ASTRONOMICAL SOCIETY OF SOUTHERN AFRICA

Durban ’nDaba

Monthly Newsletter of the Durban Centre - July 2022

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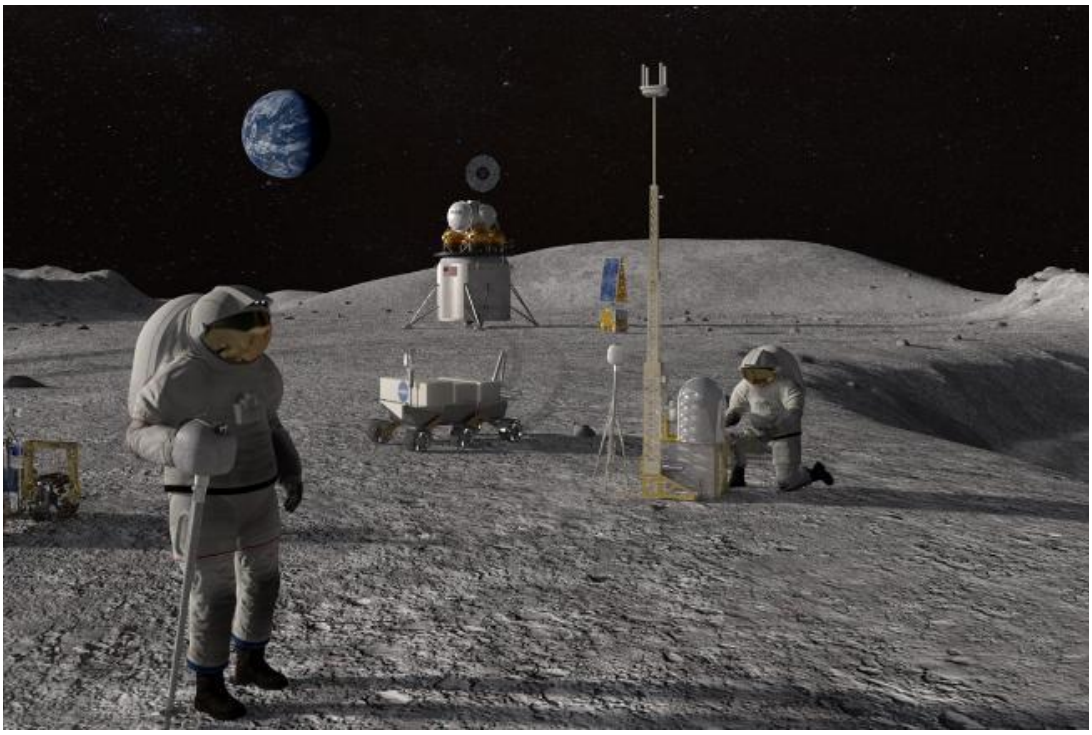


Member Submissions Disclaimer

The views expressed in 'nDaba are solely those of the writer and are not necessarily the views of the ASSA Durban Centre, nor that of the Editor.

Chairman's Chatter

July 2022

Dear ASSA members.

Our AGM is only 2 weeks away on the 13th July and with it we will be hosting a viewing evening where our telescopes will be pointed up at the super moon that rises at 16:50 and would be high enough for us to view after the meeting.

I would highly encourage those that are able to attend, to please join us for what we hope to be an enjoyable evening; Those of you that have telescopes, please bring them along. . We will also have a live broadcast for those that cannot.

On behalf of the French Astronomical Society (SAF), I wish to notify you of the "On the Moon Again" event that SAF is coordinating. You will find the details posted in the 'nDaba of the event that you can use for your communication. On the Moon Again (www.onthemoonagain.org) will take place on July 8, 9 and 10, 2022. It will be an occasion to meet and share the wonder again. On the Moon Again has now become an unmissable event and touches tens of thousands of people every year. More than 300 observation sites are already registered in the world! Enter now to be listed as viewing!

We invite you once again to get your telescope out into the street or with neighbors and share the wonders of the Moon with as many people as possible. It is easy, just register on https://forms.gle/CV8mCw98Ck8BU7ct8

While we are faced with constant and ever increasing load shedding, we can look at the positive side, with dark skies that show us more of the heavens above than would otherwise be available to us in our light polluted neighborhood's. I do hope that many of you are able to take advantage of the nights even with a pair of binoculars which provide and amazing experience.

Read the write up by one of our young astronomers, Luke Grosvenor, aged 10 on page 18, about his experience at the viewing at the dome early in the morning at the school to see the planetary alignment. Quite enlightening and enjoyable!

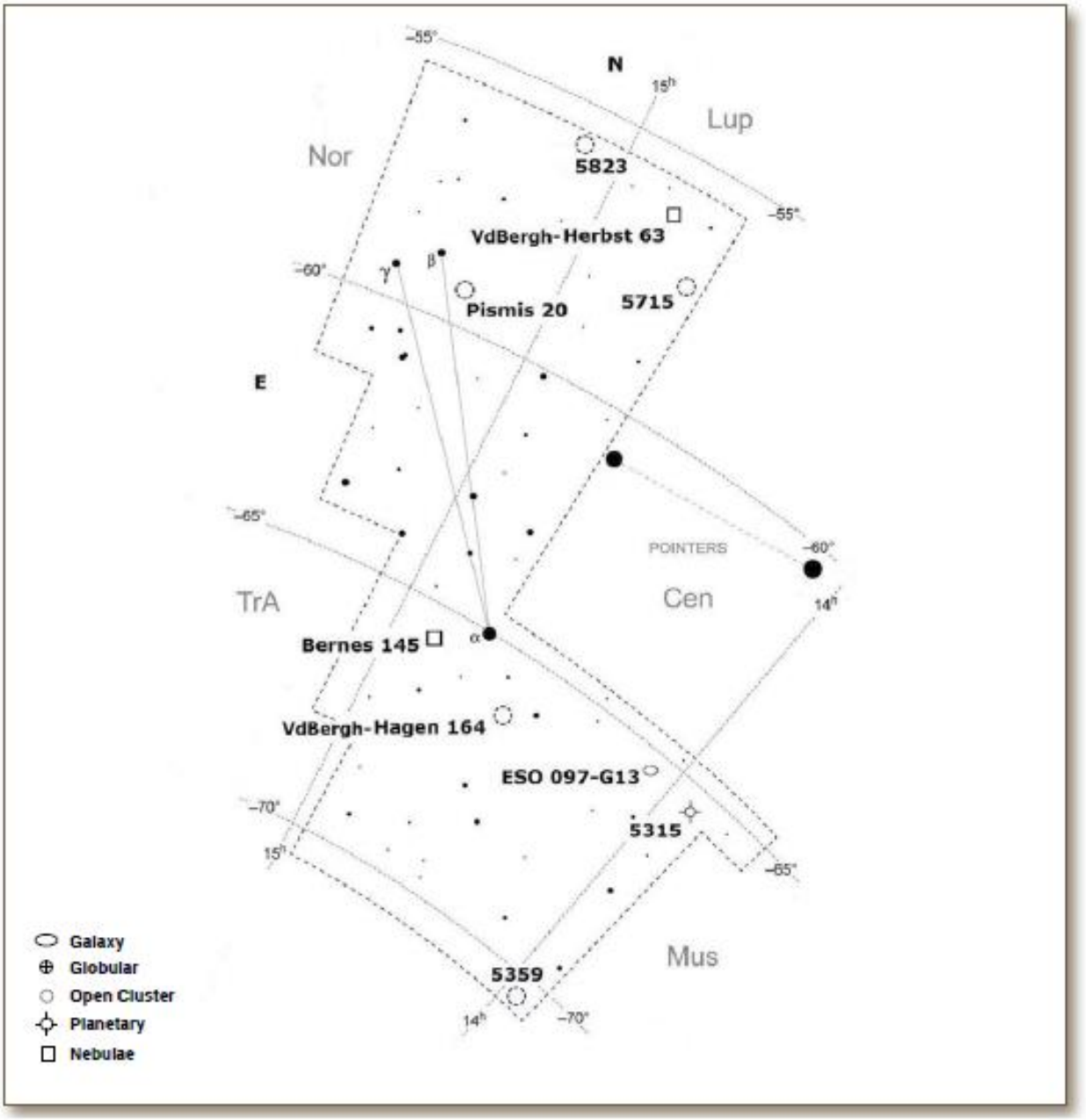
A detailed account is featured from page 20 about Artemis, NASA's forth coming voyage to the moon and the stages that it will entail. A programme that has been delayed many times and should be taking off this winter!

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

Amith Rajpal.

Astronomy Delights: Circinus
The Handy Tool

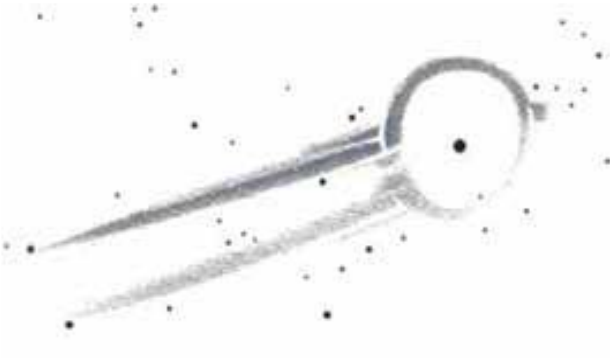
By Magda Streicher



ABOVE: The constellation of Circinus

LEFT: My grandfather's old-fashioned drawing compass dating back to 1944

…Circinus



While at the Cape of Good Hope in 1752, the astronomer Nicolas Louis de Lacaille created a constellation among the stars, which he named the Drafting Compass – a tool which, in his mind, was handy and essential for building ships that sail the seas to discover new horizons and eventually new land.

"If we think back a few decades, we will recall being introduced to an instrument, used to inscribe circles of arcs. Standard in the school stationery tin were triangles, a protractor and that wobbly compass that tended to draw ellipses rather than circles in our inexperienced hands. A protractor measures angles and as such is also used in the design and draughting industries. Then, one day, the men with the thick lenses invented a special instrument which replaced the protractor on the drawing board and which was, in reality, just a combination of the contents of the stationery tin. Then, a ruler that could rotate through any number of degrees became the next ally to the drawing board. Today measurements are done on the computer and the protractor and the school stationery tin are barely given a thought, having receded into the dim and distant past". (The late Sous Greyvenstein).

The starry drawing compass is one of the night sky's smallest constellations, with only the constellations Crux, Equuleus and Sagitta covering a smaller area. The constellation is squeezed in between Centaurus to the west, Lupus to the north, Apus on its southern side and Triangulum Australe to the east. The shape of Circinus resembles a long triangle with alpha Circini pointing southwest. The stars beta and gamma Circini complete the shape of the image, approximately 7 degrees north.

ABOVE: Lacaille's map showing his representation of the southern constellations. Photograph: Universe Today

ABOVE: NGC 5823 Image: Wikipedia

On the northern boundary, the open star cluster **NGC 5823** is early bisected by the constellations Circinus and Lupus. It is a really patchy cluster with between 40 and 50 stars fitting into one another at random, almost like a jigsaw puzzle. The inner area reminds me of a rose with stardust circling out in curls and twists. The southern section of the cluster is well rounded off with a semicircle of stars, fainter ones flowing up to the north where it stretches out with a short star string pointing north-west.

...Circinus

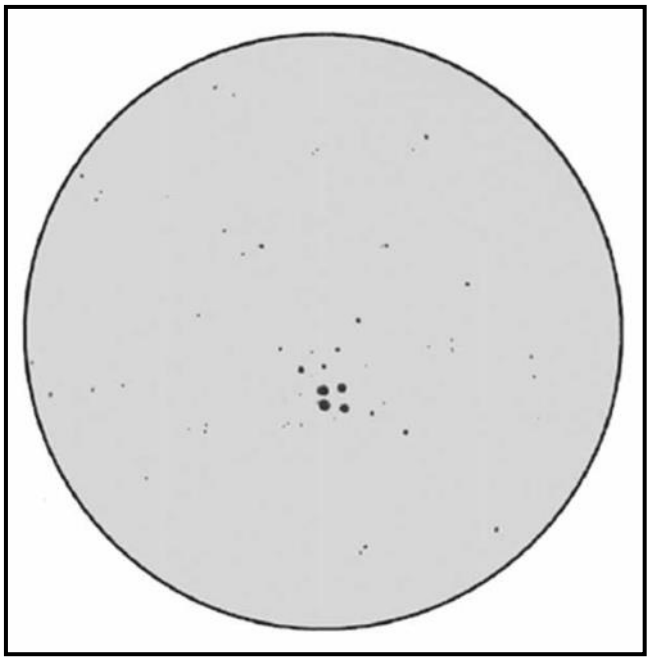
The western part of the cluster seems slightly busier in terms of starlight. For some amateurs the arrangement of stars in this cluster creates the impression of an exploding firecracker. The double star Hrg 107, named after its discoverer Lawrence Hargrave, is situated 1.5 degrees south-east of NGC 5823. This double star contains a grey to slightly yellow coloured magnitude 8.5 primary and a magnitude 9.1 companion shining in a pure yellow colour.

The nebula, **VAN DEN BERGH-HERBST 63**, situated in the far northern part of the constellation, is only a faint wisp of light seen with averted vision, reflected by the light of the magnitude 10.4-star HD 130079. Sydney van den Bergh and William Herbst compiled in 1875 the Catalogue of Southern Stars embedded in Nebulosity.

ABOVE: NGC 5715 - Image: DSS

NGC 5715 is another border hugging open cluster, situated 20' east of the border with Centaurus, in the northwestern part of Circinus. This cluster consists of around a dozen stars, noticeably fainter than the surrounding star field. Stars appear in two semi-circular arcs; one in a south-easterly direction and the other in a north-western direction. This inner core reminds of the symbol @ so familiar to electronic mail. Most stars appear to display the same magnitude, with brighter stars notched into the north-western side of the grouping. Dave Gordon, an astronomy friend, sees the shape of this grouping as a finely woven spider web with encircling strings of stars. The beauty of open clusters lies in the many impressions and ways of describing these star groups.

Adjoining beta Circini, 23' to the southwest, is the cluster **PISMIS 20**, surely one of the quietest little groupings. The cluster consists of a few stars between magnitude 8 to 11, with a closely packed square of brighter stars towards the middle area, one particularly yellow in colour. Members flank out on either side from the focal point, with the longest ray pointing in a north-west direction.



ABOVE: **PISMIS 20 Cluster**

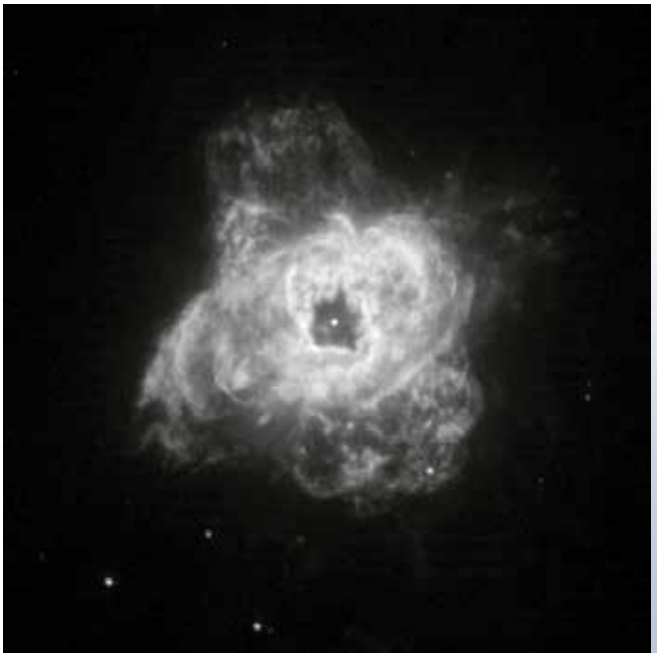
Circinus also offers a dark and a reflection nebula in its circle of elusive objects. **BERNES 145** is located 42' east of alpha Circini and appears as an almost black, oval patch, slightly elongated in a south-east to north-west direction. The Catalogue of Bright Nebulosity's of Opaque Dust Clouds by Claes Bernes, the Swedish astronomer, was compiled in 1971 to determine the physical associations between bright and dark nebulae.

...Circinus

Situated further south **VAN DEN BERGH-HAGEN 164** became debatable in 1968 because the cluster is slightly miss-plotted in relation to the indicated position. However, a cascade of eight more or less magnitude 7 blue-white stars can be seen running in a north-south direction for almost 30' just east of the indicated position. Sydney van den Bergh and Gretchen Luft Hagen, born as Gretchen Luft in 1942, who was married to John Peter Hagen, compiled a list of 262 objects in 1975.

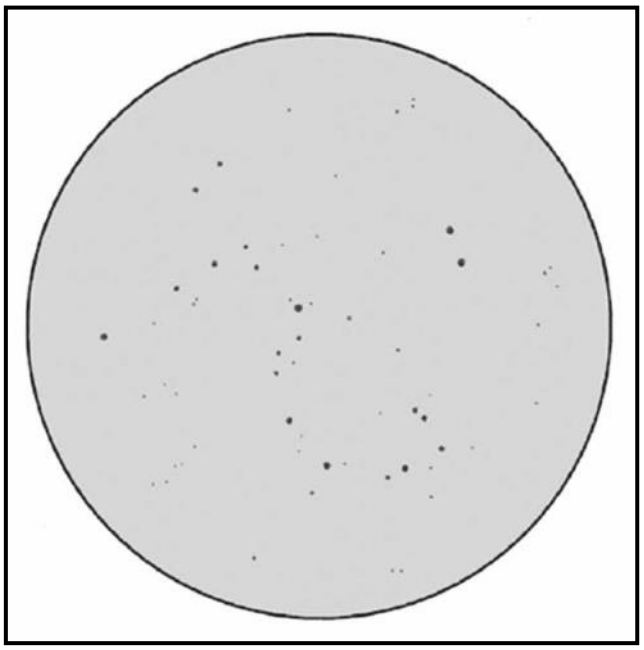
The star alpha Circini proudly occupies the place of honour at the apex of the old-fashioned compass constellation. With a white primary and golden-coloured companion, it is one of the most beautiful contrasting double stars in the southern starry skies.

ABOVE: alpha Circini – Image: Lucas Ferreira



ABOVE: NGC 5315 – Hubble Heritage

Nearly jumping the constellation fence is the planetary nebula **NGC 5315**, situated just 26' east of the constellation Musca. It is an extremely small planetary nebula, hardly visible. Careful observation reveals the planetary as a frosted point of light in a soft, misty blue to grey wrapping. Alternating between direct and averted vision, it produced a blinking on-off effect, which eventually enabled me to spot this faint speck of starlight. There are several other planetary nebulae that have the right magnitude central star in comparison with the nebula's overall brightness to show this effect. The most famous one is NGC 6826 better known as the Blinking Planetary in the constellation Cygnus.

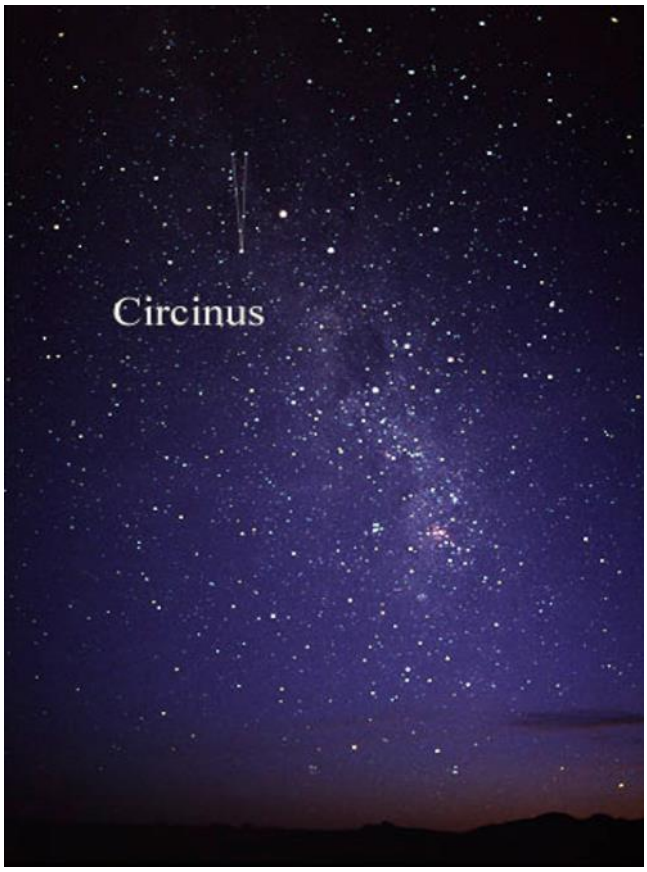


ABOVE: NGC 5315 – Hubble Heritage

Running in circles around the heavenly drawing compass, we find the open cluster **NGC 5359**, which is situated 15' north and dangerously close to the Apus constellation border. It is a lovely grouping with stars in a roundabout snake formation. The group contains about 22 stars and appears to me rather like a little seahorse in shape, displaying a curly tail on the western side, which really does justice to the little marine animal.

...Circinus

John Herschel described NGC 5359 in 1835 as a coarsely scattered cluster of class VIII. Herschel used a system for fainter stars which is not the same as the one we use today, and the then magnitude 11 is probably nearer to the present magnitude 10 or maybe slightly brighter. His scale even goes down to 20 magnitude!



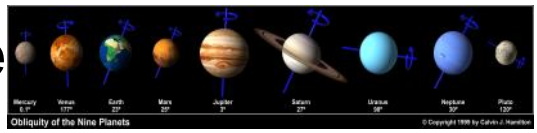
ABOVE: NGC 5359 Open Cluster
Image: the skylive.com

Only 3 degrees west of alpha Circini we find arguably one of the most interesting objects in the starry skies. The Circinus Galaxy was discovered as recently as 1974, when Ken Freeman noticed this large spiral galaxy on a red-light photographic plate taken with the Uppsala Schmidt telescope at Mount Stromlo in Australia. It had remained hidden for so long because it is partly obscured by the galactic plane. The galaxy is now listed formally as **ESO 097-G13**. The distance is about the same as the Centaurus Galaxy group, although it is not a member of that group, but for now the nearest Seyfert galaxy discovered.

Take a wide, dancing sweep through the constellation Circinus to the beat of the drawing compass and observe its wonderful objects to a fine edge.

OBJECT	TYPE	RA	DEC	MAG	SIZE
NGC 5315	Planetary Nebula	13h53m.9	-66°30′.8	9.8	13″
NGC 5359	Open Cluster	13h59m.8	-70°23′.5	10	8′
ESO 097-G13	Galaxy	14h13m.2	-65°20′.0	10.6	6.9′×3′
NGC 5715	Open Cluster	14h43m.7	-57°34′.6	9.8	7′
VAN DEN BERGH-HAGEN 164	Open Cluster	14h44m.1	-66°24′.0	7	29′
BERNES 145	Dark Nebula	14h48m.6	-65°15′.0	–	12′×5′
VAN DEN BERGH-HERBST 63	Nebula	14h49m.4	-56°14′.0	10.4	1.5′×1.5′
NGC 5823	Open Cluster	15h05m.7	-55°36′.2	7.9	10′
PISMIS 20	Open Cluster	15h15m.4	-59°04′.0	7.8	4.5′

At the Eyepiece



July 2022 by Ray Field

The Moon is First quarter on the 7th, Full on the 13th, Last quarter on the 20th and New on the 28th. The Moon is near Regulus on the 3rd, Porrima (γ virgo) on the 6th, Spica on the 7th, M80 in Scorpius on the 10th, Antares and M4 on the 11th, near Saturn on the 16th, Jupiter on the 19th, Mars on the 21st, the Pleides on the 23rd and Venus on the 26th.

Mercury is not suitably placed for observation this month.

Venus may be seen above the East, in the early morning sky before dawn. Its also in a straight line with Venus, Mars and Jupiter. Venus is near the Moon on the 26th and Venus is near Aldebaran in Taurus on the 1st. Venus is also within 1° of Uranus on the 12th and 13th of this month.

Mars is a morning sky object fairly high above the eastern horizon before dawn. It is near the bright planet Jupiter. It will brighten up as the year continues. It is as bright as Saturn by now and the Moon is near Mars on the 21st.

Jupiter is a very bright object in the morning sky at a magnitude of -2. It rises nearly 5 hours before the Sun. It is much higher than Venus which is below it in the pre-dawn twilight.

Saturn, in Capricornus, remains an evening object all year. It is easy to follow with the naked eye once found. It looks like a pale, yellow “star”. Its rings are striking in a telescope.

Comet C/2017 K2 Pan Starrs, may be visible in binoculars in the evening sky in July as per Sky Guide 2022 page 85. It will then be in the constellation of Ophiuchus, passing into Scorpius in August.

Meteor Showers:

Name	Max	Active Dates	ZHR	Start	End	Prospects
July Phoenicids	13 July	10 July – 16 July	<5	23:00	05:00	Full moon
Piscis Austrinds	29 July	19 July – 17 Aug	5	21:30	05:00	Favourable
Southern δ Aquariids	30 July	21 July – 29 Aug	25	22:00	05:00	Favourable
α Capricornids	30 July	15 July – 25 Aug	20	00:00	04:00	Good

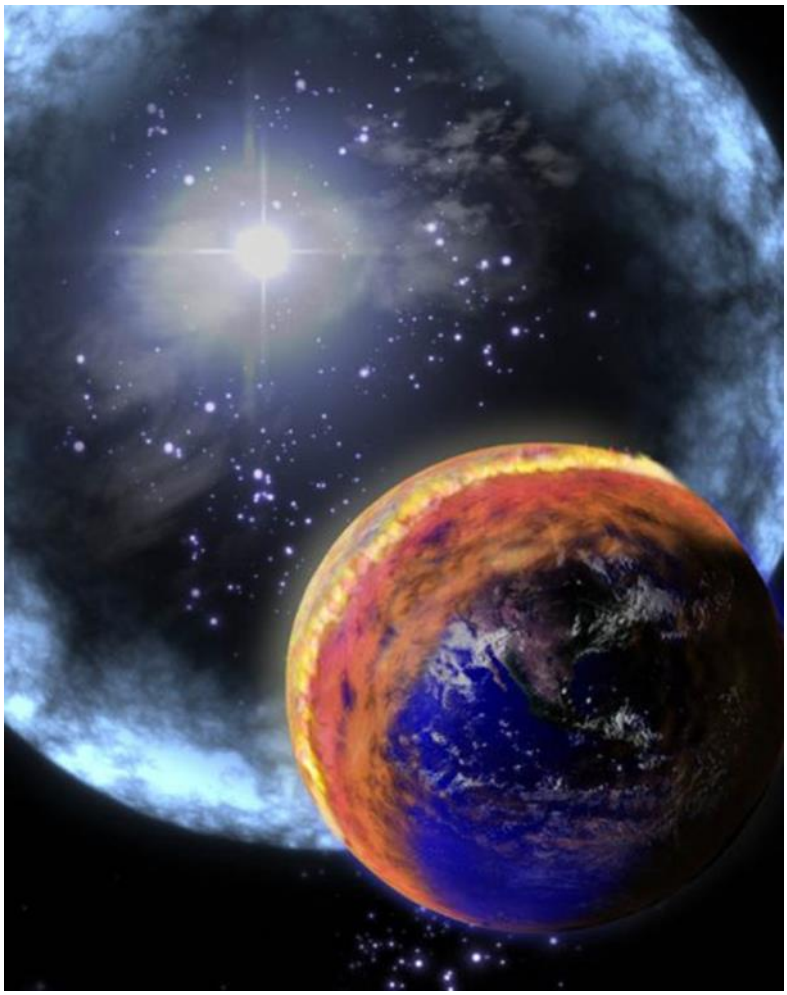
The Starry Sky from Durban. The Southern Cross has passed its highest for the early evening sky but is still favourably placed for observation as is the rich Milky Way of the “3 Crosses area” and the Scorpius/Sagittarius region of the night sky.

Low over the North is the bright orange star, Arcturus in Bootes, the Herdsman, and to its left Leo followed by Virgo is setting. The little Northern Crown constellation of “Corona Borealis” is due North needing a clear horizon. Hercules lies between the Northern Crown and the bright blue-white star Vega, which has just risen in the Northeast with Altair and its “star to either side of it”, up and to its right. The Southern Cross points to the quadrilateral of Corvus the Crow, which is followed across the sky by the bright star Spica in Virgo.

References include the ASSA Sky Guide Africa South 2021, Nortons Star Atlas, Stars of the Southern Skies by Mary Fritzgerald and Philips’ Planisphere for 35° S.

Is the Universe Too Dangerous for Life?

by Brian Ventrudo



ABOVE: Artist's impression of a gamma ray burst hitting the Earth. The gamma rays would trigger changes in the Earth's atmosphere that might make life as we know it impossible. Credit: NASA

It's a question that inevitably arises in conversations about the cosmos: does life exist elsewhere in the universe?

For those who hope the answer is "yes", the harvest of exoplanets by NASA's Kepler Space Telescope and other telescopes over the past decade has been hugely encouraging. As of mid 2019, in the small slice of sky under its exacting gaze, analysis of Kepler's measurements found more than two thousand extrasolar planets, and all telescopes have confirmed some 3,700 exoplanets. Extrapolating these results, astronomers estimate our Milky Way galaxy alone might hold some 10 billion planets that may have the temperature and composition to harbor habitable life. With that much real estate, many believe that complex or even intelligent life must have formed on at least some of these?

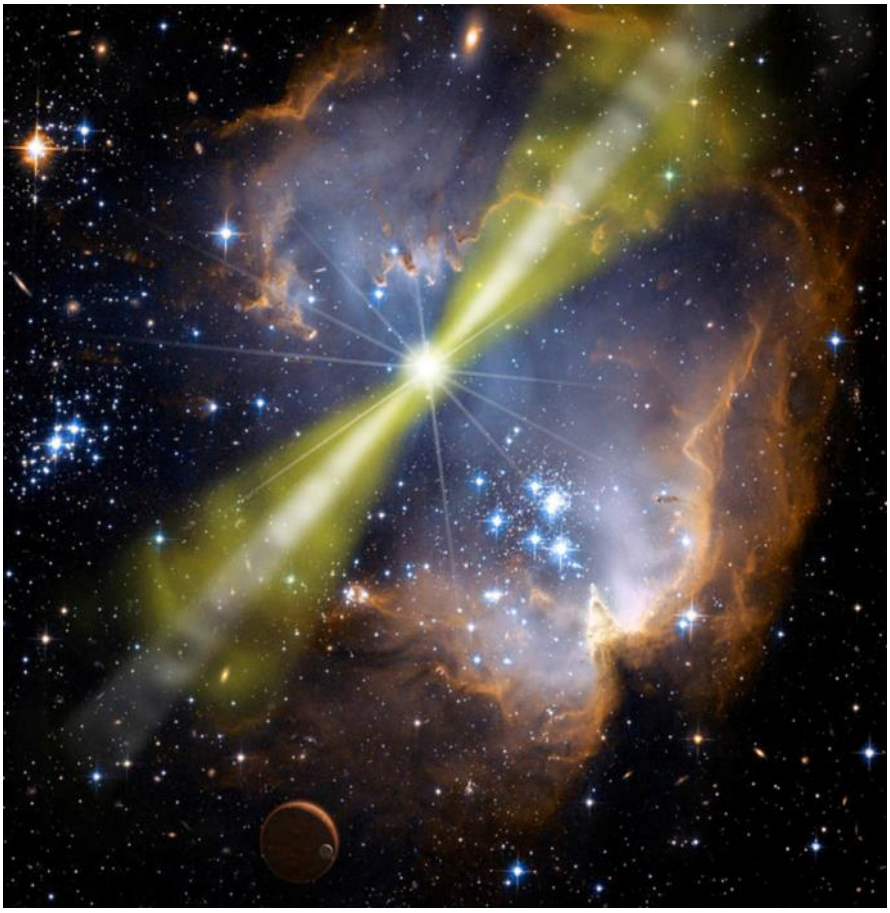
Well, perhaps not. In a sobering paper published a few years ago in the prestigious *Physical Review Letters*, astrophysicists Tsvi Piran and Raul Jimenez argue that most planets in the universe have been wracked by frequent galactic-scale environmental catastrophes that could destroy nascent life more complex than a single-celled organism.

The sources of these catastrophes are so-called long gamma ray bursts (LGRBs). These enormously violent events occur upon the collapse of a massive star which runs out of fuel, collapses, and sprays out more energy and radiation than a supernova along a highly directional beam. Only the most massive stars collapse and create a LGRB, but the universe contains a lot of stars, so in the universe as a whole, these events happen frequently. Using space-based satellites, astronomers notice some sort of GRB somewhere in the sky about once a day. They flash only briefly, but they are so bright we can easily detect them across billions of light years if we happen to lie in the path of the gamma rays.

A long gamma ray burst lasts for just a few seconds, but it ejects so much energy it would wreak havoc upon the biosphere of any nearby planet in the direction of its beam. The surface of a close-by planet might be fried by the gamma rays themselves. But even at a distance of a few thousand light years, a LGRB would destroy the protective ozone layer in the atmosphere of an Earth-like planet for several weeks or even months.

...Is the Universe Too Dangerous?

Without ozone, ultraviolet light from a planet's star would irradiate biological life (as we currently understand it) and completely degrade the biosphere. And computer models show that ozone might also form at ground level in the atmosphere where it's toxic to most forms of life life. Under these conditions, any complex surface life forms would be doomed. Simple life might survive, but its evolution to more complex forms would be set back by millions or billions of years.



ABOVE: Artist's impression of a gamma ray burst hitting the Earth. The gamma rays would trigger changes in the Earth's atmosphere

The likelihood of a planet suffering a blast from a LGRB increases with the density of nearby stars, since a small fraction of these stars will detonate as LGRBs. So regions of a galaxy where stars are packed close might be especially inhospitable. Using estimates of the distribution of stars in galaxies, the intensity and frequency of long GRBs, and our current understanding of stellar lifecycles, Piran and Jimenez calculated the probability of a planet in a spiral galaxy like the Milky Way suffering from a LGRB.

The result? In any 500 million year period, a planet within about 13,000 light years of the center of the Milky Way has a 95% chance of getting blasted by a lethal LGRB.

Further from the galactic center, where stars are further apart on average, the news is a little better. About 30,000 light years from the center of the Milky Way, the chance of a planet suffering a lethal LGRB is about 50% in a 500 million year period. Our Earth is about 25,000 light years from the galactic center, so even in our relatively benign neighborhood, there's a roughly 50-50 chance our planet suffered the effects of a LGRB sometime in the last 500 million years. Some scientists speculate such an event may have caused one of the five known mass extinctions on Earth, perhaps the Cambrian–Ordovician extinction about 488 million year ago. No one knows for sure.

Though to set your mind at ease, at present, there are no stars capable of generating a LGRB presently lie close enough to Earth to do us harm, so we are in no danger from these events in the foreseeable future.

...Is the Universe Too Dangerous?

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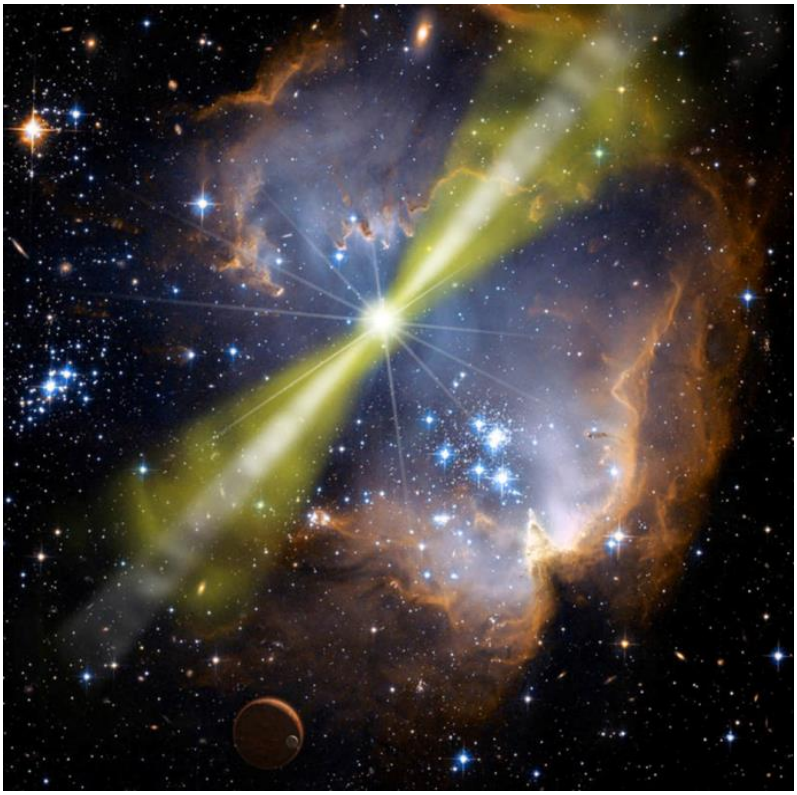

ABOVE: Artist's conception of a long gamma-ray burst (Credit: NASA/Swift/Mary Pat Hrybyk-Keith and John Jones)

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How about other galaxies? In most cases, the news is worse. In our own relatively sparse galaxy cluster, the so-called Local Group, galaxies are hundreds of thousands or millions of light years apart. So planets are in no danger from LGRBs from nearby galaxies such as the Large Magellanic Cloud or the Andromeda Galaxy. But most galaxy clusters are much denser than our Local Group, so the environment might be more dangerous. The study by Piran and Jimenez shows only galaxy clusters with 1/10th the density of the average galaxy cluster have an environment safe for Earth-like life to evolve over the long term.

...Is the Universe Too Dangerous

Billions of years ago, the results are even more woeful. Galaxies were smaller then, stars were closer together, and massive stars in the earlier universe were more likely to detonate as LGRBs. After running the numbers, Piran and Jimenez found that until about 5 billion years ago, most planets in the universe had a high probability of suffering a GRB. So complex biological life (again, as we currently understand it) was extremely unlikely to form on any planet in the first 8.8 billion years of the universe.

At the end of their paper, the two speculate that the lethal effects of GRBs may at least partly explain the famous Fermi Paradox. This argument, first posed by the physicist Enrico Fermi, wonders why with such a large number of stars in the universe, and with the great age of the universe allowing enough time for life to evolve and slowly propagate across a galaxy, there should be many civilizations within range of contact of Earth. So where are they? According to this study, maybe they were fried by gamma rays before they got off the ground.

ABOVE: Dense galaxy cluster Abell 2218 credit :STScI)

But the study by Piran and Jimenez contains many estimates and approximations. The most important is the assumption that all life in the universe has an Earth-like fragility to the direct and indirect effects of gamma rays on a planet's atmosphere. We have no idea if this is true.

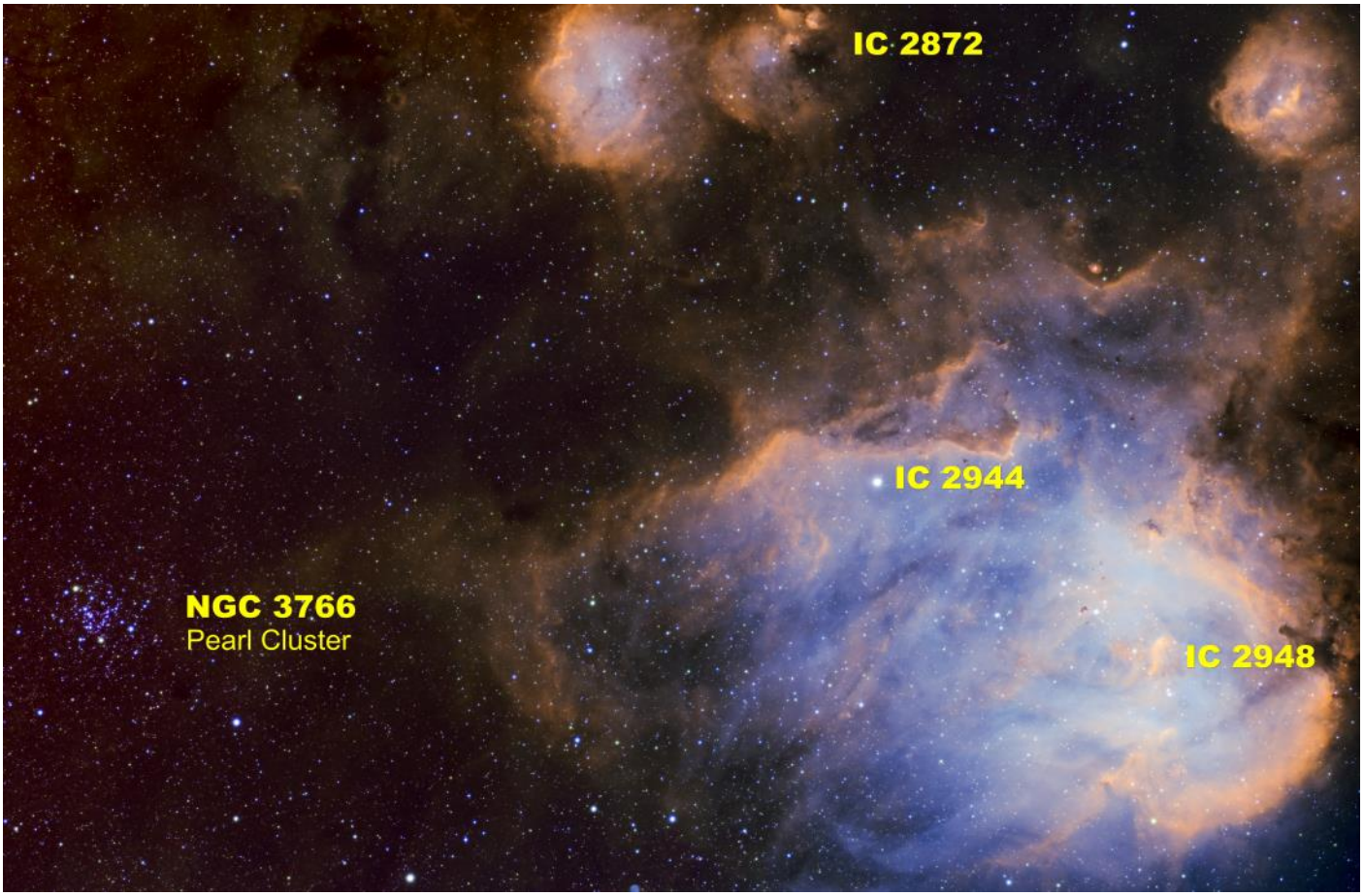
Astronomer and SETI advocate Seth Shostak tries to look on the bright side. Even with the inner part of many galaxies, and with entire dense clusters of galaxies off limits to complex life, there still may be plenty of stars, perhaps the majority of stars in a relatively safe galaxy like the Milky Way, in the safe zone for life to evolve. "The idea that certain regions of many galaxies might be sterile — or at least limited to life that requires a microscope to see — is interesting and sobering", say Shostak. "But pessimism about habitats for life has a bad track record. We once thought that in our own solar system, only Earth had the right conditions for life. Today, we know of a half-dozen worlds within the reach of our rockets that could support some biology."

His advice is to "… do the experiment. The theoreticians may point to the sky and say 'it's dead, Jim.' But unless you look, you'll never know for sure."

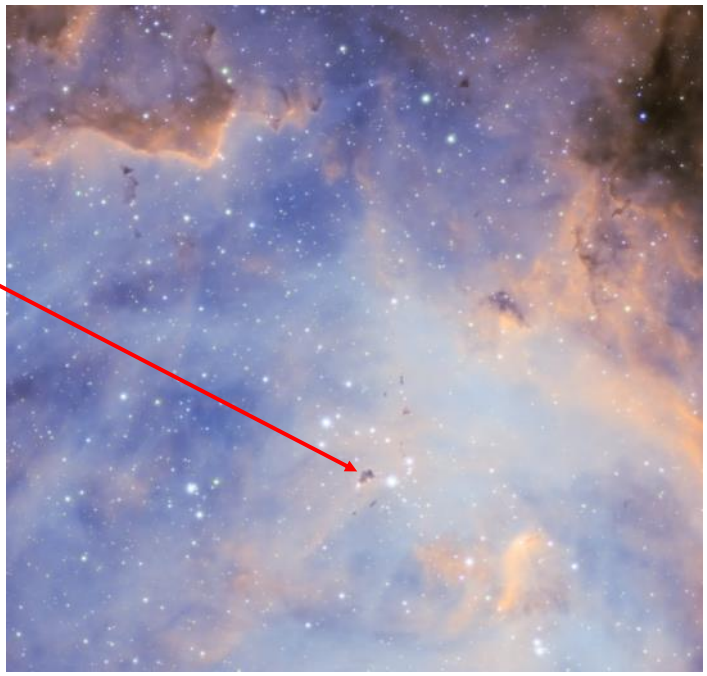
Cover Image - The Running Chicken Nebula

Image by John Gill

IC 2944, also known as the Running Chicken Nebula, the Lambda Centauri Nebula or the λ Centauri Nebula, is an open cluster with an associated emission nebula found in the constellation Centaurus, near the star λ Centauri. It features Bok globules, which are frequently a site of active star formation. However, no evidence for star formation has been found in any of the globules in IC 2944. Other designations for IC 2944 include RCW 62, G40 and G42.



The image on the right is a close up of a set of Bok globules discovered in IC 2944 by astronomer A. David Thackeray in 1950. These globules are now known as Thackeray's Globules. In 2MASS images, 6 stars are visible within the largest globule.

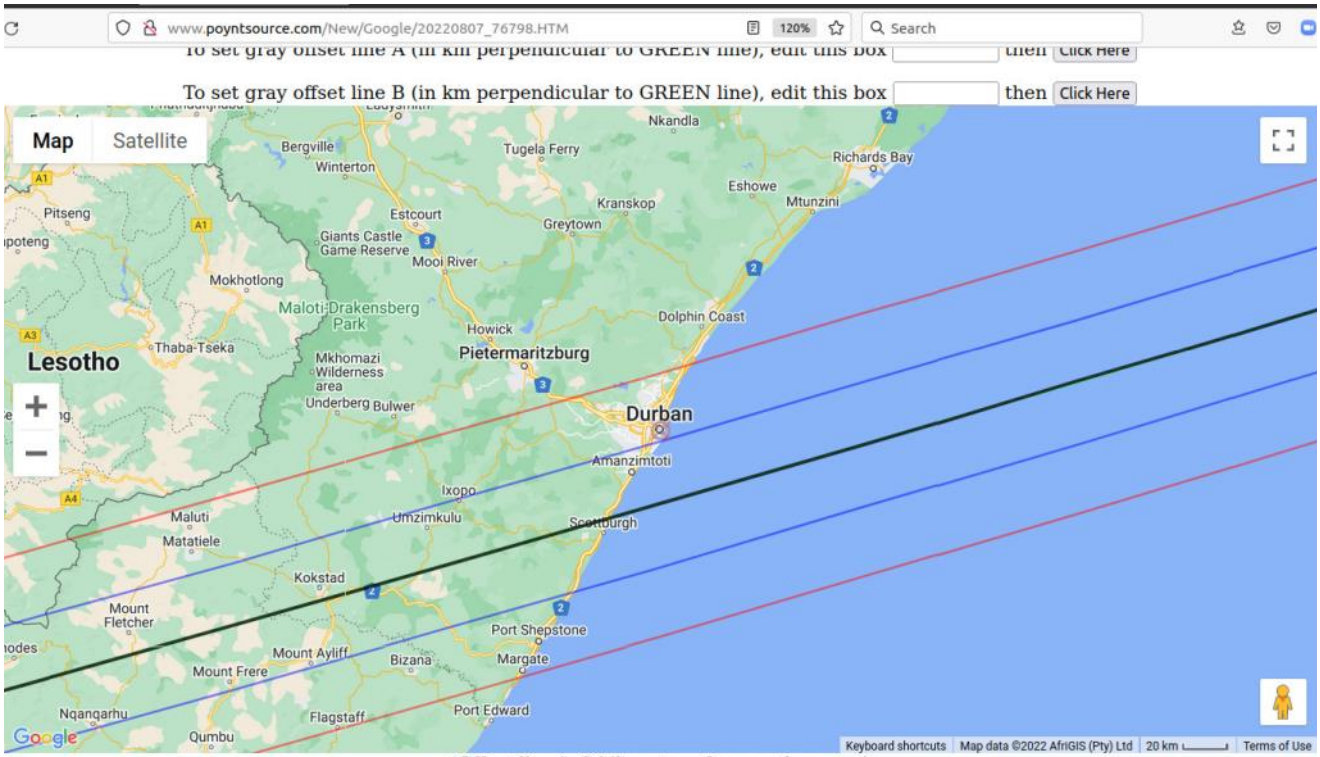


The region of nebulosity visible in modern images includes both IC 2944 and IC 2948, as well as the fainter IC 2872 nearby. IC 2948 is the brightest emission and reflection nebulae towards the southeast, while IC 2944 is the cluster of stars and surrounding nebulosity stretching towards λ Centauri. IC 2944 gets the running chicken nebula name from a group of stars that resemble a running chicken. The star Lambda Centauri lies just outside IC 2944. The nebulae is 6,500 light years from earth.

I used an APM 107/700 telescope with a 0.75 focal reducer covering 2.4° x 1.6° of sky. The camera was a QHY268m with Ha, Sii and Oiii filters using a Celestron CGX Mount. Captured in April over two nights. Total exposure of 6 hours, 170 Lights, 960 Calibration frames. Auto-guiding with PhD, acquisition software N.I.N.A. and processed with PixInsight.

Asteroid Eugenisis

IOTA/IOTA-ES occultation update for
(743) Eugenisis / TYC 5736-00135-1 event on 2022 Aug 07, 21:25 UT
Visible from S Africa



(Offset line is 0 kilometres from path center)

Summary

On 2022 Aug 07 UT, the 52.3 km diameter asteroid (743) Eugenisis will occult a 11.2 mag star in the constellation Sagittarius 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 3.40 mag to 14.53 mag (the magnitude of the asteroid) for at most 5.050 seconds.

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

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: 89
* Date and approx. time of event: 2022 Aug 07, 21:15 - 2022 Aug 07, 21:35
* Geocentric midpoint of event [JD]: 2459799.39261354
* Magnitude of target star: 11.18
* Magnitude drop [mag]: 3.40
* Estimated maximum duration [s]: 5.050
* Moon: 76 % sunlit, 40° distance
* Sun: 159° distance
* Rough path description: S Africa

...Asteroid Eugenisis

The Occultation Path

* Approximate projected width [km]: 55
* 1 sigma uncertainty interval [path widths]: +/- 0.54
* 1 sigma uncertainty interval [seconds]: +/- 4.4
* 1 sigma uncertainty interval approx RA,DE ["]: (+/- 0.033, +/- 0.021)
* 1 sigma uncertainty ellipse (major, minor, PA): (0.033", 0.021", 77°)
* Approx speed of asteroid's shadow [km/s]: 10.3642
* Website for maps: http://www.asteroidoccultation.com

Path Coordinates:

Occultation of TYC 5736-00135-1 by 743 Eugenisis on 2022 Aug 7
Uncertainty in time = +/- 4 secs
Prediction of 2022 June 13.9

Data for the Target Star

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	°	°	°	° ‘ “	° ‘ “	° ‘ “	° ‘ “	
28 00 00	-30 54 18	21 24 39.2	71	331	-72	-30 38 51	-31 09 47	-30 22 14	-31 26 29	0.33
29 00 00	-30 39 53	21 24 20.7	71	328	-72	-30 24 24	-30 55 23	-30 07 47	-31 12 05	0.33
30 00 00	-30 25 14	21 24 20.7	71	325	-73	-30 09 44	-30 40 44	-29 53 06	-30 57 28	0.33
31 00 00	-30 10 21	21 24 11.5	70	322	-74	-29 54 51	-30 25 53	-29 38 11	-30 42 37	0.33
32 00 00	-29 55 15	21 24 02.2	70	319	-74	-29 39 44	-30 10 47	-29 23 04	-30 27 33	0.33

* Name: TYC 5736-00135-1
* Constellation : Sagittarius
* BCRS position with proper motion to date of event [h,m,s ; °,',"]
  RA: 19 43 42.6873 DE: -14 09 27.185
* GCRS Astrometric position with proper motion and parallax to date of event [h,m,s ; °,',"]
  RA: 19 43 42.6872 DE: -14 09 27.185
* Position source: Gaia EDR3
* Standard error: RA,DE [mas]: (0.100,0.100)
* V mag [mag]: 11.2
* Diameter [mas]: 0.00

Data for the Minor Planet

* General Information:
  (Number) name: (743) Eugenisis
  Asteroid class:
  Approx. diameter [km]: 52
  Approx. diameter ["]: 0.038
  Distance from Earth [AU]: 1.87760
  Asteroid position offset in RA [mas]: 0
  Asteroid position offset in DE [mas]: 0

...Asteroid Eugenisis

Data for the Minor Planet…

* Orbital Information:
  Orbit source: JPL#74
  Date of fit: 2022 June 06
  Source of used astrometry: MPC, JPL
  Number of used observations: 0

* Orbital Elements for (743) Eugenisis :
  Mean anomaly = 253.7116656921 deg
  Arg. of pericenter = 186.0735729655 deg
  Long. of node = 228.9509577996 deg
  Inclination = 4.8352613830 deg
  Eccentricity = 0.0600219738
  Semimajor axis = 2.7919025362 AU
  Perihelion dist = 2.6243270354 AU
  Mag: H = 10.36, G = 0.15
  Epoch of elements: MJD 59798.89250000 TDT
  (2022 Aug 07.8925)

Program File:

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  </Event>
</Occultations>
------ occelmnt file for Occult  END   ----------------------------------
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Calculator (s): Steve Preston
Date of update: 2022 Jun 13, 20:50 UT

Steve Preston
7640 NE 32nd St
Medina, WA 98039
stevepr@acm.org

A special thanks to Nigel Wakefield for providing this Occultation information

My Visit to the Dome to see the Alignment of the Planets

By Luke Grosvenor - Aged 10

I became interested in the stars in the middle of last year. For my 10th birthday in January this year, Mom signed us up to join ASSA, Durban branch. I have managed to watch a few of the monthly webinars and have been reading the 'nDaba newsletters which are helping me to discover more about this fascinating subject. Unfortunately, we had not been able to attend any of the public viewings at the Dome as yet.

But that all changed on the morning of Thursday 16 June when we went to see the alignment of the 5 planets – Mercury, Venus, Mars, Jupiter and Saturn.

We woke up really early and wrapped up warmly against the winter cold. We were the first to arrive at the school and weren't sure where to go. Thankfully, Sihle joined shortly thereafter and started to explain to us what lay ahead. When Mike arrived at 4:30, I was very excited to finally be going inside the Dome. It was smaller than I imagined it to be but all 7 of us could fit inside and the equipment in there was fascinating to see. Mike opened the roof and set about focusing the telescope on Mars. He used a very powerful laser to help align the scope which I found amazing to watch. I have not yet managed to see any planets in my telescope, so viewing Mars was my first planet and I was thrilled to see it through the eyepiece.

Next, Mike located Jupiter, and we could see 3 of the 4 Galilean moons. The colourful gas bands were not visible but seeing this planet made me very excited and it was a bonus to be able to see most of its largest moons. The 4th of the Galilean moons was hiding behind the planet.

We moved on to Saturn, which was my absolute favourite. Not only could we see the rings (in a vertical position) but we also saw Titan, Saturn's largest moon. To see Saturn's rings on my first outing to the Dome was mind-blowing.

By this time, Venus had risen quite high above the horizon and Mercury was following behind. Both of these planets were being chased by the rising sun. Standing outside the Dome, we could see all 5 of the planets with our naked eye. Sihle, who had been answering all my questions thus far, showed me a video which explained that the next alignment of all the planets would only occur in 2040. To help me understand what is happening in the skies, Sihle and Mike recommended the websites www.heavens-above.com and https://spotthestation.nasa.gov/

Despite the rising sun making the sky lighter, Mike managed to focus in on both Venus and Mercury to complete the 5-planet viewing. It was incredible that we could still see these planets, even in such a bright sky.

…Planetary Alignment

I want to thank both Mike for operating the telescope and Sihle for all his information about space. I thoroughly enjoyed my first visit to the Dome and look forward to my next adventure there.

Luke Grosvenor - Aged 10
(with some help from Mom, Helen)

BELOW: Planets as viewed on 16th June - Image: Stellarium

Artemis - A Future Visit to the Moon

Why the program is called Artemis?

Artemis is the mythological Greek goddess of the Moon and twin sister of Apollo. The link with the mission which first launched humans to the Moon 50 years ago therefore is clear.

The crewed spacecraft currently under development meanwhile is called Orion. Orion is one of the most recognisable constellations in the sky, while in Classical mythology Orion is the hunting companion of Artemis.

Why is NASA going back to the Moon?

NASA is not simply aiming to repeat the feats of the Apollo missions with Artemis, but rather to go to the Moon 'and stay there'. That means investigating the possibility of establishing bases both in lunar orbit and on the Moon's surface, although the primary goal for now still involves returning humans to the Moon by the middle of the decade.

Key NASA mission objectives include:

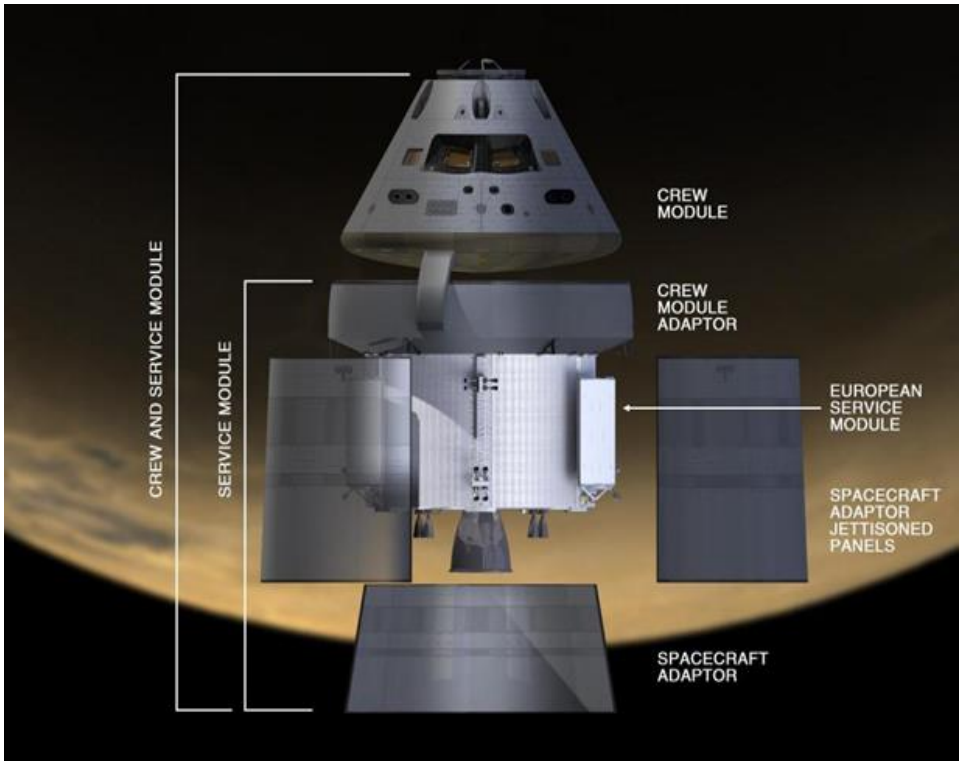
- **Equality**: a chief aim for NASA is to land the first woman and first person of colour on the lunar surface.
- **Technology**: from rockets to spacesuits, the technologies currently being developed are designed to pave the way for future deep-space missions.
- **Partnerships**: the Artemis program is one of NASA's first large-scale collaborations with commercial companies, such as Blue Origin, SpaceX and Boeing.
- **Long-term presence**: where the Apollo 17 crew spent three days on the lunar surface, Artemis aims to establish a base to extend the trips to weeks and possibly months.
- **Knowledge**: as more is known about the Moon compared with 50 years ago (and technologies have greatly advanced), NASA claims that this next series of missions will be able to retrieve samples more strategically than during the Apollo era.
- **Resources**: the discovery of water on the Moon and potential deposits of rare minerals hold promise for both scientific and economic exploration and exploitation.

How will NASA get back to the Moon?

There are four main phases of the Artemis Moon missions. These include:

Orion spacecraft

Equipped with life support systems and shuttle interfaces, Orion is the command module needed to transport the astronauts through space.



RIGHT: Orion's planned crew, command and service modules. Source: NASA

…Artemis

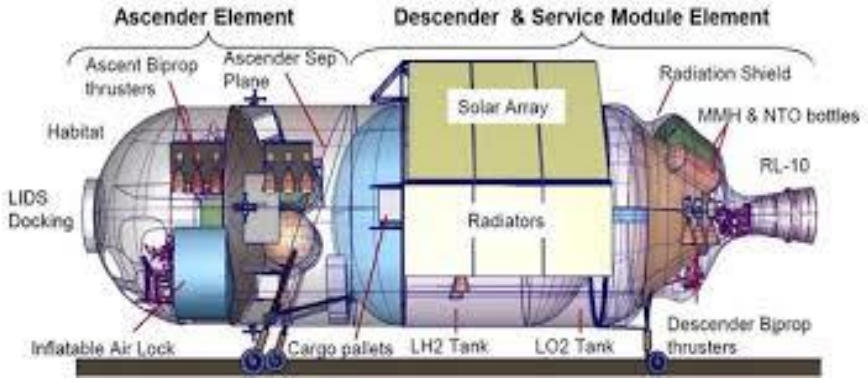
Lunar Gateway

The Lunar Gateway is a small space station orbiting the Moon, designed to be a flexible platform for missions to the Moon and beyond.
The Orion module will dock with Gateway, and from here, the astronauts will transfer into the lunar landing module.

Unlike the International Space Station (ISS), the Lunar Gateway won't be permanently occupied, but will serve as a platform where astronauts can live and undertake research for short periods. It will also be able to continue scientific research even between human lunar missions. International partners such as the European Space Agency are working with NASA on the design for the Lunar Gateway.

Moon Landing Module

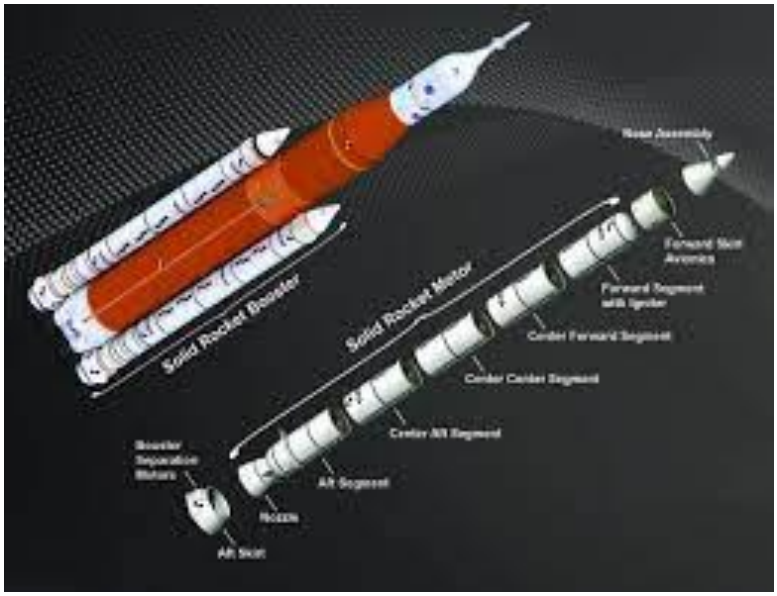
The lunar landing vehicles will take cargo and humans from the Lunar Gateway to the Moon's surface. NASA is working alongside commercial companies to develop both a human landing system (known as HLS) and a series of other vehicles for robotics and cargo.



Where Apollo's Lunar Module was designed to be used for one return journey to the Moon's surface, the landing systems for the Artemis missions are set to be used for multiple missions.

Space Launch System (SLS)

Tying together all these elements is the launcher that will carry them beyond Earth's atmosphere and into space. This super heavy-lift rocket can carry almost 180,000 kg and will cost over $800 million per launch. When complete, the SLS will be the most powerful rocket in the world, rivalling the original Saturn V launcher that first took astronauts to the Moon.



The launcher has been in development at NASA for most of the last decade, enduring multiple delays and rising costs. In March 2022, the rocket and spacecraft for Artemis, was moved to the launch pad at Kennedy Space Centre in Florida.

The SLS will take off from the Kennedy Space Centre in Florida, and once in space the Orion module will detach and travel to the Moon. Its orbit will take it 62 miles above the lunar surface before it continues 40,000 miles beyond the Moon. After a travel time of 20 to 25 days, the module will splash down in the Pacific Ocean near California.

…Artemis

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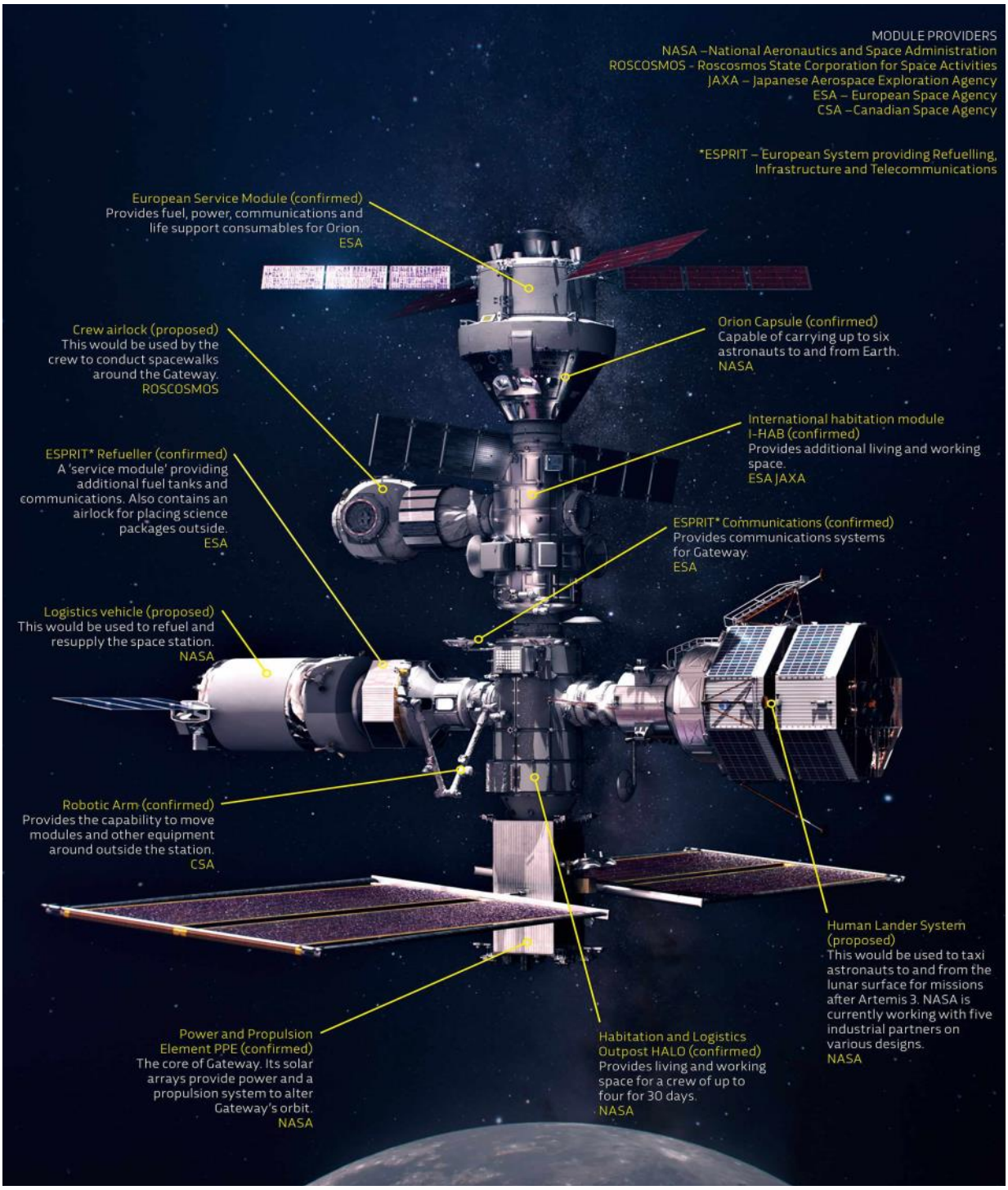

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Artemis 1: Rolled out and ready to launch

Many earthly spacecraft have visited the moon, but now NASA is preparing to send people back there. NASA’s moon Artemis mission, and the space agency has created its most powerful rocket ever – the Space Launch System, or SLS – to launch it. The rocket provides the propulsion for the Orion spacecraft, which will be un-crewed in the first two Artemis launches. In the third Artemis launch – scheduled for no earlier than 2025 – the Orion spacecraft will carry astronauts. As of mid-June 2022, the Orion spacecraft is sitting atop the SLS at Launch Pad 39B at the Kennedy Space Centre in Florida. Soon, SLS and Orion will head into space together for an un-crewed test run – Artemis 1 – hopefully blasting off during winter of 2022.

The last time humans set foot on the moon was December 13-14, 1972.

…Artemis

Above: The Orion spacecraft – and the SLS rocket that will launch it – are now poised on historic Launch Pad 39B at Kennedy Space Centre in Florida. They are part of NASA's Artemis mission, a multi-year plan to return humans to the moon. Launch for an un-crewed first test mission, Artemis 1, is expected by late winter 2022. Image via NASA.

Long-term goals

Artemis 1's purpose, formerly called Exploration Mission-1, is mainly to test the inaugural un-crewed flight of NASA's SLS, a rocket taller and more powerful than the mighty Saturn V rockets used during the Apollo program.

The Orion spacecraft, a Multi-Purpose Crew Vehicle, will ride atop the SLS for the first time in winter 2022. Orion has already undergone an Earth-orbiting test in 2014.

But the long-term goal of Artemis looks farther into the future. It's to establish the first long-term human presence on the moon. Then, NASA says, it'll use what it learns on and around the moon to take the next giant leap: sending the first astronauts to Mars.

Artemis 1, 2 and 3 According to NASA, Artemis 1 will break records:
Orion will stay in space longer than any ship for astronauts has done without docking to a space station, and return home faster and hotter than ever before. Approximately two years after Artemis 1, it will be Artemis 2's turn. Artemis 2 is a crewed flight that'll perform tests in Earth orbit. Finally, hopefully around, the Artemis 3 crew of four people will gear up for the 236,000-miles-long (380,000-km-long) journey to the moon F. Overall, they'll be in space about a month. The four astronauts will spend six days at our natural satellite's south pole.

…Artemis

Artemis 1, 2 and 3

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Orion will stay in space longer than any ship for astronauts has done without docking to a space station, and return home faster and hotter than ever before.
Approximately two years after Artemis 1, it will be Artemis 2‘s turn. Artemis 2 is a crewed flight that’ll perform tests in Earth orbit. Finally, no earlier than 2025 but hopefully around that time – if the program can stay on schedule – the Artemis 3 crew of four people will gear up for the 236,000-miles-long (380,000-km-long) journey to the moon. Overall, they’ll be in space about a month. The four astronauts will spend six days at our natural satellite’s south pole.

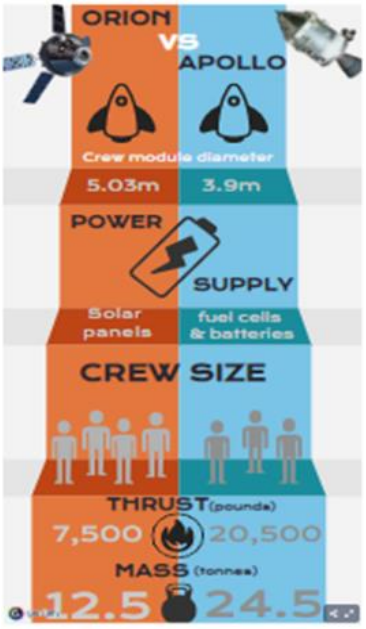
Details of Artemis 1 mission

Visionaries have been dreaming for decades of a return to the moon. And – although NASA first announced the Artemis program in December 2017 – the development of the Orion crew capsule and the powerful SLS that’ll blast it into orbit officially began earlier, in 2011.

For the Artemis 1 mission – with lift-off in perhaps late winter 2022 – the powerful launch system will send the Orion capsule up from Kennedy Space Center in Florida. Together, they will launch from the historic Launch Complex 39, originally built as the Apollo program’s Moonport and later modified for the Space Shuttle program. NASA explained: “During launch and ascent, SLS will produce 8.8 million pounds of maximum thrust, 15% more thrust than the Saturn V rocket.”

It’ll need that much thrust to send the 6 million pounds (3 million kg) of vehicle into orbit. As explained by Space.com, although Orion won’t have a human crew during Artemis 1; “ the commander’s seat will be occupied by a mannequin dressed in the Orion Crew Survival System, a special suit designed to help protect against radiation. Snoopy, shown on the LEFT; will be the zero G Indicator on the Artemis 1 flight. Image via NASA. Two radiation sensors will monitor radiation levels.

The mannequin will be strapped in, but the weightless environment also needs testing. So NASA is flying a ‘zero gravity indicator’ in the form of a Snoopy cuddly toy dressed in an iconic orange NASA jumpsuit. The comic strip character has a long association with lunar exploration: the crew of Apollo 10 used it as nickname for their lunar module.”



How does Artemis 1 compare with Apollo?

Philippe Berthe, ESA’s project coordination manager for the module, said in a podcast interview; “The propulsion is largely the same. It is very comparable to the Apollo era.”

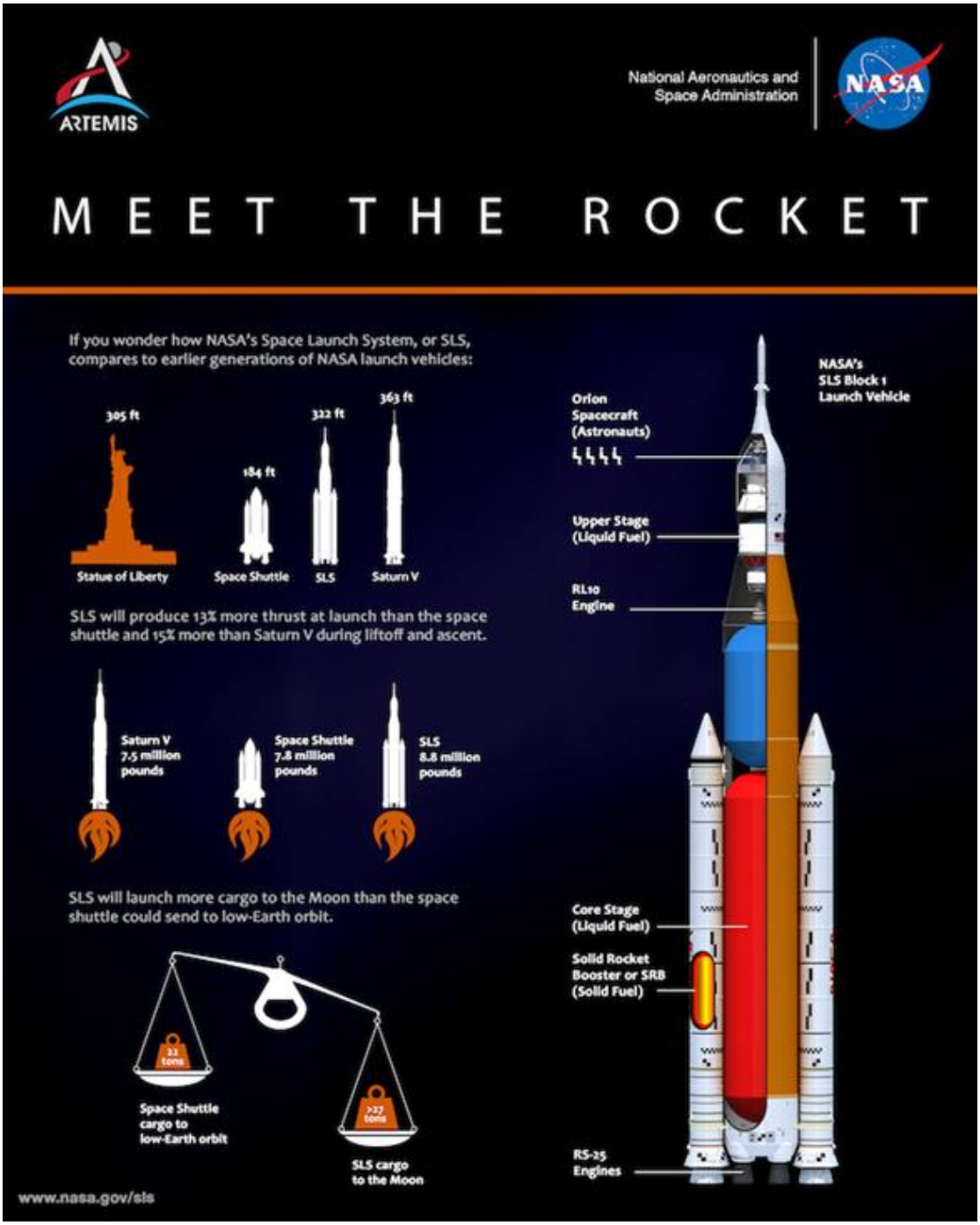
But of course after 50 years, there’s been technological progress. Berthe commented, for example: There have been vast improvements in solar cells.” These are devices that directly convert the energy of light into electrical energy. Orion will derive most of its power from its solar cells.

…Artemis

But naturally the biggest difference is computing power. Computers may have been on the horizon in the Apollo era in the late 1960s / early ’70s, But as reported at ZMEscience.com; “Your smartphone today is millions of times more powerful than the Apollo 11 guidance computers” back then.

So the Artemis program will benefit from our vast modern computing power. As Berthe said; “Computing power is another major improvement. We can program much more complex operations now. The crew don’t need to intervene directly in every nitty-gritty detail.”

Piloting the mission



ABOVE: NASA’s Space Launch System (SLS) will send missions farther and faster through space. It’s the only launch vehicle that can send Orion, astronauts and supplies to the moon in a single mission. As the SLS evolves, it will have even more power and will be capable of lifting even heavier payloads to orbit. Image via NASA/ MSFC.

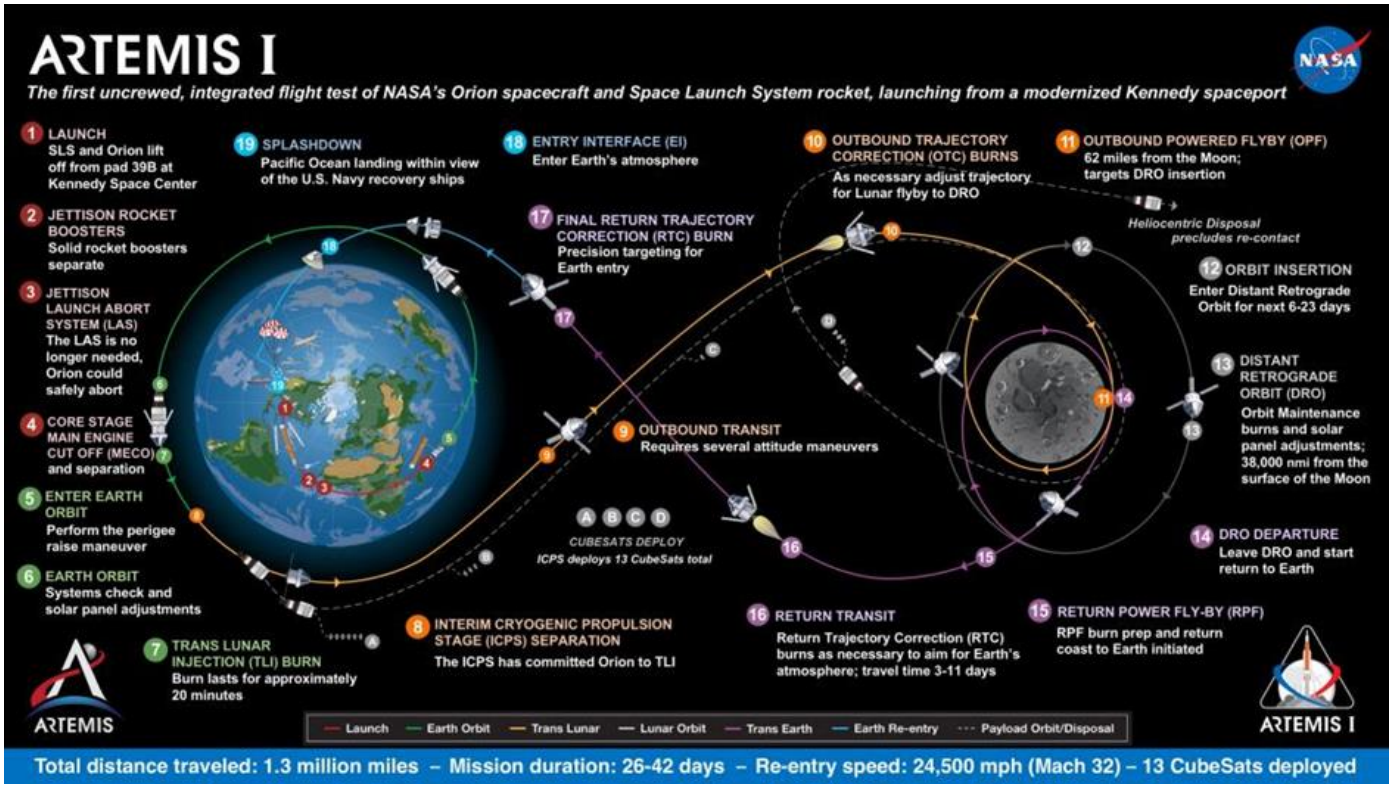
…Artemis

Piloting the mission …

There was a lot of talk in Tom Wolfe‘s famous 1979 book (later a classic movie, and recently a series) The Right Stuff about the idea of spam in a can. That was the intrepid test pilot Chuck Yeager‘s description of the early Mercury flights, which reduced the role of the astronauts to that of passengers (rather than pilots).

The Apollo missions *had* pilots, and of course, pilots are among the most glamorous of spacemen, both in science fiction and in reality. As we go further into the Artemis era, it’ll be fun to hear how *much* piloting takes place aboard the eventual Artemis 3 moon mission.

Artemis 1



ABOVE: Artemis I projected flightpath | Source: NASA

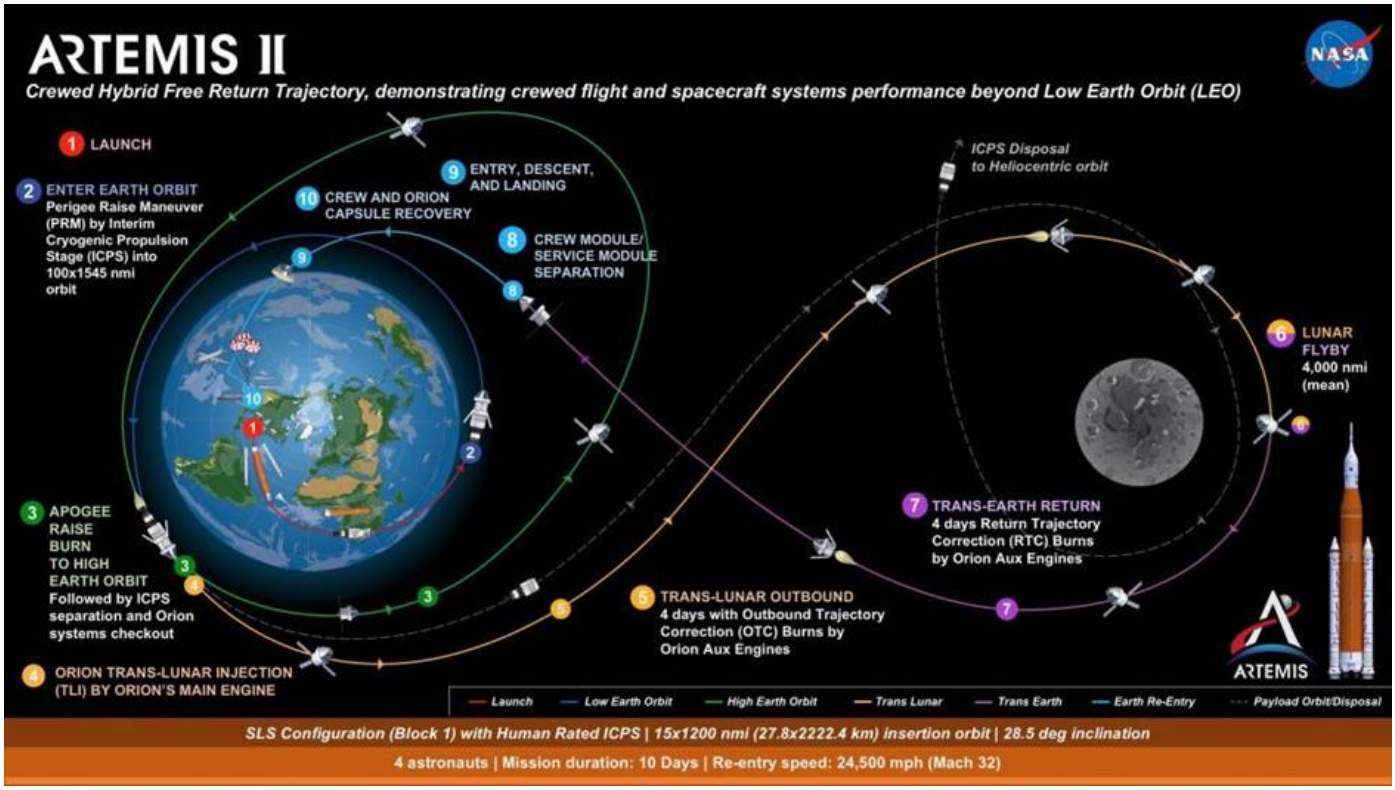
Formerly called Exploration Mission-1, this un-crewed mission is an extensive test of the Space Launch System (SLS) and the Orion module.

The SLS will take off from the Kennedy Space Centre in Florida, and once in space the Orion module will detach and travel to the Moon. Its orbit will take it 62 miles above the lunar surface before it continues 40,000 miles beyond the Moon. After a travel time of 20 to 25 days, the module will splash down in the Pacific Ocean near California.

Artemis 2

This will be a pioneering crewed spaceflight for the Artemis Program, taking humans further than they've ever been in space. After being launched into space by the SLS rocket, the four-person crew will fly the Orion module 8889 km beyond the Moon, complete a lunar flyby and return to Earth. The mission will take between eight to ten days and collect valuable flight test data.

…Artemis



ABOVE: Artemis II projected flightpath | Source: NASA

Humans on the moon by 2025?

And of course there's the decades-old debate about why we need to go to the moon at all. After all, over the past decades, we've learned a lot about the moon via robotic spacecraft, both orbiters and landers. Plenty of people will argue – and have argued since the Apollo era – that sending humans to the moon is a waste of time, money and resources. But the answer boils down to a number of things, one of them being efficiency. Berthe said; "An astronaut will do in a 6-hour [moonwalk] what a robot can do in 6 months. It is more expensive, but it is more efficient."

And the main reason, of course, is that the moon is a stepping stone to space. The moon's gravity is only 1/6 of the Earth's. It's much easier to blast a rocket into space from the moon than from Earth. This makes the moon a great base for future exploration of the solar system.

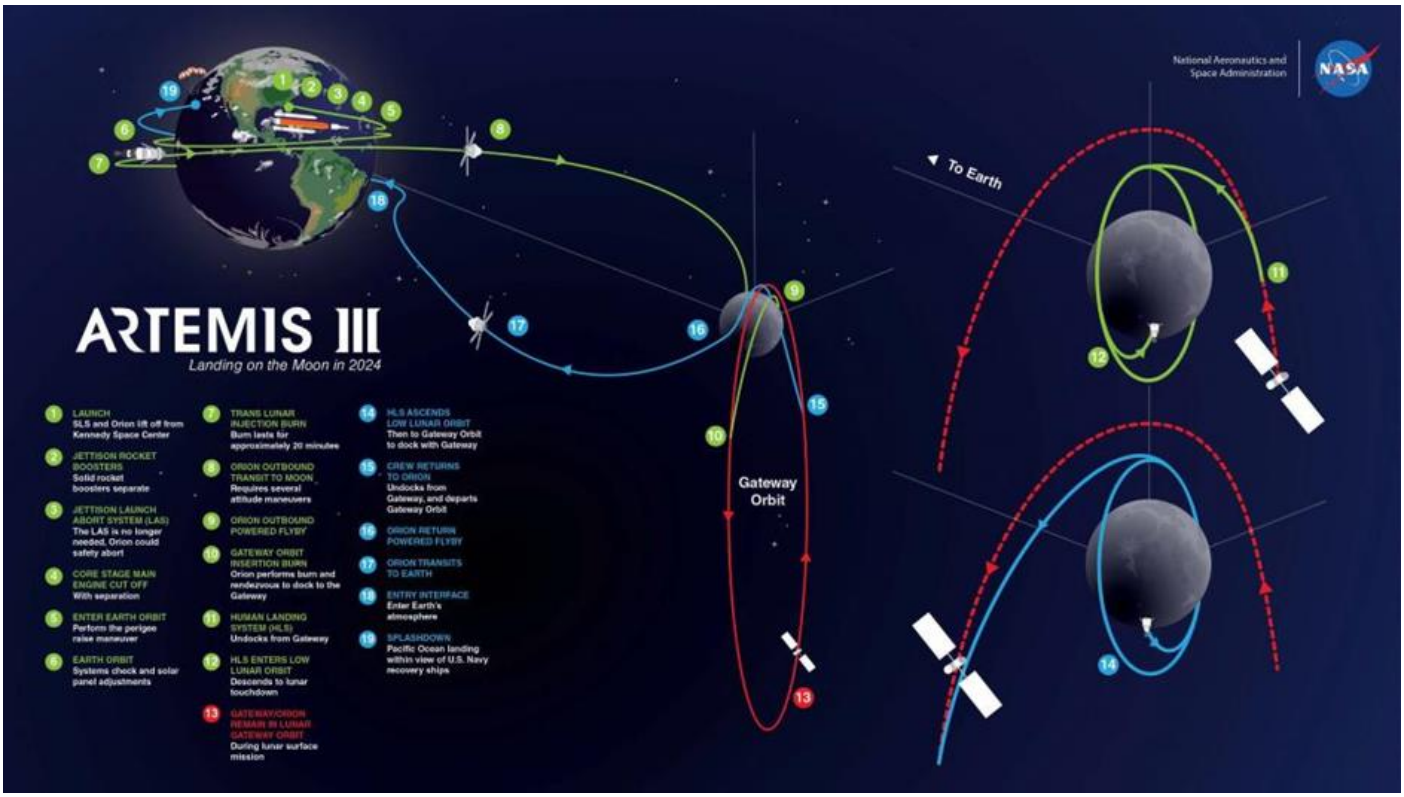
Artemis 3 - Aiming for the lunar South Pole

The third mission to the Moon is set to be the first Moon landing since Apollo 17 in 1972.

Building on the Artemis 2 mission, The 4 astronauts aboard the Orion module will dock with the Lunar Gateway and remain in space for 30 days. The human landing system will then take two astronauts down to the Moon's South Pole, a region previously unvisited by humans.
The astronauts are expected to spend a week exploring the surface and perform a variety of scientific studies, including sampling water ice - first detected on the Moon in 1971.

The crew of Artemis 3 is aiming for the moon's South Pole; a place that scientists have discovered in recent decades has large amounts of water ice. Water contains oxygen, so processing it will make it possible for future astronauts to stay for longer stretches of time, even enabling us to have a permanent presence on the on the moon.

…Artemis



ABOVE: Artemis III projected flightpath | Source: NASA (2019)

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In the end, it's all a part of humanity's natural wanderlust. Future historians might look back on this as the moment humanity took a giant leap when returning to the moon, maybe this time for good

Artemis 4,5,6 and more?

NASA are currently focusing their attentions on Artemis missions 1 to 3. If these prove successful, NASA has ambitions for further crewed missions on an annual basis. One expectation is for future astronauts to begin establishing a base on the surface of the Moon, with a view to eventually using the satellite as a staging post on the journey to Mars.

Bottom line: As of mid-June 2022, the Orion spacecraft is sitting atop the SLS at Launch Pad 39B at the Kennedy Space Center in Florida. Hopefully, this winter SLS and Orion will head into space together for an u-crewed test, Artemis 1. Watch the proposed Artemis 1 video on https://youtu.be/c5E6VGUEQWg

ASSA Durban Minutes of General Meeting

13 June 2022 - 19:30 via Jitsi (JHB) and Zoom (DBN)

Attendees:

Present	ASSA – DBN members	ASSA – JHB members	
Apologies:	Piet Strauss	Francois Zinserling	

1. **Welcome (Johannesburg meeting)**
   - x JHB Chairperson, welcomed all attendees and visitors.
   - x JHB meeting with topic: “Dark Skies”
   - x The meeting was recorded.

2. **Durban Meeting**
   - x Amith Rajpal thanked the speaker on behalf of DBN members
   - x Amith welcomed the members into the Durban meeting, hosted by Gerald on Zoom.

3. **Previous meeting minutes**
   - x Minutes proposed by Gerald and seconded by Corinne
   - x There were no matters arising from previous minutes

4. **Finance:**

4.1 Corinne, the Treasurer, prepared and presented finance report

ASSA DURBAN FINANCIALS 2022/06/08

Financials Meeting	Month	Current	Investment	Petty Cash
General Meeting	2022-06-08	**R 24 891.22**	**R 61 946.10**	**R 1 000,00**

ASSA DURBAN - MEMBERS

Date	No off	Paid Members	Honoury	Removed
2022-05-11	134	134	4	0

- x It was discussed Fees haven't been increased in 4 years
- x Agreed on increase of : Single Member ship: R 190:00
  Family Membership: R 230:00

...Minutes of the Meeting

5. TV Stand

x Corinne had a TV stand made for exhibitions which should be returned to ASSA. She paid R1 000 for it and would like to be reimbursed. Corinne will send invoice.

6. AGM

x AGM will be on 13 July at the school.
x Members to please RSVP by 20 June because school closes on the 24th.
x Nominations for committee are welcome.
x We can use school internet to broadcast AGM via Zoom

7. Events

7.1 Mtunzini

x Debbie, John and Sihle attended previous event. Corinne says the travel and venue cost may be too high since members would likely have to sleep over. Gerald advised against driving back at night. Event was planned for end-July, but to be confirmed.

7.2 Sutherland Trip

x No new updates

7.3 Next viewing evening

x 1 July 2022

8. General

x It was noted that the **ANNUAL GENERAL MEETING** will be held on **13th July 2022 instead of the General Meeting** at the Marist Brothers St Genry's School..
x All Committee Members to submit their reports on the portfolios before hand to the Chairman.
x Committee members required - nominations to be sent to Amith@astronomydurban.co.za
x School requires feedback by 22nd June on how many people will be attending the AGM at the school. Moya O'Donoghue to be advised thereof.
x Corinne requested feedback on Sutherland refunds which Ritva Orsmond had enquired about. Piet Strauss to produce financial at the next Committee meeting.
x Venue details will be sent via email and WhatsApp

8. Meeting closed

x Chairman closed the meeting at 20:59

DURBAN ZOOM MEETING

Durban members meeting.

Meeting ID: **88037701479**

Passcode: **297674**

Public Viewing Roster ASSA Durban

Dome Master	Email	Assistant	Telescope Volunteer	Public Viewing
Debbie Able	Debbie@astronomydurban.co.za	Alan Marnitz	Alan@astronomydurban.co.za	1 July 2022
Maryanne Jackson	Maryanne@astronomydurban.co.za	Ooma Rambilass	Ooma@astronomydurban.co.za	29 July 2022
John Gill	John@astronomydurban.co.za	Sheryl Venter	Sheryl@astronomydurban.co.za	26 August 2022

PUBLIC VIEWING:

Public viewing is on site at the Marist Brothers St Henry's School in the dome and around the pool area; usually the first Friday evening closest to the New Moon.

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!!!

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, cell number 083 326 4085 or Alan Marnitz on alan@astronomydurban.co.za cell number 082 305 9600.

VOLUNTEERS REQUIRED:

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.

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.

VOLUNTEERS TUTORIAL:

Mike Hadlow to organise an afternoon / evening to train volunteers as Dome Masters and the use of the large telescope. Date to be confirmed and viewing dates will be announced ASAP.

Viewing Contacts:	Phone	Email
Mike Hadlow	083 326 4085	mike@astronomydurban.co.za
Alan Marnitz		alan@astronomydurban.co.za

Notice Board

MEETINGS:

- GENERAL MEETING / ANNUAL GENERAL MEETING to be held on **13th July 2022** at the school.
- 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/

MNASSA:

- Monthly Notes of the Astronomical Society of Southern Africa.
- Available at 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/

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: **PAYABLE AFTER 01 July 2022**

Pay Fees Online

- Single Members: R 190:00
- Family Membership: R 230:00 for family membership.
- 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

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

RESIGNATIONS from ASSA:

Please send an email immediately notifying the Secretary of your wish to resign from the society to : 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:

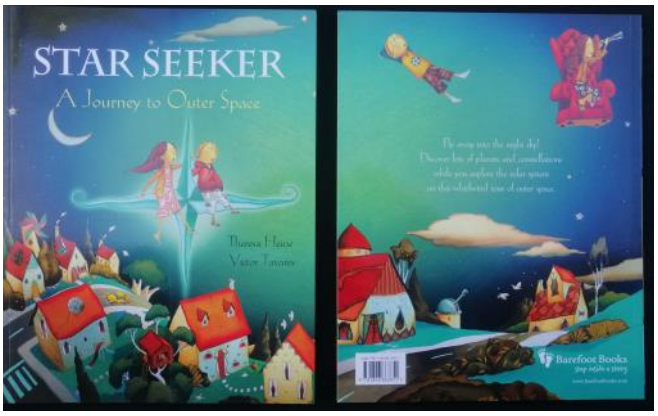
- Website: www.astronomydurban.co.za
- Emails : AstronomyDurban@gmail.com
- Instagram: https://www.instagram.com/astronomydurban/

Librarian's Books For Sale:

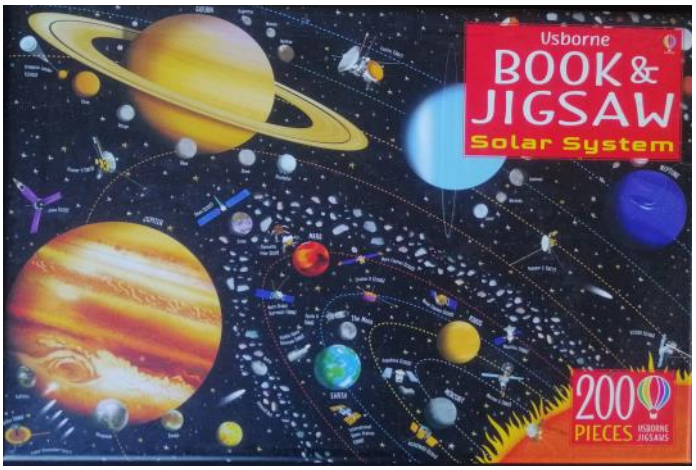
PRE-LOVED BOOKS For Sale:

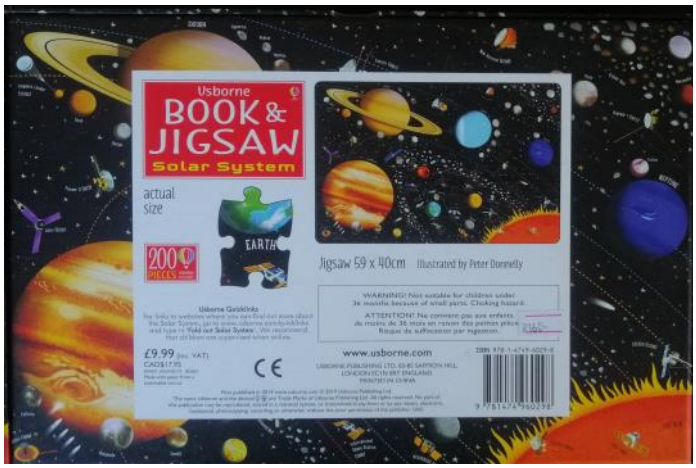
THE NEW ASTRONOMY GUIDE
Pre loved, big, packed full of information
R 80:00

STARSEEKER
New. A poetic tour of the solar system for kids
R 80:00



200 JIGSAW PUZZLE & BOOK
Miles Kelly
R 160:00





SNUGGLE BAGS

Snuggle Bags are a range of wheat bags which were created with Love by a grandmother during lockdown!

They are made with care and meticulous attention to Detail! 100% cotton inners and Covers ensure they don't catch on fire in the microwave, while extra pockets keep the wheat firmly in place!

These wheat bags are ideal for keeping warm when stargazing or capturing images late into the night! (They can be used for sore muscles, sports injuries or as a cold pack.)

ASSA members are offered a 15% discount this winter, with the added option for special ASSA branding!

Shipping available

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