain 60 for 60 seconds
- 30 x Blue @ gain 85 for 60 seconds
- 90 x Calibration frames

### Integration Time

2 hours

### Equipment

- QHY 268m cooled mono camera
- CGX Mount
- ZWO guide scope and camera

### Software

- N.I.N.A.
- PixInsight

## Tech Specs: Old Photo

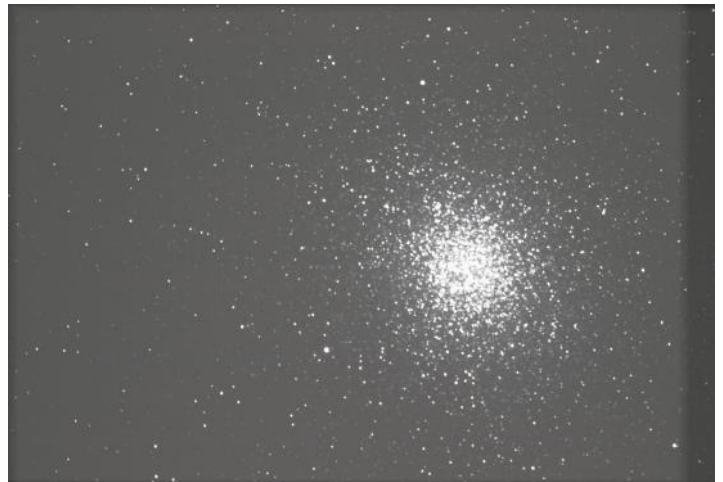
### Equipment

- Canon 600d
- Celestron 8" EdgeHD
- Celestron AVX mount

### Software

- DSS
- Photoshop CS3

appreciated being able to serve on the committee as Editor, whilst learning so much from such knowledgeable members and astro-photographers. Both my wife, Corinne and I, have so enjoyed the last 6 years producing the 'nDaba for you all. Now it's time to pass the baton onto our new Editor, Fiona Khan. Wishing her all the best and enjoying producing it, as much as we did.



being known as Telescope Widow.

The image above is my very first image I ever took and Omega Centauri (or NGC 5139 or Caldwell 80) just happened to be there. Now looking back and knowing so much more (also with a new telescope and of course, additional equipment), I can see the focus, tracking and stacking issues of this photo. But, what a thrill it was to photograph this Jewel of the South

To the left is the cover image of this issue, which is my most recent image of Omega Centauri, which you can see is a great improvement.

Omega Centauri is a globular cluster in the constellation of Centaurus that was first identified as a non-stellar object by Edmond Halley in 1677. Located at a distance of 17,090 light-years, it is the largest-known globular cluster in the Milky Way at a diameter of roughly 150 light-years. It is estimated to contain approx. 10 million stars, and a total mass equivalent to 4 million solar masses, making it the most massive known globular cluster in the Milky Way.

Most nights when I am outside taking photos of a single object, I end the night, with 5 x 1 minute photos in Luminance, Red, Green and Blue filters. I then accumulate these images over 5 or more nights and then process everything together; much of which I have learnt to do along my way, researching, chatting to fellow ASSA members and doing some courses as well.

At this point, I have to say I have greatly





# Largest 3D Map of the Universe Has 7.5 Million Galaxies in It

Starting late last decade, the Maya; 4 meter telescope at Kitt Peak National Observatory in Arizona began running something called the Dark Energy Spectroscopic Instrument. DESI for short, it is tasked with creating a gigantic map of the Universe. And boy, did it already!

Containing a focal plate with 5,000 robotic positioners, 50-meter long (164 feet) optical fibers, broadband spectrographs, and detectors, the instrument is supposed to stay in operation for a total of five years.

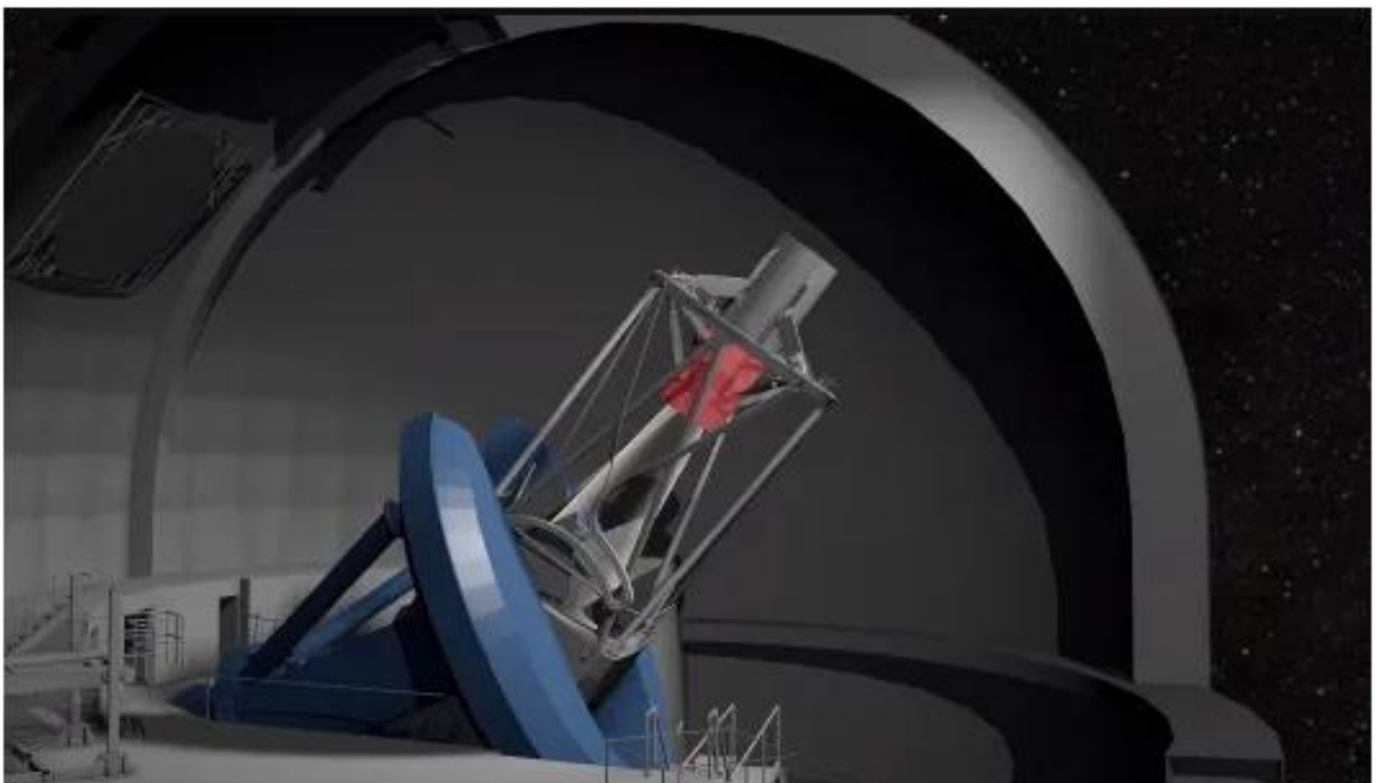


ABOVE: Kitt Peak National Observatory. Arizona, Image: KPNO Facebook



LEFT: Desi's Focal plate with 500 robotic positioners Image: KPNO Facebook

During this time, it should be capable of creating a 3D map of the Universe going as far as 11 billion light years from our planet, and including 14,000 square degrees of the sky. In this map, DESI should include tens of millions of galaxies and quasars, marking the most ambitious such project ever conducted by the human race.



ABOVE: The 4m Maya Telescope running the DESI instrument tasked with creating the gigantic map of the Universe, Image: KPNO Facebook

## ...Largest 3D Map of the Universe

The instrument, ran by the Department of Energy's Lawrence Berkeley National Laboratory (Berkeley Lab), started being put together in 2015, but only saw first light (that's how astronomers call the first time they use a telescope after construction) in 2019.

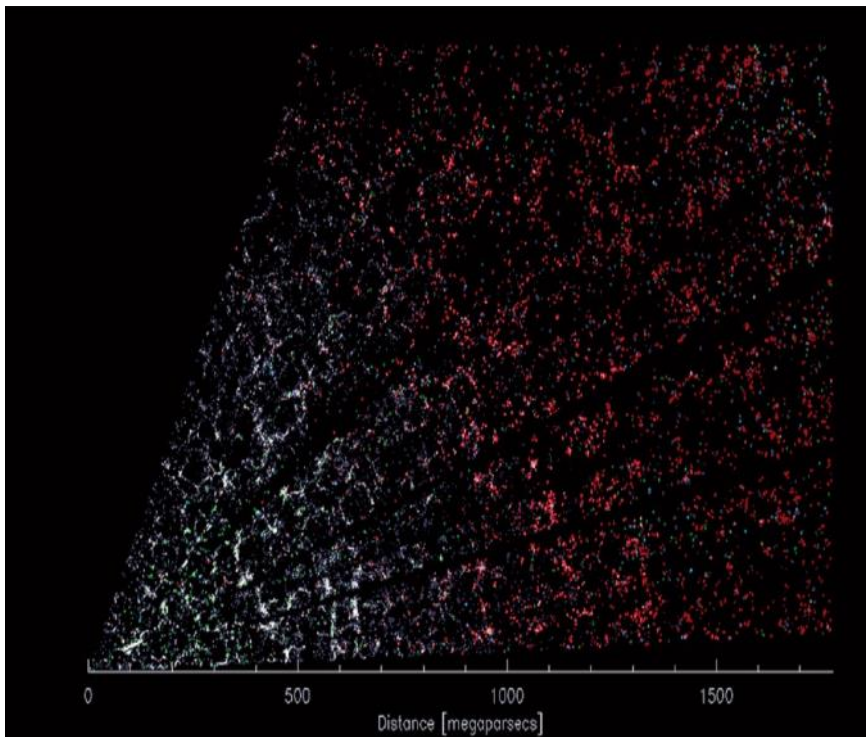
Then, the pandemic halted the project, and it was not until late 2020 that the hardware was up and running again. Its official survey mission kicked off exactly one year ago, and here's what it has been up to until now.

At the beginning of 2022, just 10 percent of the time into its mission, DESI had already mapped out more galaxies than during all previous efforts combined. In numbers we can all understand, that would be over 7.5 million galaxies, and over a million more are added each month. By 2026, people running DESI expect that number to grow to over 35 million galaxies, literally opening up the sky (and the past of the Universe, as looking at stars is like time travelling).

The stated goal behind coming up with such a large map is to measure the effects of dark energy on the expansion of the Universe. As some of you already know, our scientists believe that ever since the Big Bang, the Universe is continuously expanding.

That means galaxies and everything in them move away from one another, and the space between them gets filled with dark energy (the scientific phrase is no filled, but, believe it or not, "pop into existence").

Dark energy is supposed to be in some sense the opposite of gravity, pushing stuff away from one another. Mapping the Universe will give us a better understanding of this force, and might even put us on the right direction to answer a haunting question for astronomers: what will eventually happen with our Universe?

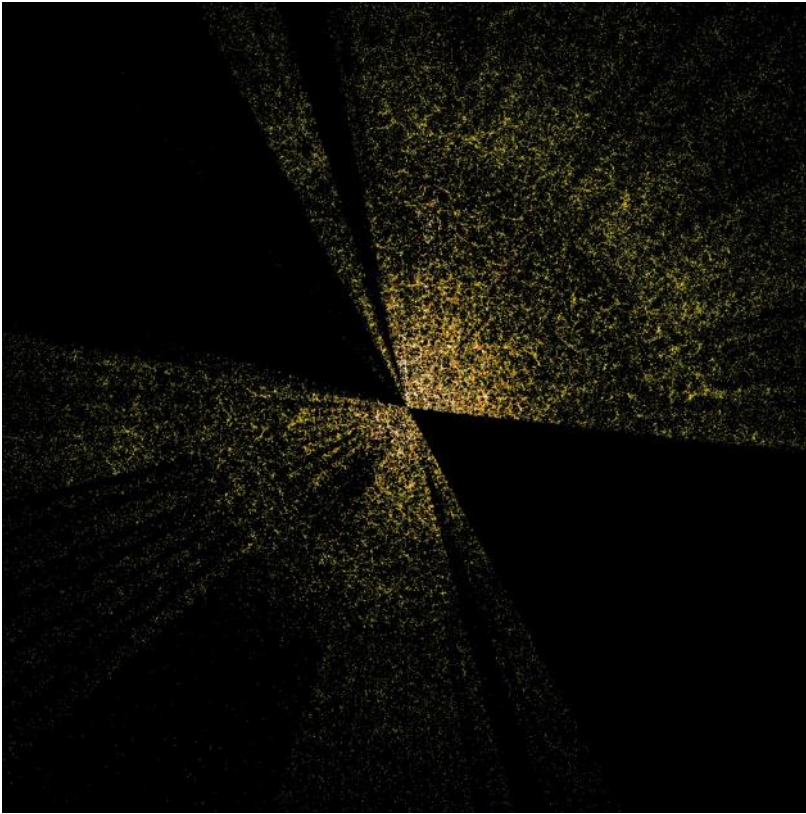


To map the galaxies for the task at hand, DESI breaks down the light from each one. Depending on how much that light is stretched toward the red end of the spectrum (called redshifting), it tells scientists how far it is from us, both in space and time.

It is light's redshift that allowed DESI to compile the image you see as the main photo of this piece. Released back in January, it shows 5 billion light years of space, as seen in the direction of constellation Virgo and Bootes, with our planet in the lower left corner.;

ABOVE: DESI's 3D "CT scan" of the Universe. The Earth is in the lower left, looking out over 5 billion light years in the direction of Constellation Virgo

## ...Largest 3D Map of the Universe

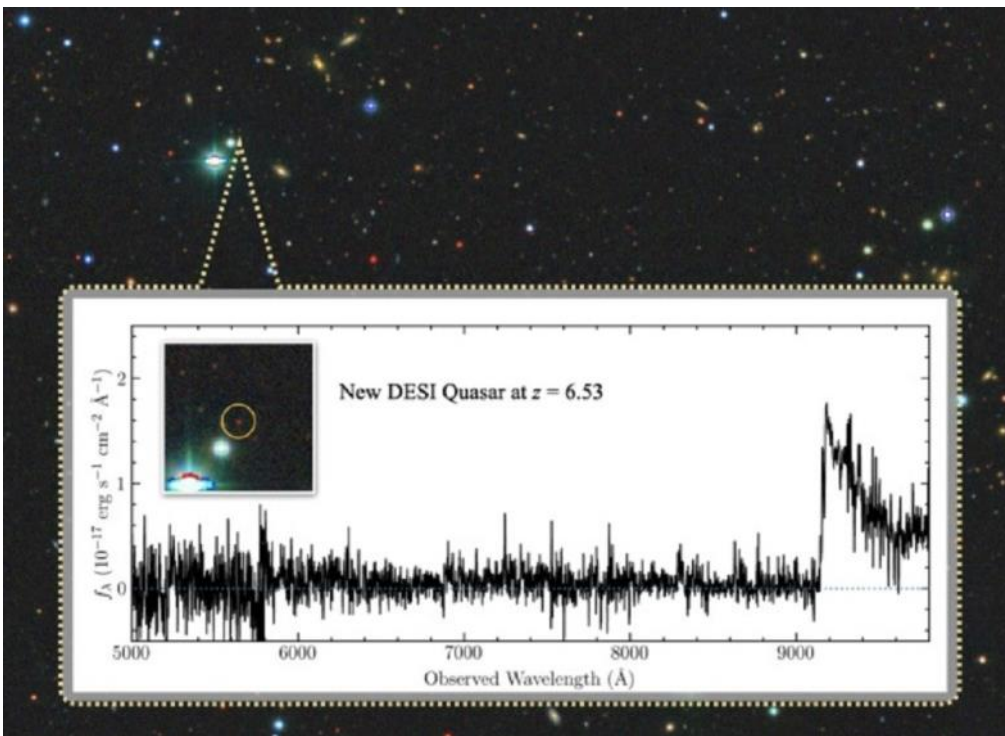


ABOVE: DESI's 3D "CT scan" of the Universe. The Earth is in the lower left, looking out over 5 billion light

To give you a sense of scale, consider that every single colored dot in there is **not a star**, but a galaxy containing billions of Suns. A closer look reveals spots where galaxies cluster together, places where they're absent, and filaments of light spreading out into the darkness.

DESI's reach will however expand far past a better understanding of dark energy. Astronomers are already crunching the data to reveal more about the behavior of intermediate-mass black holes in small galaxies, but also of quasars (very bright galactic nuclei).

As DESI continues to look out into the Universe, the map you see here will grow exponentially, and even more difficult to comprehend with our human brains.



LEFT: A new quasar using DESI gives a glimpse of the universe as it was nearly 13 billion years ago, less than a billion after the Big Bang. This is the most distant quasar discovered with DESI to date, from a DESI very high-redshift quasar sel.

SOURCE: <https://www.autoevolution.com/news/heres-the-largest-3d-map-of-the-universe-has-75-million-galaxies-in-it-188768.html#>



# A Skyscraper-sized Asteroid 2022 GU6 is Wandering towards Earth

The size of a Near-Earth Object is something that scientists always keep an eye on. The larger the object, the larger the threat. Next month, another NEO will whiz by our planet, but, thankfully, experts say there's nothing to worry about when it comes to the asteroid known as 2022 GU6.

## Asteroid 2022 GU6 Size and Closest Approach to Earth

2022 GU6 is classified as an Apollo asteroid, with a diameter approximately between 60m and 150m. (On the larger side, that's about as tall as the Fuller building, a 40-story skyscraper in New York City.)

RIGHT: Fuller Building in New York City Image: Jim Henderson



Asteroid 2022 GU6 will be at its closest point to Earth on June 13th, 2022, at 12:00 UTC time, before continuing on its orbit back towards Mars and the asteroid belt. There is little threat, with this asteroid only coming 0.008473 AU — or 1,267,536 Kilometers. For reference, the moon is 384,400 Kilometers from Earth. If the math is correct, that means the asteroid will pass at 3.3 times the distance from the Earth to the Moon.

## Does 2022 GU6 have the Potential to hit Earth

Believed to be a threat early this year, further observation and tracking from astronomers revealed that NEO 2022 GU6 poses no danger to our planet. Whenever an asteroid wanders out of the asteroid belt and towards Earth, it has the potential to cause concern. Near-Earth Asteroids are objects to keep an eye on but are rarely a threat.

Dr. Melissa Brucker from the Lunar and Planetary Laboratory of the University of Arizona confirms to *Inverse* that there is no risk of impact.

“2022 GU6 was removed from JPL’s list of possible impactors on April 26, 2022 after the previously predicted potential impact became inconsistent with orbit recalculations due to the addition of new observations,” she says.

Brucker adds that while we may refer to asteroids like this one as “near Earth,” it’s all relative.

“Calling this class of objects near-Earth asteroids can seem misleading because NEAs are not necessarily ‘near Earth’ in the colloquial sense. They are ‘near Earth’ compared to asteroids in the main asteroid belt between the orbits of Mars and Jupiter.”

Luckily, this asteroid is making a last-in-a-lifetime encounter. According to predictions, 2022 GU6 did come within 0.08 AU back in May of 2015. Many times, asteroids can be undetected until later dates. June will be the closest GU6 will come to Earth in this century.



## ...Asteroid 2022 GU6

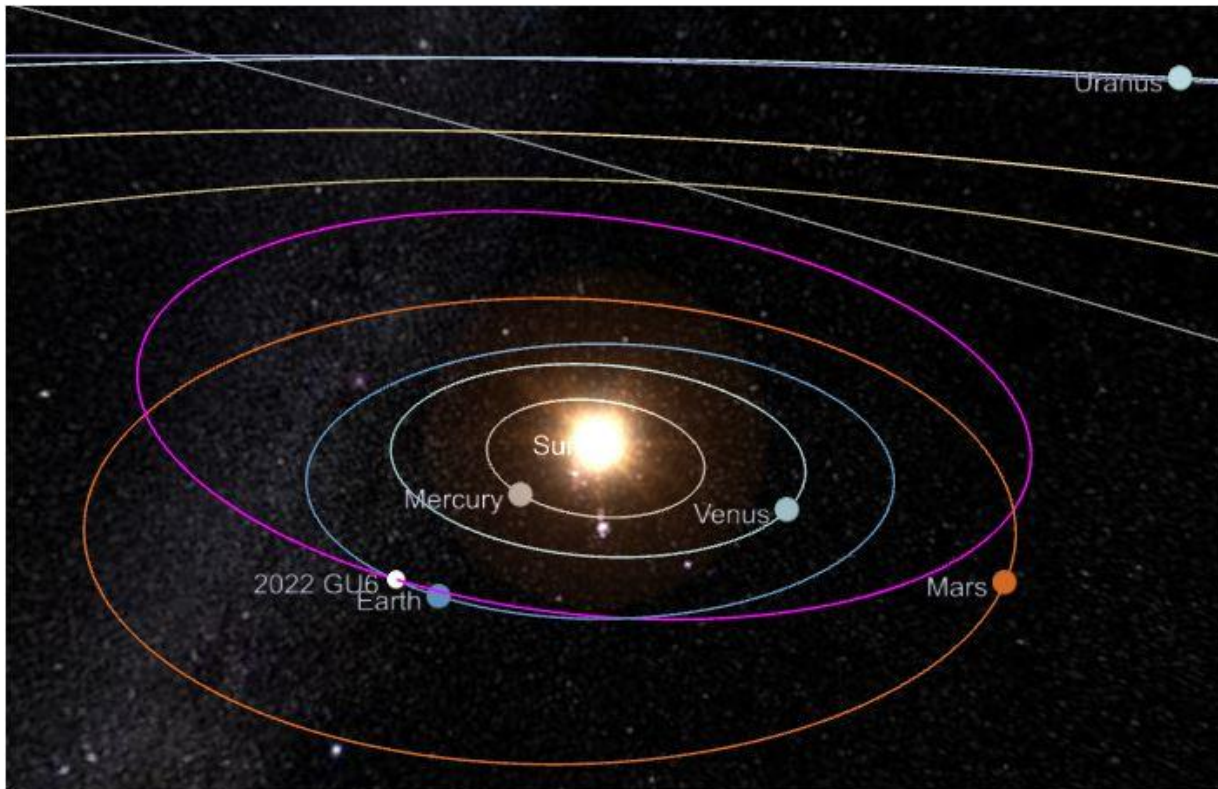
Will Asteroid 2022 GU6 be visible from Earth?

On June 12, GU6 will be 16.3 magnitude (the brightest magnitude it will reach). The asteroid is likely not going to be visible in commercial telescopes, and definitely not binoculars. If visible at all in 12+ inch telescopes — assuming it reaches 16.3 magnitude — it would be very faint and hard to detect. For comparison, an object as bright as Venus has a magnitude of around -4.6 at its brightest. The lower the number, the brighter, therefore more visible an object is to the human eye. The limit of what the unaided human eye can detect is around +7 magnitude.

Asteroid 2022 GU6 will be visible only through long-exposure photography. There is also the fact that this asteroid is moving very quickly in its orbit (18,770 miles per hour). 2022 GU6 is currently in the constellation of Coma, and will be in the constellation Cepheus in the early AM hours on June 12th, when it is at its brightest. The next morning, on June 13th, it will be closest to Earth, and then it will have move over to the left of Pegasus; orbiting back to Mars and the asteroid belt.

Today's Asteroid (NEO) 2022 GU6 location pinpointed as the rise at Azimuth  $61.7^\circ$  @ 16:00, the Transit's max altitude at  $31.5^\circ$  with the time of 20:45 and the set time Azimuth  $298.4^\circ$  calculated for KwaZulu-Natal, South Africa. The rise and set times are defined as the time at which the upper limb of Asteroid (NEO) 2022 GU6 touches the horizon, considering the effect of the atmospheric refraction. As the atmospheric conditions cannot be modelled precisely the times reported here should be considered correct with an approximation of few minutes.

If you are fortunate enough to pick up this asteroid in long exposure photography, you can rest assured that it is safely flying past us. There are always scientists monitoring the cosmos for potential threats — thankfully 2022 GU6 is not one of them.

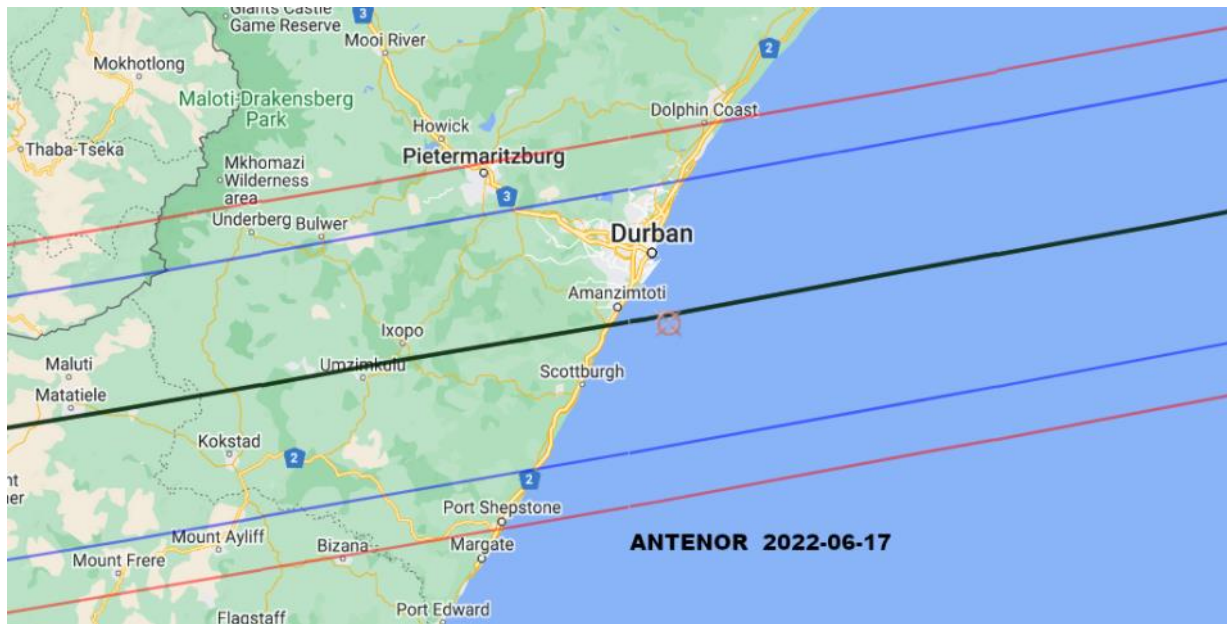


Sources: <https://www.inverse.com/science/asteroid-2022-gu6-flyby-june-2022>; <https://newsbeezer.com/canada/look-up-a-skyscraper-sized-asteroid-is-heading-towards-earth/>  
<https://www.inverse.com/science/asteroid-2022-gu6-flyby-june-2022>



# Asteroid Antenor 17 June 2022

by Nigel Wakefield



OTA/IOTA-ES occultation update for (2207) Antenor / TYC 5779-00129-1  
Event on 2022 Jun 17, 23:47 UT - Visible from South Africa

## Summary

On 2022 Jun 17 UT, the 90.5 km diameter asteroid (2207) Antenor will occult a 11.4 mag star in the constellation Aquarius for observers along a path across S Africa.

In the case of an occultation, the combined light of the asteroid and the star will drop by 4.99 mag to 16.41 mag (the magnitude of the asteroid) for at most 14.810 seconds.

This update is based on, astrometry for the asteroid kindly provided by the IAU Minor Planet Center.

This work has made use of data from the European Space Agency (ESA) mission Gaia (<http://www.cosmos.esa.int/gaia>), processed by the Gaia Data Processing and Analysis Consortium (DPAC, <http://www.cosmos.esa.int/web/gaia/dpac/consortium>).

Funding for the DPAC has been provided by national institutions, in particular the institutions participating in the Gaia Multilateral Agreement.

## The Event at a Glimpse

- \* Rank: 99
- \* Date and approx. time of event: 2022 Jun 17, 23:30 - 2022 Jun 18, 00:05
- \* Geocentric midpoint of event [JD]: 2459748.49194292
- \* Magnitude of target star: 11.43
- \* Magnitude drop [mag]: 4.99
- \* Estimated maximum duration [s]: 14.810
- \* Moon: 82 % sunlit, 10° distance
- \* Sun: 130° distance
- \* Rough path description: S Africa

# ...Asteroid Antenor

## The Occultation Path

- \* approximate projected width [km]: 93
- \* 1 sigma uncertainty interval [path widths]: +/- 0.19
- \* 1 sigma uncertainty interval [seconds]: +/- 12.5
- \* 1 sigma uncertainty interval approx RA,DE ["]: (+/- 0.023, +/- 0.007)
- \* 1 sigma uncertainty ellipse (major, minor, PA): (0.023", 0.005", 78°)
- \* approx speed of asteroid's shadow [km/s]: 6.1108
- \* website for maps: <http://www.asteridoccultation.com>

## Path Coordinates:

Occultation of TYC 5779-00129-1 by 2207 Antenor on 2022 Jun 17

Uncertainty in time = +/- 12 secs

Prediction of 2022 Apr 29.9

East Longitude	Centre Latitude	U.T.	Star Alt	Star Az	Sun Alt	Path Limits 1	Path Limit 2	Error Limit 3	Error Limit 4	Alt Crn
° ' "	° ' "	h m s	°	°	°	° ' "	° ' "	° ' "	° ' "	
-32 00 00	-30 30 14	0 04 51.0	13	97	-61	-30 04 50	-30 55 40	-29 55 12	-31 05 20	0.21
-31 00 00	-30 38 41	0 04 47.4	14	96	-62	-30 13 18	-31 04 07	-30 03 42	-31 13 46	0.22
-30 00 00	-30 46 51	0 04 43.5	14	96	-63	-30 21 29	-31 12 15	-30 11 53	-31 21 54	0.22
-29 00 00	-30 54 43	0 04 39.4	15	95	-64	-30 29 23	-31 20 06	-30 19 47	-31 29 44	0.22

## Data for the Target Star

- \* Name: TYC 5779-00129-1
- \* Constellation : Aquarius
- \* BCRS position with proper motion to date of event [h,m,s ; °,']  
RA: 21 09 18.8739 DE: -12 03 48.548
- \* GCRS Astrometric position with proper motion and parallax to date of event [h,m,s ; °,']  
RA: 21 09 18.8740 DE: -12 03 48.547
- \* Position source: Gaia EDR3
- \* Standard error: RA,DE [mas]: (0.200,0.100)
- \* V mag [mag]: 11.4
- \* Diameter [mas]: 0.00

## Data for the Minor Planet

- \* General information:
  - (Number) Name: (2207) Antenor
  - Asteroid class:
  - Approx. diameter [km]: 91
  - Approx. diameter ["]: 0.028
  - Distance from Earth [AU]: 4.51370
  - Asteroid position offset in RA [mas]: 0
  - Asteroid position offset in DE [mas]: 0

## ...Asteroid Antenor

### \* Orbital Information:

Orbit source: JPL#50

Date of fit: 2022 Feb 04

Source of used astrometry: MPC, JPL

Number of used observations: 0

Number of rejected observations: 0

Time covered by the observations: 1800 Jan 01 - 1800 Jan 01

1 sigma uncertainty ellipse (major, minor, PA): 0.023", 0.005", 78.356°

### \* Orbital Elements for (2207) Antenor :

Mean anomaly = 203.0043854545 deg

Arg. of pericenter = 305.9329883736 deg

Long. of node = 159.0292110347 deg

Inclination = 6.8022362686 deg

Eccentricity = 0.0125722427

Semimajor axis = 5.1671819586 AU

Perihelion dist = 5.1022188930 AU

Mag: H = 8.96, G = 0.15

Epoch of elements : MJD 59747.99125000 TDT

(2022 Jun 17.9912)

### Occultation Prediction Software

[www.lunar-occultations.com/iota/occult4.htm](http://www.lunar-occultations.com/iota/occult4.htm)

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Calculator (s): Steve Preston

Date of update: 2022 Apr 29, 20:53 UT

Steve Preston

7640 NE 32nd St

Medina, WA 98039

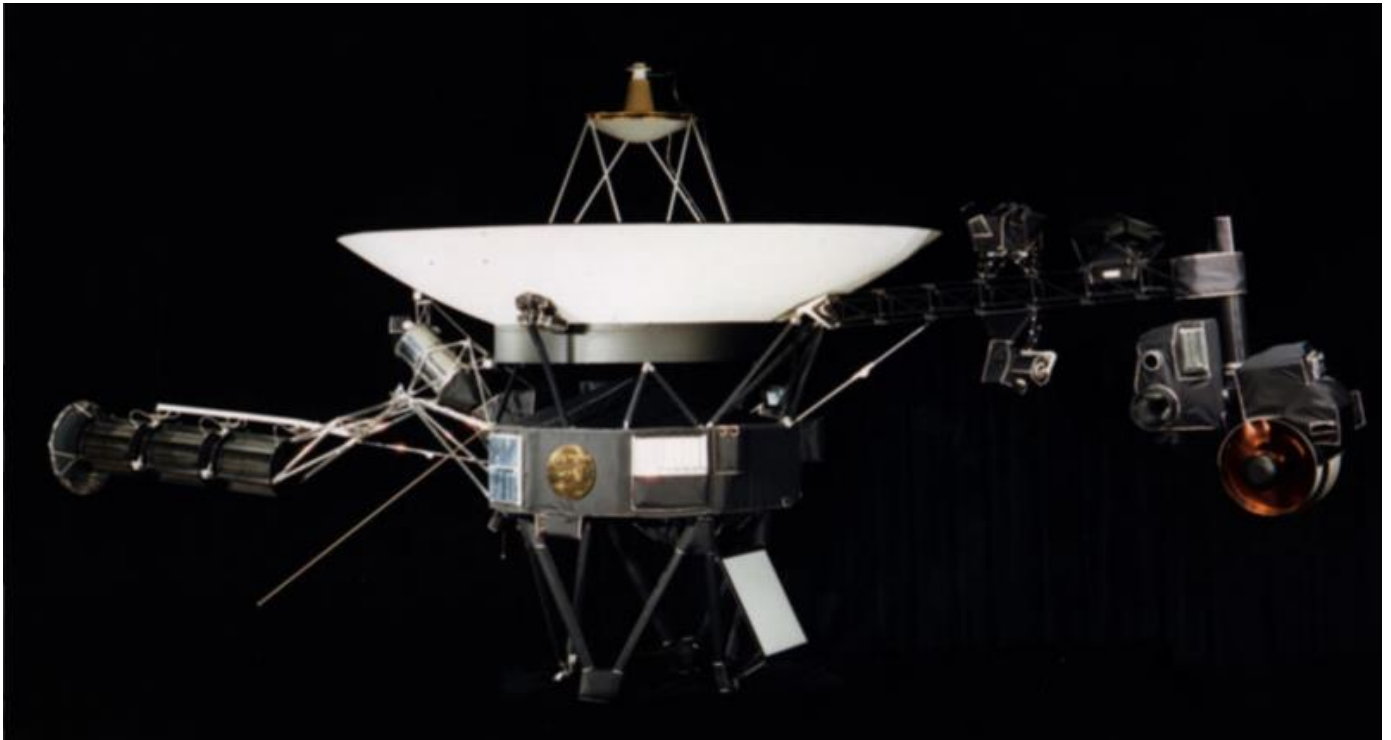
stevepr@acm.org

A special thanks to Nigel Wakefield for providing this Occultation information





# Voyager 1 Mystery: Sending Random Data



ABOVE: Artist's concept of the robot spacecraft Voyager 1. Some call it and its companion craft, Voyager 2, *the little spacecraft that could*. Launched from Earth in 1977, the pair are beyond the sphere of our sun's influence, still heading outward. But now Voyager 1 has started sending back mystery data.

## Mysterious data from Voyager 1

Voyager 1, which launched in 1977, is some 14.5 billion miles (23 billion km) from Earth. Scientists say it's beyond our solar system, in interstellar space. The 45-year-old probe has been a model of endurance, continuing to send back data using decades-old technology. But on May 18, 2022, NASA announced that Voyager 1 has been sending back mysterious data. The probe's *attitude articulation and control system* (its AACS) has the job of controlling the spacecraft's orientation, pointing its high gain antenna toward Earth and controlling attitude maneuvers. Now the AACS has sent back data that doesn't reflect what's happening aboard Voyager. NASA explained: ... the data may appear to be randomly generated, or does not reflect any possible state the AACS could be in.

## A 2-day round trip message time

For the most part, Voyager 1 still appears to be working correctly, gathering and returning science data. It's receiving and executing commands from Earth, although – because of its great distance from us – it takes about two days to send a message and get a response. Because we're still in communication with Voyager 1, we know the antenna is still pointing toward us, regardless of the strange nature of the telemetry data readings.

NASA said: The team will continue to monitor the signal closely as it continues to determine whether the invalid data is coming directly from the AACS or another system involved in producing and sending telemetry data. Until the nature of the issue is better understood, the team cannot anticipate whether this might affect how long the spacecraft can collect and transmit science data.



# ...Voyager 1 Mystery

## Communicating with interstellar Space

Voyager 1 is the most distant human made object from Earth. Working with a system that is so far away – and that was designed so many decades ago – presents many challenges, beyond just the lag in communications. Suzanne Dodd, project manager for Voyager 1 and 2, commented:

A mystery like this is sort of par for the course at this stage of the Voyager mission. The spacecraft are both almost 45 years old, which is far beyond what the mission planners anticipated. We're also in interstellar space: a high-radiation environment that no spacecraft have flown in before. So there are some big challenges for the engineering team. But I think if there's a way to solve this issue with the AACS, our team will find it.

Once the team finds the source of the problem, engineers might be able to solve the issue through software changes, or by using one of the spacecraft's redundant hardware systems. But if they can't find the source of the problem, they might just have to adapt to living with the discrepancies.

Voyager 1's journey has encountered obstacles before. In 2017, the spacecraft's primary thrusters were showing signs of wear and tear. The engineers switched to other thrusters on Voyager 1, thrusters that operated during the mission's planetary encounters some 37 years earlier. It's another example of the remarkable longevity and ingenious design of the Voyager spacecraft.



(And remember: This is interstellar exploration. Solving mysteries takes time when messages to my team take nearly 20 hours to arrive!)

Bottom line: Voyager 1, the most distant human made object from Earth, has been sending back strange data, a mystery scientists are trying to solve.

SOURCE: Kelly Kizer Whitt; <https://earthsky.org/space/voyager-1-mystery-random-telemetry-data/>



# Total Lunar Eclipse

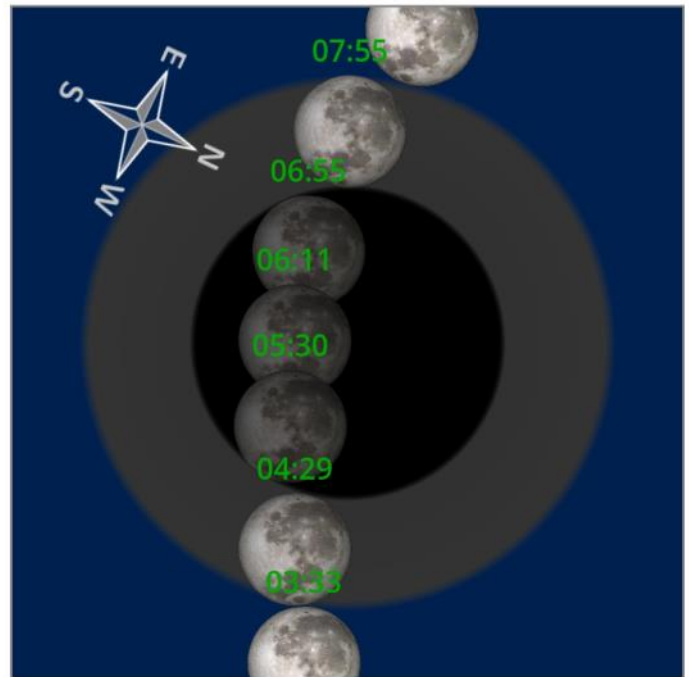
The Moon will pass through the Earth's shadow between 04:28 and 07:55 SAST, creating a total lunar eclipse. The eclipse could be visible at any location where the Moon was above the horizon at the time, including from Africa, the Americas, Europe and French Polynesia.

It was difficult to see from Pretoria since the Moon will set partway through the eclipse, and only be  $-2^\circ$  above the horizon when the eclipse starts.

The total eclipse lasted from 05:30 until 06:54. The Moon was partially eclipsed between 04:28 and 07:55 (all times given in Pretoria time).

The simulation to the right of Pretoria shows the Moon's path relative to the Earth's shadow. The outer grey circle is the Earth's penumbra, within which the Earth blocks part of the Sun's light, making the Moon appear less bright than usual, but not completely dark. The inner black circle is the umbra, within which the Earth entirely blocks the Sun's light, making the Moon's disk appear entirely unilluminated.

By default the eclipse is drawn with the local vertical in Pretoria uppermost (*Zenith up*), so that it is orientated as you would see it looking up at the Moon. The compass shows the direction of celestial north relative to the local vertical. Alternatively, you can orientate the sky with celestial north orientated uppermost, by selecting the option *North up*.



ABOVE: Eclipse simulation of Pretoria South Africa

The lower panel shows the Moon's position in the sky relative to the horizon, as seen from Pretoria, south Africa.

## Sequence of events

The eclipse began at 03:33, when the Moon first entered a region of the Earth's shadow called the penumbra. In this outer part of the Earth's shadow, an observer on the Moon could see the Earth partially obscuring the Sun's disk, but not completely covering it. As a result the Moon's brightness will begin to dim, as it is less strongly illuminated by the Sun, but it remains illuminated.

At 04:28, the edge of the Moon's disk entered the Earth's umbra. This is the region of space in which an observer on the Moon's surface could see the Earth completely obscuring the whole of the Sun's disk, and would find themselves thrust into night-like darkness.

As an increasing fraction of the Moon's face crept into the Earth's umbra, we saw our planet's circular shadow sweep across the face of the Moon.

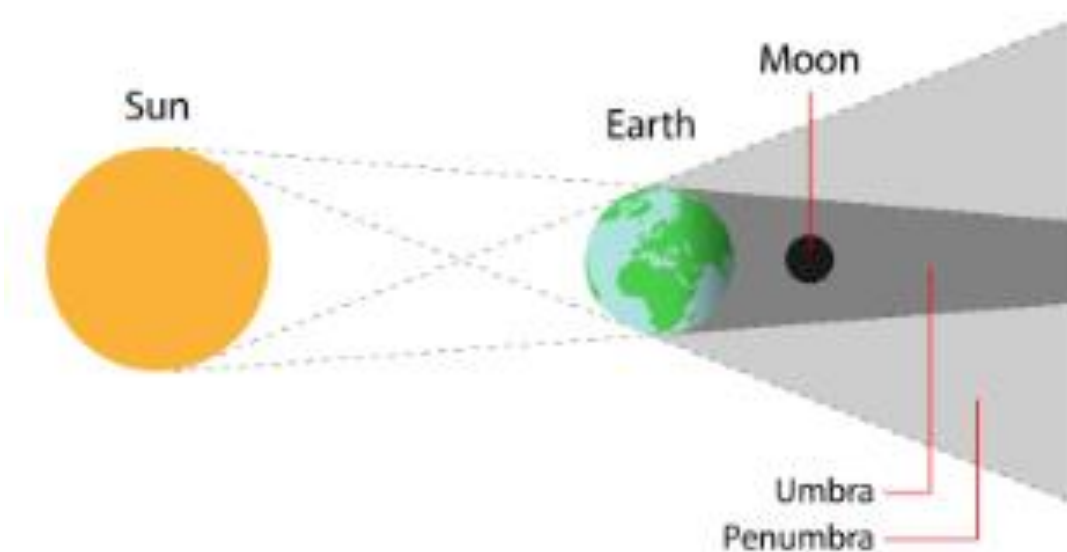
Eventually the Moon passed entirely within the Earth's umbra at 05:30, and the total eclipse began.

# ...Total Lunar Eclipse

The table below lists the times

Local time	UTC	
03:33	01:33	Moon begins to enter the Earth's penumbra
04:28	02:28	Moon begins to enters the Earth's umbra. Partial eclipse begins.
05:30	03:30	Moon fully within Earth's umbra. Total eclipse begins.
06:12	04:12	Midpoint of eclipse
06:54	04:54	Moon begins to leave the Earth's umbra. Total eclipse ends.
07:55	05:55	Moon fully outside the Earth's umbra. Partial eclipse ends.
08:51	06:51	Moon leaves the Earth's penumbra

## The eclipse geometry



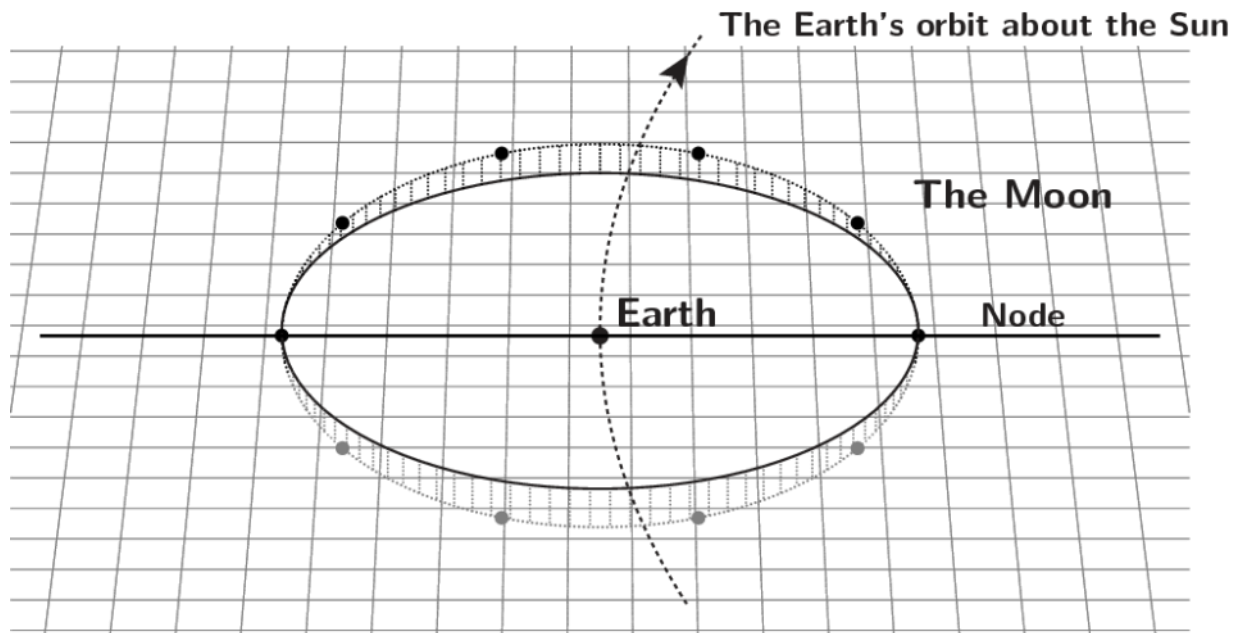
The geometry of the Earth's shadow. Within the Earth's penumbral shadow, the planet covers some fraction the Sun's disk. Only within the smaller umbra does the Earth cover the entirety of the Sun's disk. Any areas of the Moon's surface that passes through the penumbra appear darker than usual as the Earth is obstructing some of the sunlight that usually illuminates them. Areas within the umbra, meanwhile, receive no illumination from the Sun at all. .

Lunar eclipses occur when the Sun, Earth and Moon are aligned in a straight line, so that the Earth passes between the Sun and Moon and casts a shadow onto the latter's surface.

Each time the Moon orbits the Earth, it passes almost opposite to the Sun in the sky as it reaches Full Moon. If the Moon orbited the Earth in exactly the same plane that the Earth orbits the Sun, the Earth would pass between the Sun and Moon and create a lunar eclipse at Full Moon every month.

## ...Total Lunar Eclipse

In fact, the Moon's orbit is tipped up at an angle of  $5^\circ$  relative to the Earth's orbit around the Sun. This means that the alignment of the Sun—Earth—Moon line at Full Moon usually isn't exact. As a result, an observer on the Moon would see the Earth pass a few degrees to the side of the Sun.

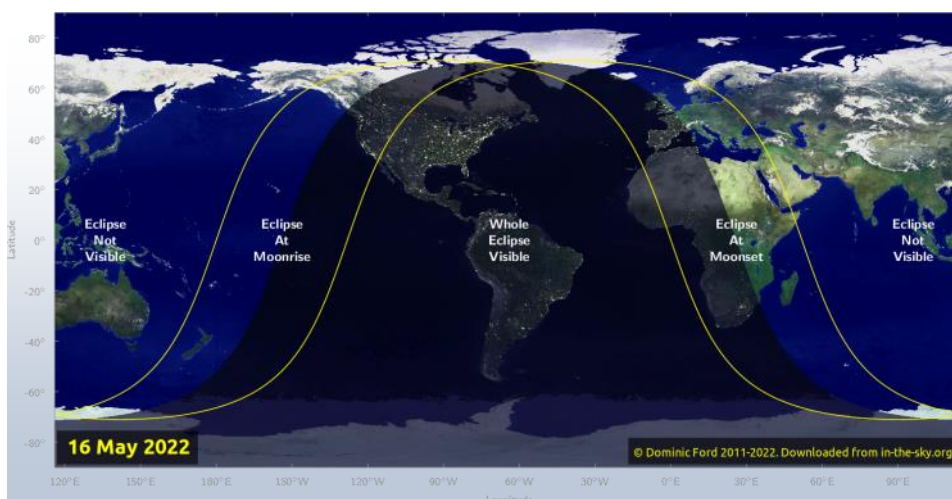


The Moon's orbit is tipped up by  $5^\circ$  relative to the Earth's orbit around the Sun, represented by the grid above. Lunar eclipses only occur at full moon if they occur when the Moon is close to the Earth–Sun plane, at points called the Moon's *nodes*.

in the diagram to the right, the grid represents the plane of the Earth's orbit around the Sun. As it circles the Earth, the Moon passes through this Earth–Sun plane twice each month, at the points on the left and right labelled as *nodes*. A lunar eclipse happens only when one of these node crossings happens to coincide with Full Moon. This happens roughly once every six months, usually two weeks before or after a solar eclipse.

### Visibility of the eclipse

Eclipses of the Moon are visible anywhere where the Moon is above the horizon at the time. Since the geometry of lunar eclipses requires that the Moon is directly opposite the Sun in the sky, the Moon can be seen above the horizon anywhere where the Sun is beneath the horizon.



LEFT: The map shows where the eclipse of May 16 was visible.



# Total Lunar Eclipse Photos 16 May 2022



ABOVE: Image taken at Queenstown East London by Marius Labuschagne



ABOVE: Images taken at Morningside, Durban by Koseelan Padayachee

BELOW: Images taken at Hillary, Durban by Laurianne Nelson

BELOW: Image taken over Hout bay, Cape Town by Kyle Goetsch - kyleincpt



BELOW: Image taken at Rushbrook, PMB by Dylan Evans



# Baily's Beads seen during a Solar Eclipse



ABOVE: Baily's beads are beads of sunlight caused when sunlight shines between mountains and other features on the moon. These Baily's beads are from the February 16, 1991, annular solar eclipse. Image via [Fred Espenak, aka Mr Eclipse](#).

**May 15, 1836:** On this date in science, [Francis Baily](#) (1774-1844), an English astronomer, saw beads of sunlight shining along the edge of the moon's silhouette during an eclipse of the sun.

It was an *annular* eclipse – nowadays often called a *ring of fire* eclipse – meaning that the moon was too far away in its monthly orbit around Earth to appear large enough in our sky to cover the sun completely. Baily saw beads of light shining around the darkened lunar limb (edge of the moon).



ABOVE: Another shot of Bailey's beads from the February 16, 1999, eclipse. Image via [Fred Espenak](#). Used with permission

## Baily's discovery

Baily's goal was to time the length of the annular phase of the eclipse. He would do this by recording the time during which the moon was inside the sun's disk. He would start timing as soon as a line of sunlight appeared along the trailing edge of the moon.



## ...Baily's Beads

Baily expected to observe a nice, smooth line of sunlight along one edge of the moon. Imagine his surprise as he watched and waited for it to appear – while observing with a [filtered](#) 2.6-inch, f/16 [refracting telescope](#) – at 40 magnification. Instead of seeing a *smooth* line of sunlight, he saw a *broken* line of light and dark spots.

Don't start that stopwatch yet, Mr. Baily!

Baily and others have commented that the line of light and dark spots resembled *beads on a string*. And, as the seconds ticked by, Baily saw the dark spots *decrease* in both number and size. And he saw the light spots *increase* in both number and size, until there was a fine line of sunlight around the edge of the moon.

Okay, now start the stopwatch!

But after the moon was completely inside the solar disk, the moon did look “smooth and circular” to him. At least four other local observers confirmed this observation during this eclipse.

### Sunlight shining through lunar valleys

Later, others realized that these beads of light appeared due to mountains and valleys, crater walls, and other topographic features extending above the limb, or edge, of the moon as seen from Earth. This phenomenon earned the name Baily's beads. And *you* can see it during total eclipses, too, just before the moon covers the sun completely. A video of Baily's beads on video <https://youtu.be/ZerlU1floyQ>

Baily published his discovery in the *Monthly Notices of the Royal Astronomical Society* in December of 1836. In a talk to the Royal Astronomical Society, he mentioned that he knew of only one other person who had seen these before, that being Jean Henri van Swiniden (1746–1823), a Dutch scientist.

Today, Baily's beads are one of the eclipse effects that amateur astronomers around the world – using proper eye protection – watch for during annular and total eclipses of the sun.

RIGHT: Francis Baily Image: The Royal Astronomy Society



### Baily's beads during a total eclipse

Baily discovered the beads during an annular eclipse, but they're best known for being visible during a total eclipse. Let's look at the process during a total eclipse.

As the seconds tick by, the sunlight decreases, and the dark areas increase until there is only one spot of light on the limb of the moon: the *diamond ring*. When that final bright spot disappears, the total eclipse begins. Remove the solar filters for a fantastic view.

As the total phase draws to a close, the effects resume in reverse order. On the trailing side of the moon the sunlight appears. First, the diamond ring. Next, Baily's beads.

## ...Baily's Beads

The Baily's beads phase is unappreciated during total eclipses. The main show is totality, and observers are typically preparing to remove their solar filters while Baily's beads and the diamond ring are occurring. And those Baily's beads at the end of totality? They are accompanied by sighs as the total phase comes to an abrupt end. But you can watch the phenomena at the end of the total eclipse with unfiltered and dark-adapted eyes, so they might appear brighter and more noteworthy than those leading into the total phase.



ABOVE: Baily's beads, visible during a total eclipse of the sun. Here, you're almost seeing another effect, known as the diamond ring. Image Luc Viatour - Encyclopaedia Britannica.

### **Baily's beads during an annular eclipse**

Here is the process during an annular eclipse, the type that Baily saw. To start, the moon appears smaller than the sun, so you must use filters the entire time. At the center of the annular eclipse, you see a ring of the sun around the moon. And the episode begins on the trailing, not the leading, edge of the moon. As the last bit of the moon moves onto the sun, the uneven dark limb (edge) of the moon produces bright spots. These bright spots increase in number and size until the whole edge of the moon is a bright arc of sunlight.

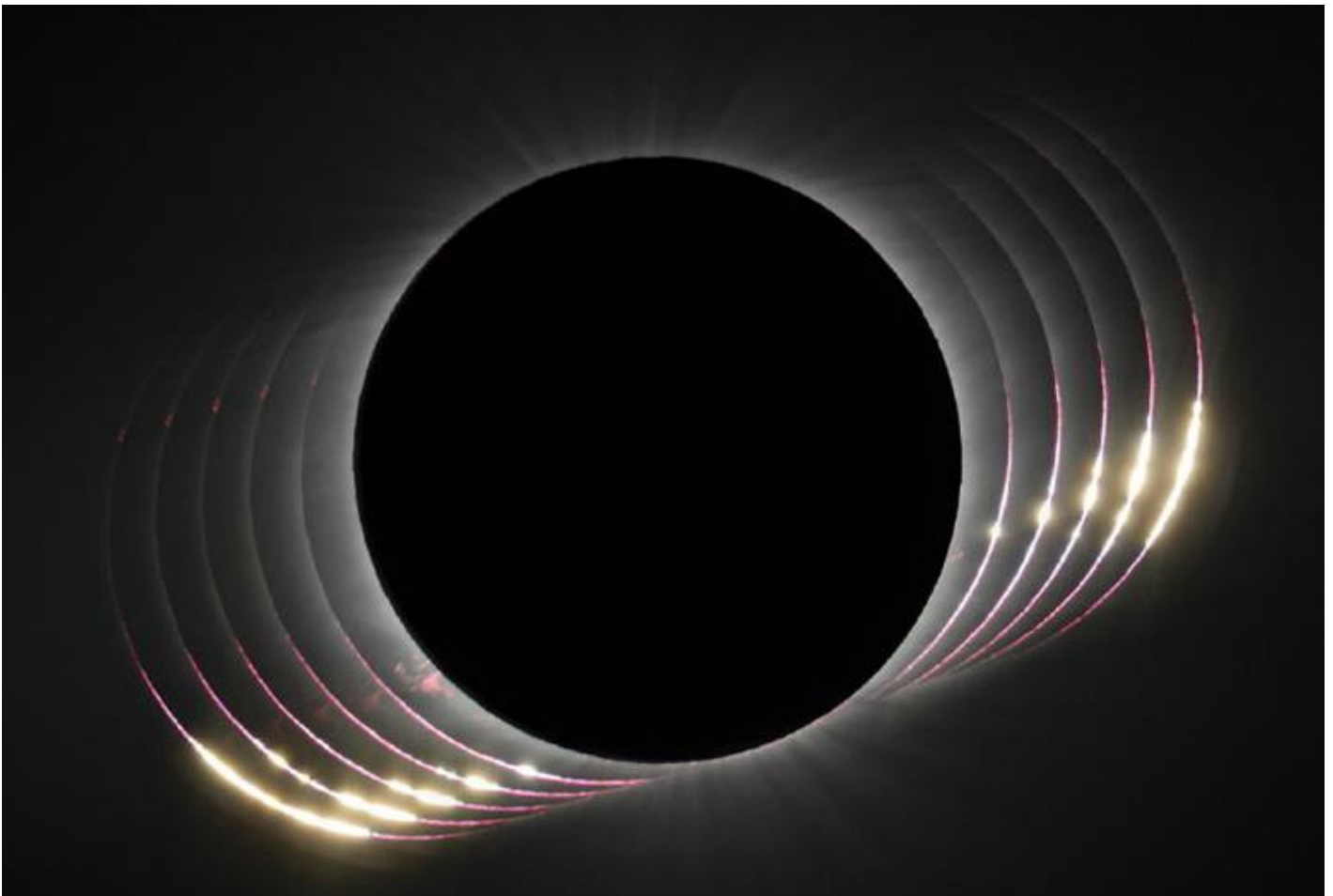
## ...Baily's Beads

That is what Baily saw. Toward the end of the annular phase of the eclipse, now looking toward the leading edge of the moon, that bright arc of sunlight begins to be interrupted by dark spots, growing in size. A video of Baily's beads during an annular eclipse can be seen here at <https://www.youtube.com/watch?v=nLnTGw3tlQc>

### Extending the beads

Is there a way to make those beads visible for a longer length of time? Yes, there are two ways. One is to hop onto a jet and zoom along the path of the eclipse. This will also extend the length of the total phase of the eclipse.

The other way is to set up near the edge of the central path of the eclipse. The typical eclipse shows the main event, whether annular or total, only along a path on the earth that is about 100 miles (160 km) wide. Sit in the center of that path and the eclipse phase will last longer than near the north or south limit of this path. But if you go near the north or south limit, the Baily's beads phase will last longer, at the sacrifice of the central phase. A video of Baily's beads lasting more than two minutes is here. [https://www.youtube.com/watch?v=JlcQ0z\\_xQlo](https://www.youtube.com/watch?v=JlcQ0z_xQlo)



ABOVE These images from the La Silla Observatory in Chile during the July 2, 2019, total eclipse. The photographer was near the edge of the path of totality. Image: Petr Horalek.

# ...Baily's Beads

## Baily's beads or Halley's beads?

On April 22, 1715 (Julian calendar, or May 3, 1715, Gregorian calendar) Edmond Halley (1656-1742) observed a total solar eclipse from London. He predicted the eclipse, and so it is often referred to as Halley's Eclipse. During this total eclipse, Halley observed Baily's beads too, 59 years before Baily was even born. Here is Halley's description:

About two Minutes before the Total Immersion, the remaining part of the Sun was reduced to a very fine Horn, whose Extremities seemed to lose their Acuteness, and to become round like Stars ... which Appearance could proceed from no other Cause but the Inequalities of the Moon's Surface, there being some elevated parts thereof near the Moon's Southern Pole, by whose Interposition part of that exceedingly fine Filament of Light was intercepted.

This is an excellent description of Baily's beads, even though Halley hit the "shift" key a few too many times!

Edmond Halley was the first to observe and identify the event we now call Baily's beads, yet they are not named after him. What *is* named after Edmond Halley?

- Halley's Comet, which he did not discover, but he did predict its return.
- Halley's Eclipse in 1715, which he also predicted.
- Halley, the crater on the moon, named long after Halley passed away.
- Halley, the crater on Mars, named in 1973.
- Halley Research Station, in Antarctica, established in 1956. Edmond Halley never went to Antarctica, nor to the moon nor Mars, for that matter.
- Halley's Mount, a hill on the island of Saint Helena, from where Halley observed the southern sky.

But we don't have "Halley's beads," even though he discovered and defined them. One suggestion is to refer to the beads seen during the annular eclipses as Baily's beads and the ones seen during the total eclipses as Halley's beads. Then Edmond Halley would finally be recognized for something he discovered.

Bottom line: May 15, 1836: Francis Baily, an English astronomer, saw light shining through lunar ridges during an eclipse of the sun. These are now known as Baily's beads

Source: Elizabeth Howell <https://earthsky.org/space/this-date-in-science-bailys-beads-discovered/>



## Editor Stepping Down

After six years and 72 issues of the 'nDaba I have decided to step aside as the editor and hand over to the new editor Fiona Khan. I must thank my "Senior Editor", Corinne for all the hard work, time and effort in making the 'nDaba such a success..... To Ray Field, who never failed to deliver "At The Eyepiece" even during Covid and emailing scanned copies of hand-written notes, thank you! Thanks also to the people that shared their photos and stories Thanks go to Jean, Nigel, *Through the 'nDaba, I have learnt a great deal about astronomy* I will still keep the Facebook and website [www.astronomydurban.co.za](http://www.astronomydurban.co.za) updated. I am now wanting to concentrate more on my astro-photography and hopefully still be a regular contributor to the cover image....

# Public Outreach Monteseel 20 April 2022

By Claire Odhav

After quite a few delays due to Covid and grouchy weather, the Monteseel Sky Party finally happened!

This is the second stargazing event we have collaborated with the conservancy on, and they did a splendid job of organising and getting the word out! Approximately 200 people attended, and ASSA and Monteseel Conservancy split the gate takings, so a lovely fundraising opportunity for both.

**Monteseel is an area in the Valley of 1000 Hills**, between Drummond and Inchanga. Sitting atop the "Inchanga Hill" overlooking the Comrades Marathon halfway point.

It is the oldest and most popular climbing destination in Kwazulu-Natal, with over 300 documented climbing routes. Beautiful flowers grow all year round and the soil is rich, loose and well drained. This popular area truly offers a magical experience for all nature lovers. Follow the



conservancy on Facebook for updates on their special events!  
([www.seeupperhighway.com](http://www.seeupperhighway.com))

Being my first experience at this event and venue, I wasn't sure what to expect. However, I was pleasantly surprised and delighted and I hope to meander the area again in search of sunshine and bliss!

Arriving just in time to see the sun set over the ridge, private telescopes were already put up and eager attendees were getting coffee and snacks from the stalls, having picnics, and settling in.

ASSA members Amith Rajpal, Dylan Evans, Yesen Govender and Piet Strauss set up telescopes around the field. Amith connected his to a sizeable projector screen, for optimal viewing!

The evening opened with a welcome and intro from Anne (Monteseel) and Amith (Assa), followed by a live tour and presentation of the evening's sky by Ooma Rambilass.

I was reminded of the first sky party I attended a few years ago at Murray's farm, in search of the Big 5 of the night sky. Ooma was and is an incredible teacher with a wealth of knowledge and interesting stories! This was the most captivating part of the evening, Thank you Ooma, what a rockstar of the sky!



## ...Monteseel

Shortly after, viewing through telescopes started, with clouds blowing in and out, just to tease.

I was so impressed with our society's contribution to the evening. Members were engaging and interactive with viewers, answered questions, and shared information. A job enthusiastically and well done!

Here is some feedback from the evening:

### **Anne from the Monteseel conservancy:**

"Good morning Cheryl! The stargazing was great! The projected images that Amith set up lifted the event to a new level. A number of people brought their own telescopes, which was also new. And the lady who did the naked eye observations with the laser was so good too. So glad we got it together at last! X"

### **Yesen (ASSA)**

"My guests said they really enjoyed Ooma's presentation. It was a really good event, and maybe we could plan a members event where we can enjoy a few hours of viewing. I didn't get to spend too much time through my eyepiece as I had a line for viewing. But it was so cool to chat to the public as they were viewing!"

### **Piet (ASSA)**

"There were quite a few people with their own telescopes. And lots interested in joining ASSA. We handed out bookmarks with our details, so hopefully will get more members!"

### **Sheryl (Our ASSA organiser for this event):**

"Anyone can organise a Star party, a Stargazing Weekend Away, or a school or other club event. Just come up with a date and place suggestions. The more prep you do, the better chance of success. Monteseel is special because the Conservancy members did the admin, including all the marketing to their outdoor enthusiasts!"

Thank **YOU**, Sheryl, for setting up this wonderful evening.

And so, ended our special evening indeed. What wonderful memories of a dark, crisp night on a beautiful ridge with a glorious night sky! What more could anyone want?

Enjoy the pics, and we hope to see you at the next one!

Claire



# ASSA Durban Minutes of General Meeting

11 May 2022 - 19:30 via Jitsi (JHB) and Zoom (DBN)



## Attendees:

<b>Speaker:</b>	Tessa Collins		
<b>Present</b>	ASSA – DBN members	ASSA – JHB members	
<b>Apologies:</b>	Amith Rajpal	Mike Hadlow	Armitage Family
	Mike Watkeys	Cheryl Venter	Corinne Gill

## 1. Welcome (Johannesburg meeting)

- x Alison Coulter, the JHB Chairperson, welcomed all attendees and visitors.
- x The meeting was recorded.

## 2. Guest Speaker

- x Tessa Collins gave a talk based on her recent honours thesis: 'Madala Dark Matter in the Coma and Virgo Galaxy Clusters'

## 3. Durban Meeting

- x Piet Strauss thanked speaker on behalf of DBN members
- x Piet welcomed the members into the Durban meeting, hosted by Gerald on Zoom.

## 4. Previous meeting minutes

- x Minutes proposed by Claire and seconded by John
- x There were no matters arising from previous minutes

## 5. Finance:

- 5.1 Francois presented the financial report prepared by Treasurer Corinne

## ASSA DURBAN FINANCIALS 2022/05/11

Financials Meeting	Month	Current	Investment	Petty Cash
General Meeting	2022-05-11	R 25 121.22	R 61 743.11	R 1 000,00

## ASSA DURBAN - MEMBERS

Date	No off	Paid Members	Honoury	Removed
2022-05-11	132	132	4	1

# ...Minutes of the Meeting

## 6. Events

### 6.1 Monteseel

- x Monteseel 30 April was a very good project. Possibly more than 200 people attended
- x Venue is perfect for star-gazing and we got some good income from the event
- x Some new members joined

### 6.2 Viewing evenings

- x Next viewing evening 27 May.

## 7. General

- x More committee members required
- x The next General Meeting will be held on **8th June 2022**
- x Times topic and venue details will be sent via email and WhatsApp

## 8. Meeting closed

- x The Acting Chairman closed the meeting at 20:30

### DURBAN ZOOM MEETING

Durban members meeting.

Meeting ID: **88037701479**

Passcode: **297674**



If **Light** Doesn't Have **Mass**, Why  
Its Affected By **Black holes**..?



@science\_cosmo

According to **General Relativity** Any Massive Object Warps the Spacetime Around It. Since a **Photon Travels** by the **Shortest Distance** Between Two Points, **Light Appears** to Bend When It Passes Through the Warped Spacetime Around a Massive Object. It's Just That the **Spacetime** Around Black Hole is **Warped** and Light Takes the Shortest Path Making It **Look Like** the Black Hole is **Affecting** the **Motion** of **Light**.

**DRAKE EQUATION**

$$N = R \times f_p \times N_e \times f_i \times f_c \times L$$



@science\_cosmo

### EQUATION FOR ALIEN LIFE

In 1961 American astronomer Dr. Frank Drake made an equation which can calculate the number of different types of Alien civilization in our Galaxy. This equation is known as 'Drake Equation' & according to this our Milkyway galaxy alone may contain 1000 to 100 million planets with alien civilization.





# Public Viewing Roster ASSA Durban



Dome Master	Email	Assistant	Telescope Volunteer	Public Viewing
Mike Hadlow	<a href="mailto:Mike@astronomydurban.co.za">Mike@astronomydurban.co.za</a>	Alan Marnitz	<a href="mailto:Alan@astronomydurban.co.za">Alan@astronomydurban.co.za</a>	3 June 2022
Debbie Able	<a href="mailto:Debbie@astronomydurban.co.za">Debbie@astronomydurban.co.za</a>	Sihle Kunene	<a href="mailto:Sihle@astronomydurban.co.za">Sihle@astronomydurban.co.za</a>	1 July 2022
Maryanne Jackson	<a href="mailto:Maryanne@astronomydurban.co.za">Maryanne@astronomydurban.co.za</a>	Ooma Rambilass	<a href="mailto:Ooma@astronomydurban.co.za">Ooma@astronomydurban.co.za</a>	29 July 2022
John Gill	<a href="mailto:John@astronomydurban.co.za">John@astronomydurban.co.za</a>	Sheryl Venter	<a href="mailto:Sheryl@astronomydurban.co.za">Sheryl@astronomydurban.co.za</a>	26 August 2022

## PUBLIC VIEWING RESUMED:

Public viewing is allowed back on site at the school in the dome and around the pool; due to revised lockdown level. This may change according to any revised lockdown conditions.

Please note there is a roster with a booking system. Once the number of telescopes are confirmed, Individuals will be contacted to confirm dates and times. Please book your place!!!

Kindly note, everyone will be required to adhere to the Covid & social distancing regulations of 1.5m and all will need to sign the attached mandatory questionnaire. Temperatures will also be taken on site.

## NOTIFY OBSERVATORY MANAGER:

Members interested in attending the above viewing evenings and/or becoming involved in assisting with the viewing evenings, please send your names to Mike Hadlow [mike@astronomydurban.co.za](mailto:mike@astronomydurban.co.za), cell number 083 326 4085 or Alan Marnitz on [alan@astronomydurban.co.za](mailto:alan@astronomydurban.co.za) cell number 082 305 9600.

Volunteers to please identify which role you are willing to assist with, Dome Master, Viewing Assistant or a Telescope Volunteer. After which, attendance will be confirmed and viewing dates will be announced.

## VOLUNTEERS REQUIRED:

**Dome Master** - Taking responsibility for the viewing evenings and learning how to set up, manage and use the new telescope.

**Viewing Assistant** - Learning about the new telescope, assisting with the viewing evenings, assisting viewing members as required.

**Telescope Volunteers** - Members willing to bring their telescopes to the viewing evenings to set up around the pool for public viewing.

Viewing Contacts:	Phone	Email
Mike Hadlow	083 326 4085	<a href="mailto:mike@astronomydurban.co.za">mike@astronomydurban.co.za</a>
Alan Marnitz		<a href="mailto:alan@astronomydurban.co.za">alan@astronomydurban.co.za</a>

# Notice Board

## MEETINGS:

- GENERAL MEETING: Next meeting to be held on **8th June 2022**
- PUBLIC VIEWING MEETINGS - please refer to website under the tab "Viewing and Events" for any updates with regards dates & public viewing under the current Covid restrictions; or click here: <https://astronomydurban.co.za/events-viewing/>
- ANNUAL GENERAL MEETING to be held on **13th July 2022**

## MNASSA:

- Monthly Notes of the Astronomical Society of Southern Africa.
- Available at [www.mnassa.org.za](http://www.mnassa.org.za) to download your free monthly copy.

## NIGHTFALL:

- Fantastic astronomy magazine. Check it out.
- Available from the ASSA website [assa.saao.ac.za/about/publications/nightfall/](http://assa.saao.ac.za/about/publications/nightfall/)

## MEMBERSHIP FEES & BANKING:

- Remember Membership fees for the 2022-07-01 to 2023-06-30 financial year will be due after the Annual General Meeting (2022-07-13) at which the cost of the new financial year will be confirmed.
- **Please all only pay your new year's membership subscription via EFT after 2022-07-15 following the AGM to ensure correct subscriptions are deposited. All that have paid later in the financial year will be advised of their adjusted fees once the new fees have been verified.**

Membership fees indicated below:

- Single Members: **R 190:00**
- Family Membership: **R 230:00** for families.
- Under 18 members: **Free**
- Cash/Cheques: **Please note: NO cheques or cash will be accepted**
- Account Name: **ASSA Natal Centre**
- Bank: **Nedbank**
- Account No. **1352 027 674**
- Branch: **Nedbank Durban North**
- Code: **135 226**
- Reference: **SUBS - SURNAME and FIRST NAME**
- Proof of Payment: [treasurer@astronomydurban.co.za](mailto:treasurer@astronomydurban.co.za)



## SKY GUIDE 2022 and ASSA MASKS - Limited number available !!!

- SKY GUIDES **SOLD OUT**
- MASKS: R **50:00** each with payment reference: MK - SURNAME and FIRST NAME

Please ensure proof of payment is sent to [treasurer@astronomydurban.co.za](mailto:treasurer@astronomydurban.co.za)

## RESIGNATIONS from ASSA:

Please send an email immediately notifying the Secretary of your wish to resign from the society to : [secretary@astronomydurban.co.za](mailto:secretary@astronomydurban.co.za)

## COMMITTEE POSITIONS & CONTACTS:

• Chairman	Amith Rajpal	Amith@astronomydurban.co.za	
• Vice Chair	Debbie Abel	Debbie@astronomydurban.co.za	
• Secretary	Francois Zinserling	Secretary@astronomydurban.co.za	
• Treasurer	Corinne Gill	Treasurer@astronomydurban.co.za	
• Guest Speaker Liaison	Piet Strauss	Piet@astronomydurban.co.za	
• Observatory & Equipment	Mike Hadlow	Mike@astronomydurban.co.za	083 326 4085
• Observatory Assistant	Alan Marnitz	Alan@astronomydurban.co.za	
• Publicity & Librarian	Claire Odhav	Claire@astronomydurban.co.za	083 395 5160
• Out-Reach - Public	Sheryl Venter	Sheryl@astronomydurban.co.za	082 202 2874
• Out-Reach - Schools	Sihle Kunene	Sihle@astronomydurban.co.za	
• St. Henry's Marist College Liaison	Moya O'Donoghue	Moya@astronomydurban.co.za	
• nDaba Editor, Website & Facebook	John Gill	John@astronomydurban.co.za	083 378 8797

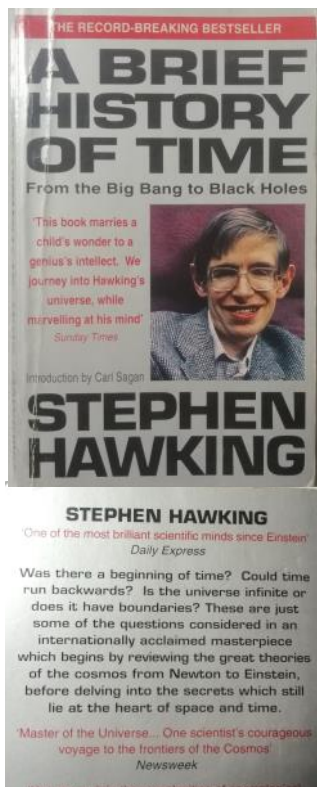
## ELECTRONIC DETAILS:

- Website: [www.astronomydurban.co.za](http://www.astronomydurban.co.za)
- Emails : [AstronomyDurban@gmail.com](mailto:AstronomyDurban@gmail.com)

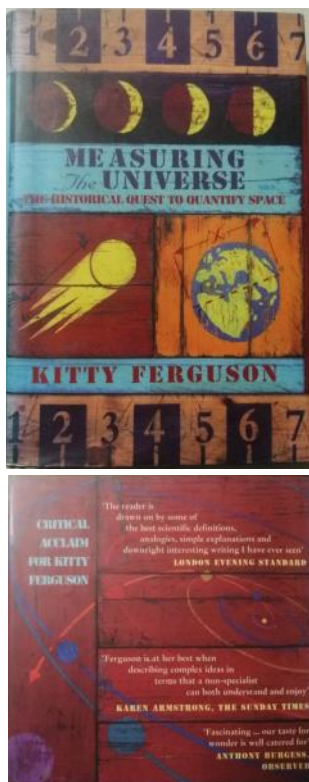
# Librarian's Books For Sale:

## PRE-LOVED BOOKS For Sale:

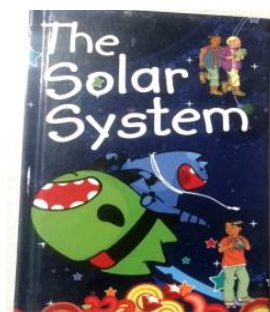
**A BRIEF HISTORY OF TIME**  
Paperback by Stephen Hawking  
**R95:00**



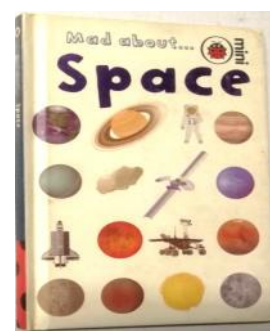
**MEASURING THE UNIVERSE**  
Hardcover by Kitty Ferguson  
**R 50:00**



**THE SOLAR SYSTEM**  
Mini Hardcover By Collins  
& Harper **R 35:00**



**SPACE**  
Mini Hardcover By Collins  
& Harper **R 35:00**



For a full list of books, posters and puzzles on space, contact me, Claire, on 0833955160

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