



East Rand Astronomy Club

The Universe Is In Us



Interstellar News

July 2019



Picture taken by NASA



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THE EDITORS PIECE:

Welcome All readers. Welcome to our new club's astronomy magazine. Here, we hope to inform you about all things new, all things historical and all things the East Rand Astronomy Club will be doing.

Our colourful logo depicts a woman looking through a telescope.

The brown circle depicts "Mother Earth", our planet, which is part of the only solar system we are familiar with. The green circle represents the growth of life on earth, green being the most prolific colour we find on our planet.

The circles connect us all with time and space, our Universe and within.

The Cosmos has fascinated humanity since the dawn of time. Planets, moons, stars, shooting stars, asteroids, comets and galaxies have fascinated and captured the minds and hearts of scientists, engineers, philosophers and possibly every person all over the world. Without a doubt, we are all intrigued by the immensity, the energy of the Universe and the mysteries of space.

Let us all enjoy the ride through the skies.

Always looking forward and looking upward.

Enjoy!

OUR NEXT MEETING:

WHERE: Marachelle Country Estate.

WHEN: Wednesday 7 August.

SPEAKER: Ani Vermeulen.

SUBJECT: Moving to Mars: What does it take?

About our Speaker:

When I first met Ani, she had just returned from Antarctica and her story just fascinated me. Who wants to live in ice, on ice? I did not know how normal adaptation could make life like that be.

Ani Vermeulen is an Engineer, Astrophysicist and Space Scientist with a focus on Space Systems and Space Mission Design.

She has just completed her master's degree in Space Studies at UCT Space Lab. She has done research with the South African National Space Agency and spent time at SANAE1V Base in Antarctica.

She is one of the 5 global recipients of the 2019 Space Generation Advisory Council's Leadership Award to attend the International Astronautical Congress in Washington, D.C., later this year as well as the Space Generation Congress.

A young and budding scientist, vivacious and bubbling with energy. Whether it is life on ice or life in space Ani can tell you all about it.

Come to the meeting and meet her there!



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NASA: breathtaking picture of the sun

SUNRISE AND SUNSET TIMES IN JULY:

<u>DATE</u>	<u>SUNRISE</u>	<u>SUNSET</u>
7/7/2019	6:55	17:29
14/7/2019	6:54	17:32
21/7/2019	6:52	17:35
28/7/2019	6:49	17:39



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SUN, EARTH AND MOON:

It is fascinating to think that man proposes that we are the only inhabitants of our solar system. That we live on Earth which is a planet in the “Goldielocks Zone”, a supposition again, that this is the only inhabitable world.

Recently, I read about scientists saying that the Sun’s history might be found buried in the Moon’s crust. The Sun's rotation rate in its first billion years is unknown. Yet, this spin rate affected solar eruptions, influencing the evolution of life. Scientists think they've figured it out by using the Moon as critical evidence.

Presumably at its star birth, the sun gave off intense radiation in the form of extreme energy clouds right across our solar system. These chemical reactions kept Earth at the right temperatures for warmth and a right degree of heat for water to keep Earth wet. At the same time it kept planets like Mercury and Venus burnt to a frazzle and Uranus and Neptune too far away, cold and frozen. All of this could have caused the lack of atmosphere and burning up the vital chemicals for life on other planets. The destruction was dependant on the rate of rotation of the Sun on its axis. The faster it rotated the quicker it destroyed possibility of life.

“This critical piece of the Sun's history,has bedeviled scientists”, said Prabal Saxena, an astrophysicist at NASA's Goddard Space Flight Center in Greenbelt, Maryland. Saxena studies how space weather, the variations in solar activity and other radiation conditions in space, interacts with the surfaces of planets and moons.

Now, he and other scientists are realizing that the Moon, where NASA will be sending astronauts by 2024, contains clues to the ancient mysteries of the Sun, which are crucial to understanding the development of life. May we find some vital clues on this trip and by then,may we know how to look for such clues.

"We didn't know what the Sun looked like in its first billion years, and it's super important because it likely changed how Venus' atmosphere evolved and how quickly it lost water. It also probably changed how quickly Mars lost its atmosphere, and it changed the atmospheric chemistry of Earth," Saxena said.

<https://www.sciencedaily.com/releases/2019/06/190617164640.htm>

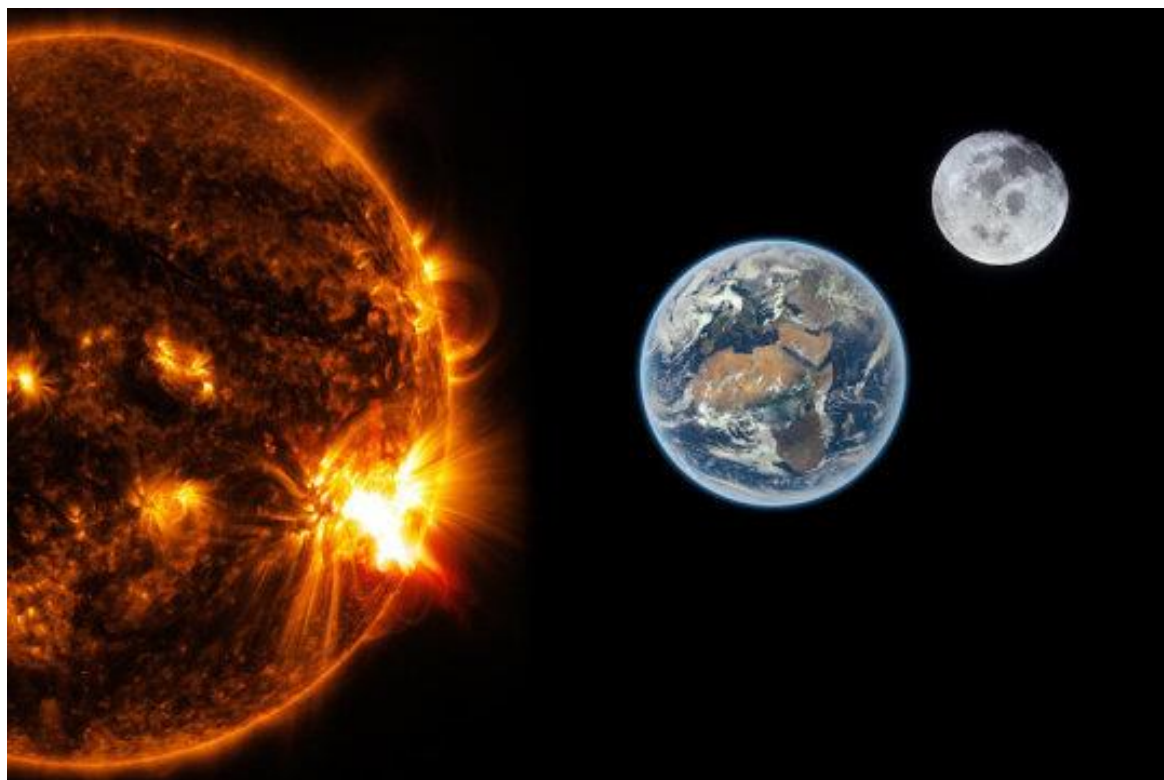


Moon photographed from Apollo



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Sun, Earth, Moon (not to proportion; stock image, elements furnished by NASA).

Credit: © Jürgen Fälchle / Adobe Stock

THE MOON IN JULY:

MOON RISE

NEW MOON	6:22	2/7/2019
FIRST QUARTER	12:05	9/7/2019
FULL MOON	17:15	16/7/2019
LAST QUARTER	00:12	25/7/2019

Blue moon month:

For the second time this month. On 31 July, the moon will travel between Earth and the sun and reach its new phase. Since sunlight is only reaching the far side of the moon, and the moon is in the same region of the sky as the sun, the moon becomes completely hidden from view. The moon cycles through its phases every 29.5 days, allowing a phase to repeat if it occurs early in the month.



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DID YOU KNOW?

Around the Moon's South Pole there is an area called the Aitken Basin?

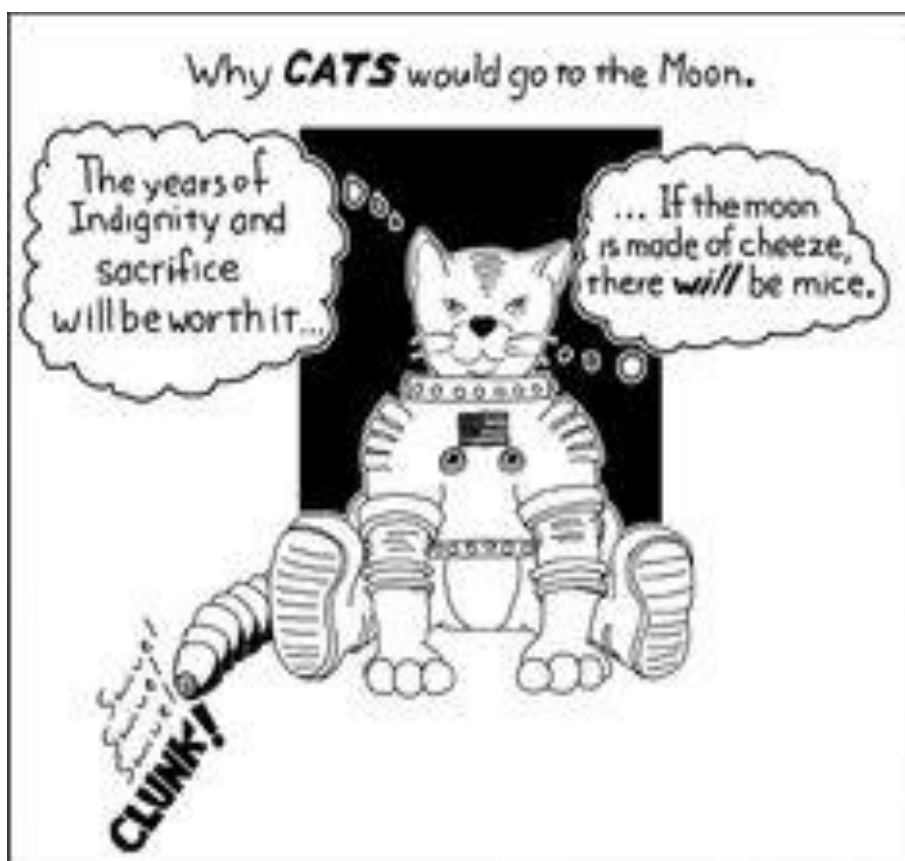
Here, an asteroid crashed into the moon to form that basin.

The crater is oval shaped and as wide as 2000 kms. We cannot see it through our telescopes because it is on the dark side of the moon.

Scientists have discovered a mass of material under this crater. Scientists think that it may contain metal from an asteroid that crashed on this site and formed the crater.

The Aitken basin is the largest preserved basin in our solar system, thought to be about 4 billion years old. No doubt, there have been larger impacts in our solar system, but they are either lost or not as well preserved.

<https://www.sciencedaily.com/releases/2019/06/190610100620.htm>





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TELESCOPES:

Way back in 1608 two children were playing with discarded lenses in their backyard. Holding them up to make a distant weathervane seem closer. Hans Lippershey, an eyeglass maker saw this and that was the start of the telescope.

Hans Lippershey called his telescope a “kijker”, “kyker” in Afrikaans or “looker” in English. It consisted of a concave eyepiece that was aligned with another convex objective lens. As the story goes, there were conflicting theories of who was the inventor at the time but It was Lippersheys telescope that caught the eye of one Jacques Bovedere who told Galileo Galilei.

That was just the spark of interest, enough for Galileo to promptly start with building his own telescope.

Galileo was the first recorded person to point his telescope skyward. With his telescope, he was able to make out the cratered surfaces of the moon, drew the moon's phases in detail, and even described the Milky Way.

His observations also led him to discover the rings of Saturn, sunspots and [Jupiter's moons](#). Galileo was quickly convinced that Copernicus's [Heliocentric model](#) was absolutely correct - a position that ultimately saw him put under house arrest by the Catholic Inquisition until his death in **1642**.

Galileo presented his telescope to the [Venetian Senate](#) who rewarded him as a lecturer at the University of Padua for life.

From then onwards both telescopes and astronomy flourished. Looking at the night skies became the interest of many. Galileo was able to make out the craters and mountains on the moon. He also made out the mystic, beautiful ribbon of diffuse starry light which we know as the Milky Way today.

Then came the time of Sir Isaac Newton who invented the reflective type telescopes. Astronomy galloped ahead in the 19th. Century. Astronomers gathered information about the stars using a spectroscope and learnt of the chemical composition of the stars and the motions of celestial objects.

At last, the time came for more advanced telescopes in the twentieth century. Larger and better telescopes were invented, many astronomy hobbyists managed to own a telescope privately and specialised telescopes came into use.

We know the difference between a star and a planet today. Planets do not twinkle, but stars do or so we say. However, stars do not really twinkle either. It is steady starlight that has been bent by the Earth's atmosphere. Imagine looking at an object through a glass of water. The object appears distorted, that is what happens when looking through the atmosphere at stars.

Today, we have telescopes up in space. They are there to explore the solar system close by. To measure the age and size of the Universe and to gather information about the cosmos, look at evolution and find answers to the mystery of Space and life on Earth itself.



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Telescopes are affordable today. We can acquire one to appease our own curiosity and what could be nicer than gazing upward and seeing night objects at a closer range. However, there are some ground rules to abide by when we think of obtaining a telescope:

1. Telescopes are all about light gathering.
2. The greater the amount of light one can gather, the more distant and the clearer one will see objects. Therefore, a telescope with an aperture of six inches or more is the better one to have. Smaller than six inches will give one the opportunity to observe the solar system, that is the planets and the moon.
3. The above being the case, it is better to acquire advice before purchasing the easiest, most available one at the time, only to avoid personal disappointment.



The best telescope ever – is the one that gets used. It is most definitely, not the one that gets left in a corner or cupboard to gather dust!

There is really no better type of telescope, small to large, refractor to reflector and more, they all let one see something of our universe, but, it all depends on what one really wants to do with the telescope. There is no point in buying a good, practical easy to use telescope, then storing it and never using it either because of no knowledge of the night skies or, no knowledge of how to set up and use the telescope.

Some infer that astronomy is one of the best and most interesting hobbies to follow, so why not make it worthwhile?



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THE NIGHT SKIES TOWARD THE END OF JULY:

Planet Jupiter will pass close to NGC6235 a globular star cluster in constellation Ophiuchus. The interesting part is that NGC 6235 is about 38,000 light years away while Jupiter will only be 38 light-minutes away. When one looks at Jupiter one can see a fuzzy patch nearby, that will be NGC 6235.

Jupiter will be very well placed for evening observing all month, occupying the lower part of the southern sky (above Scorpius) after dusk, and setting in the west a few hours after midnight. During the month, the planet's apparent disk size will decrease slightly from 45.4 to 42.5 arc-seconds, and its brightness will drop from magnitude -2.57 to -2.42 as we increase our distance from the planet. From time to time during July, the little round shadows cast by Jupiter's four Galilean moons will be visible as they cross the planet's disk.

During July, Venus will end its sojourn in the eastern morning sky and disappear from view near the sun as it heads toward solar conjunction. The planet will re-appear in the western evening sky in September.

Great news! If one can get out of a snug and warm winter bed, before dawn, constellation Orion is already above the Eastern horizon.

SOME ASTRONOMY TERMS TO REMEMBER:

Gibbous: Used to describe a planet or moon that is more than 50 percent illuminated.

Asterism: A noteworthy pattern of stars within a larger constellation.

Degrees: (measuring the sky): The sky is 360 degrees all the way around, which means roughly 180 degrees from horizon to horizon. It's easy to measure distances between objects: Your fist on an outstretched arm covers about 10 degrees of sky, while a finger covers about one degree.

Visual Magnitude: This is the astronomer's scale for measuring the brightness of objects in the sky. The dimmest object visible in the night sky under perfectly dark conditions is about magnitude 6.5. Brighter stars are magnitude 2 or 1. The brightest objects get negative numbers. Venus can be as bright as magnitude minus 4.9. The full moon is minus 12.7 and the sun is minus 26.8.

Terminator: The boundary on the moon between sunlight and shadow.

Azimuth: The azimuth represents the cardinal direction in which an object can be found. It varies between 0 degrees and 360 degrees. For example: If east is 0 degrees, turning southward, south would be 90 degrees, west 180 degrees, north 270 degrees and back to east 360 degrees.

Altitude: If you know in which direction the object is which you have in mind, you need to know how high in the sky to look for it. This is what is called the Altitude. Altitude ranges from 0 degrees to 90 degrees and measures the angle between the horizon, you and the object. Assuming your



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object is on the horizon, the altitude would be 0 degrees while at the zenith, directly above you, or overhead, will be 90 degrees.

If you stretch out your arm and make a fist, then your fist covers about 10 degrees on your field of vision, so if the sun is at 40 degrees altitude, it is about 4 outstretched fists above the horizon.

If you see or read altitudes less than 0 degrees, example: -20 degrees altitude, this would mean, below the horizon and not to be seen or it would be night time, as in the case of looking for the sun.

Zenith: The point in the sky directly overhead.

COMETS AND METEORS:

It is well known that comets are described as dirty frozen snowballs, frozen gases, rock and dust that orbit the sun. When a comet's orbit brings it close to the sun it heats up and the ice starts to boil making a glowing head forming a gaseous cloud around the head called a coma. Dust and gases form a long, usually a greenish coloured tail behind the head away from the sun. Comets do not really "shoot" across the sky, they move at about the same speed through the sky as planets do. They rise and set along with the stars

Particles travelling through space are called meteoroids. They are mostly smaller than a grain of sand and enter the Earth's Atmosphere every day. When a particle enters Earth's atmosphere, it heats up due to friction, from Earth we see a streak of light, this is known as a meteor or "shooting star". Heavier and slower fireballs could enter our atmosphere and descend below 80km altitude, those are known as meteorites.

Most meteors are sporadic travelling in isolation but, some are streams of particles left behind by comets in their passage around the sun and these are called meteor showers. These meteor showers have a radiant which is the area, or constellation, from which they come. For example in July we have the Phoenicids, Piscis Australids or S.Delta Aquarids. When the radiant is low that is when viewing is not favourable.



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Vredefort Dome

COSMOLOGY:

Cosmology is a branch of astronomy that involves the origin and evolution of the universe, from the Big Bang to today and on into the future. According to NASA, the definition of cosmology is "the scientific study of the largescale properties of the universe as a whole."

The dawn of the 20th century brought further insights into comprehending the vast universe. Albert Einstein proposed the unification of space and time in his General Theory of Relativity. In the early 1900s, scientists were debating whether the Milky Way contained the whole universe within its span, or whether it was simply one of many collections of stars. Edwin Hubble calculated the distance to a fuzzy nebulous object in the sky and determined that it lay outside of the Milky Way, proving our galaxy to be a small drop in the enormous universe. Using General Relativity to lay the framework, Hubble measured other galaxies and determined that they were rushing away from the us, leading him to conclude that the universe was not static but expanding.

In recent decades, cosmologist Stephen Hawking determined that the universe itself is not infinite but has a definite size. However, it lacks a definite boundary. This is similar to Earth; although the planet is finite, a person traveling around it would never find the "end" but would instead constantly circle the globe. Hawking also proposed that the universe would not continue forever but, would eventually end.

What came before the Big Bang?:



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Because of the enclosed and finite nature of the universe, we cannot see "outside" of our own universe. Space and time began with the Big Bang. While there are a number of speculations about the existence of other universes, there is no practical way to observe them, and as such there will never be any evidence for (or against!) them.

Will the universe end? If so, how?:

Whether or not the universe will come to an end depends on its density — how spread out the matter within it might be. Scientists have calculated a "critical density" for the universe. If its true density is greater than their calculations, eventually the expansion of the universe will slow and then, ultimately, reverse until it collapses. However, if the density is less than the critical density, the universe will continue to expand forever. Not only are scientists unsure how the universe will end, they aren't even sure it will end at all.

Several possibilities for the fate of our universe have been bandied about. They tend to have names such as Big Crunch, Big Rip and Big Freeze that belie their essential bleakness. Ultimately, space could collapse back in on itself, destroying all stars and galaxies in existence, or it could expand into essentially an endless void.

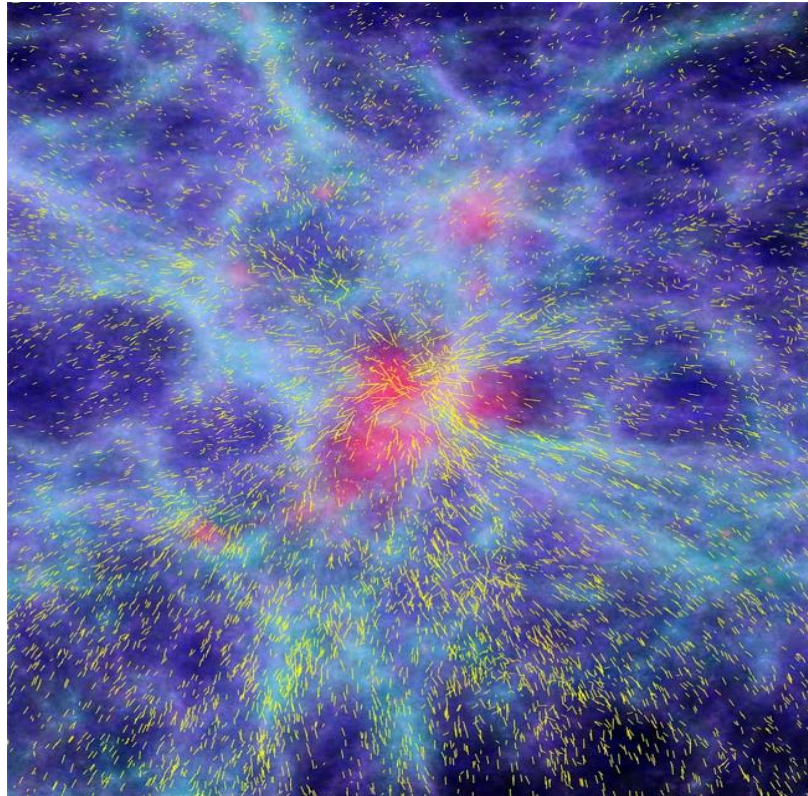
"The truth is that it's still an open scenario," said astrophysicist Steve Allen of Stanford University. "We certainly don't know for sure what's going to happen."

On the brighter side, any eventuality will take billions or even trillions of years to occur, long after our great-great-great-great-great-great-grandchildren should be past caring. If humans are still in existence at that point, however, they may have a tough time of it.



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Snapshot from a computer simulation of the formation of large-scale structures in the universe, showing a patch of 100 million light-years and the resulting coherent motions of galaxies flowing toward the highest mass concentration in the centre.

(Image: © ESO)

<https://www.space.com/16042-cosmology.html>