



East Rand Astronomy Club

The Universe Is In Us



Interstellar News

August 2019



Image Credit: NASA/ESA/Hubble NASA butterfly picture



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Description of our Cover Picture

NASA Butterfly Nebula (NGC 6302) Located in the constellation Scorpius, the structure of this nebula is one of the most fragile and complex that has ever been studied. The butterfly shape has lead scientists to name the Butterfly's structure a "bipolar structure."

. Though its wingspan covers over 3 light-years, NGC 6302 is no exception. With an estimated surface temperature of about 250,000 degrees C, the dying central star of this particular planetary nebula has become exceptionally hot, shining brightly in ultraviolet light but hidden from direct view by a dense torus of dust.

This sharp and colourful close-up of the dying star's nebula was recorded in 2009 by the Hubble Space Telescope's Wide Field Camera 3, installed during the final shuttle servicing mission. Cutting across a bright cavity of ionized gas, the dust torus surrounding the central star is near the centre of this view, almost edge-on to the line-of-sight. Molecular hydrogen has been detected in the hot star's dusty cosmic shroud. NGC 6302 lies about 4,000 light-years away in the arachnologically correct constellation of the Scorpion (Scorpius).

<https://apod.nasa.gov/apod/ap170208.html>

THE EDITORS PIECE:

Towards the end of July, a certain restlessness appears to set in. It is almost as if one has truly become tired of the long haul through winter, not that our winters are too much to handle, our winters are comparably mild, that way we are spoilt. However, impatience sets in and the astronomy hobbyist gets restless. Having watched Scorpius move from East to West. Seen and photographed all things beautiful in our winter skies. Wants to see if Orion is to be spotted yet, are all the old favourites going to come back?

The other morning, I was observing the pre-dawn sky and sure enough, there they were, Orion and Sirius peeping over the Horizon. Oh glorious! everything is normal. Turning my gaze westward and noting with relief Scorpius has departed to rest. All is as it should be, for Scorpius and Orion are never to be found in our skies simultaneously. The Scorpion having bitten Orion in the heel. Orion died and the gods wanted to revere his memory, so they set him in the night sky as a special set of summer stars, to be remembered always. However, the Scorpion had brought down a very strong fighter, so the keep the peace they set the Scorpion in the winter night skies. It is as Mark Twain said: "East is East and West is West and ne'er the twain shall meet."

While spring progresses, little bits of green and blossom pop out to lighten our hearts, we bid farewell to the marvels of our winter nights, looking forward in anticipation to viewing in spring and summer nights to come. Clouds roll by and rain falls, but our optimism never washes away, there is always hope.

May the stars be with you,
Looking upward!



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OUR NEXT MEETING:

WHERE: Marachelle Country Estate.

WHEN: Wednesday 4 September.

SPEAKER: David Rogers

SUBJECT: Apollo Fifty Years Later – With so much going wrong, how did they get it right?

A Biography of Our Speaker:

"David Rogers

Studied Chemical Engineering, Environmental Science and Education at UCT, owned a horse riding school, and has taught computing, and managed network systems at seven schools around South Africa including Michaelhouse, Bridge House and the Kyalami School Group.

In 2013 he was selected for the Honeywell Educators@Space programme at the US Rocket and Space Center in Huntsville, Alabama. Home to Wernher von Braun's Marshall Space Flight Center, this was where the Saturn V rockets that powered Apollo were built. This was his first contact with people involved with NASA's project and his passion for space flight was fanned. Since 2017, he has hiked, cycled, biked and travelled in Southern Africa, the Middle East and 28 States in the USA. He has visited a number of Air & Space museums and Space Centres from the Mojave Desert to Boston."



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NASA: breathtaking picture of the sun

SUNRISE AND SUNSET TIMES IN AUGUST 2019:

DATE	SUNRISE	SUNSET	DAY LENGTH
7/8/2019	6:42	17:43	11:00:57
14/8/2019	6:36	17:46	11:09:36
21/8/2019	6:30	17:49	11:20:14
28/8/2019	6:23	17:52	11:28:37

HELIOPHYSICS:

Heliophysics is the scientific study of the sun. Understanding the sun and its interactions with Earth, the Solar System and Space Weather.

Most of us imagine that Space is completely empty but that is not the case at all. Can we grasp the idea that we live in an extended atmosphere of an active star, our Sun? Our Sun not only sends out rays of sunlight but there is a steady outpouring of particles, of energy, the solar wind, and a constantly moving magnetic system. This represents the solar



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atmosphere that surrounds the Sun, Earth the Solar System and far out into the deeper reaches of space. Any understanding we gain from the study of heliophysics gives us the basic knowledge of how the Universe works.

With such knowledge we can protect the astronauts in space, satellites, communications and so much more like space weather. Remembering that the Sun is a star, scientists can learn more about stars and how and what they contribute to the habitability of the planets throughout the Universe.

OUR SUN:

Our sun is a star, only a smallish, average star with a diameter of 1392530 km.

Nevertheless, it is the only star that our scientists and astronomers can study in detail, because of its proximity.

The surface of the sun is known as the photosphere and the only and most prominent feature that we know of is sunspots.

Sunspots consist of a dark centre surrounded by a lighter circle, which, if, and when we have excellent conditions for surveillance will show radial structure.

Sunspots appear dark because the temperature of the sunspot is slightly cooler than the surrounding surface of the sun and they are also regions where the sun's magnetic field is particularly strong. The black spots often form in in close pairs of opposite magnetic polarity.

It has been calculated that our sun is about four and a half billion years old. Do we ever wonder how long we are going to have a sun holding our little Solar System together? How long will our sun, shine? Scientists say stars like our sun burn for about 10 billion years and as our sun is about four and a half billion years old it could mean that it is halfway through its' lifetime and so many of our generations can still live on Earth in time to come.

Long before our sun dies, it will become a red giant and as such, will become about 2000 times brighter than it shines today. The sun will increase in size and get cooler at the same time.

Aspiring photographers why not have some 'fun-time'! photograph a blue sun that is of course, if you can come by a Mylar filter. Any sunspot will be clearly visible on a blue image of the sun.

Aspire to that of course, but, take heed of these strong words of advice. NEVER look at the sun directly, either with the naked eye or with any form of equipment that is not a Solar Filter. Invisible infrared radiation can cause irreparable damage to one's eyes.



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THE JOURNEY OF THE PARKER SOLAR PROBE

One year has passed since the Parker Solar Probe was launched, 12/8/2018, on a daring scientific venture to find out more about our sun. Now it is well into its third orbit around the sun.

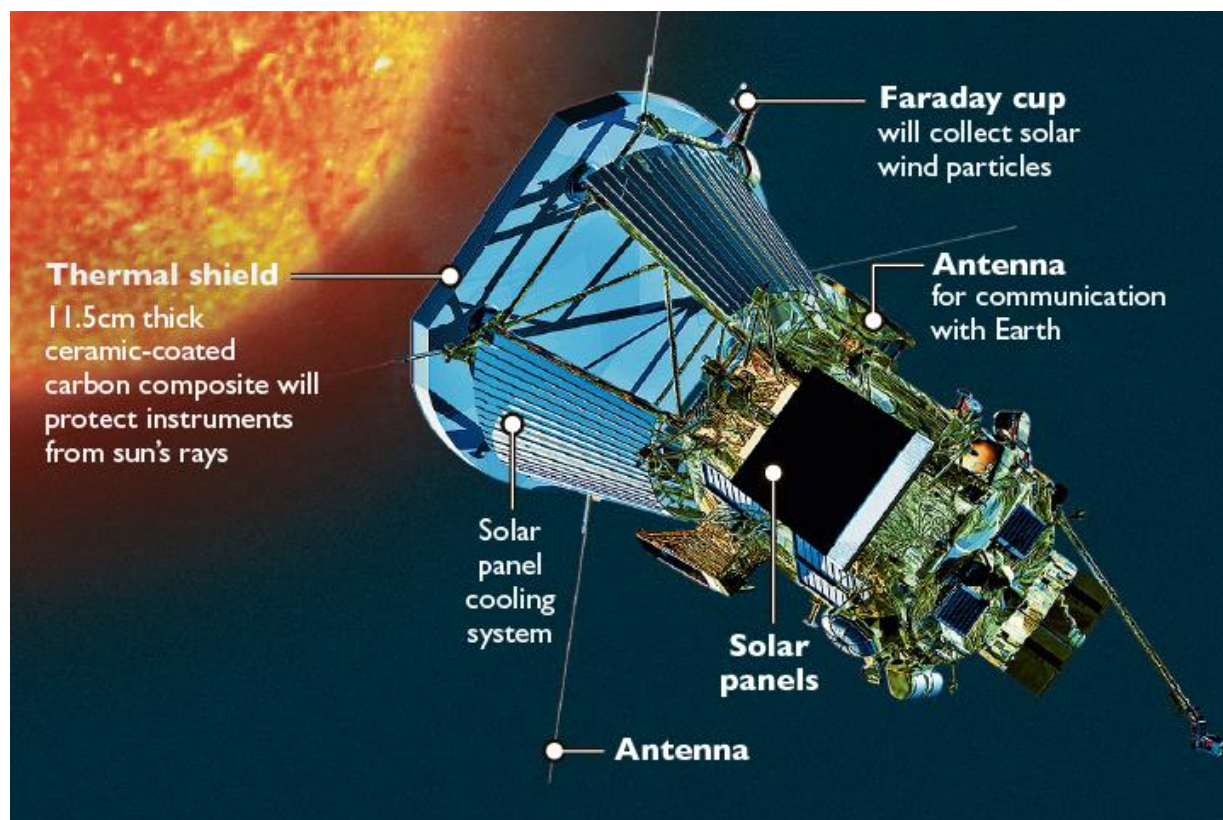
Around March this year the Parker Solar Probe began what was termed the second solar encounter phase. At this time the Solar Parker probe reached its closest approach to the sun. During this time all the scientific instruments on board were busy storing data collected from the Sun's corona.

All this information is currently being analysed and the Parker Solar Probe is about to make a third encounter.

The probe's instruments also will map the sun's powerful magnetic field, as well as the torrent of electrically charged particles that are constantly blasted away into space in explosive outbursts, and the mechanism that accelerates those particles to extreme velocities.

Source: <https://pressfrom.info/us/news/science-and-technology/-175250-nasas-solar-probe-cleared-for-launch-on-mission-to-touch-the-sun.html>

<https://www.nasa.gov/content/goddard/parker-solar-probe-mission-news>



<https://pressfrom.info/us/news/science-and-technology/-175250-nasas-solar-probe-cleared-for-launch-on-mission-to-touch-the-sun.html>



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THE MOON IN AUGUST 2019:

	<u>MOON RISE</u>	<u>MOONSET</u>	<u>MOON PHASE</u>
1/8/2019	7:01	18:08	<u>New Moon</u>
7/8/2019	11:22	00:00	First Quarter
15/8/2019	17:48	17:48	Full Moon
23/8/2019	00:00	6:36	Third Quarter
30/8/2019	6:27	18:01	<u>Blue Moon</u>

Blue moon month:

For the second time this month. On 30 August, 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.

A word of advice to the dreamers and moon idolizers. There is definitely; no man in the moon and the moon has no green cheese!

The moon's surface is not flat, smooth and shiny as we see it from Earth. The moon shines by the reflection of the sun. Its surface is a gravelly grey and there are a lot of mountains, rilles, ridges and craters or mare on the moon.





East Rand Astronomy Club

The Universe Is In Us



THE VOYAGE OF THE TWIN VOYAGERS

Voyager 1 and Voyager 2, are like “Ancient Mariners”, ancient sailors of space. More than forty years old is their great space exploration, having been launched in 1977.

The mission of these planetary Voyagers was originally meant to do close-up studies of Jupiter and Saturn, their larger moons and Saturn’s Rings. This they did, to great success, providing scientists with more than enough material to revise most thinking and information on astronomy.

The beginning of interstellar space is on the edge of the heliopause, where the Sun’s flow of material and magnetic field stop affecting its surroundings.

The sun creates this heliosphere by sending a constant flow of particles and a magnetic field out into space at over 670,000 miles per hour. This stream is called the ‘solar wind.’ This wind pushes against the stuff around it. What this wind pushes against, are particles from other stars and about anything that doesn’t come from our own solar system.

Voyager 1 became the first human-made object to enter interstellar space. It visited Jupiter and Saturn, crossed the orbits of Uranus, and Neptune but did not visit them. Voyager 1’s trajectory was designed to send it past Titan and behind Saturn’s rings, this gave it a northward path out of the ecliptic plane where planets orbit the sun. Voyager was given an opposite trajectory, designed to fly by Saturn at a point sending it direct to Uranus.

Voyager Interstellar Mission (VIM) is an extension of the Voyager primary mission that was completed in 1989 with the close flyby of Neptune by the Voyager 2 spacecraft, and so now, “Both spacecraft are to continue to study ultraviolet sources among the stars, and the fields and particles instruments aboard the Voyagers will continue to explore the boundary between the Sun’s influence and interstellar space. The Voyagers are expected to return valuable data for at least another ten years. Communications will be maintained until the Voyagers’ power sources can no longer supply enough electrical energy to power critical subsystems.”

“The Voyager Interstellar Mission has the potential for obtaining useful interplanetary, and possibly interstellar, fields, particles, and waves science data, until around the year 2020 when the spacecraft’s ability to generate adequate electrical power for continued science instrument operation will come to an end.”

<https://voyager.jpl.nasa.gov/mission/science/planetary-voyage/>

<https://voyager.jpl.nasa.gov/mission/science/thirty-year-plan/>



East Rand Astronomy Club

The Universe Is In Us



THE CONSTELLATIONS:

Without electricity and nothing but weather to disturb them; what fun the Ancients must have had star hopping, connecting the dots and naming the results.

For an astronomy hobbyist, finding one's way through the night skies is the most essential requirement. There are 88 constellations in the sky and joining the stars to make what the meaning of the name, or its representation is, is very difficult for a beginner in light polluted skies. Some of the names are very odd and going back in antiquity, derived from more than one language or culture. Today, the patterns of stars rarely bear even the slightest resemblance to what they have been named after.

It is important to remember however, that individual stars are at great distances and light years apart. Stars are also totally unrelated to one another.

To learn the Constellations, one needs good eyesight and a very good imagination topped with lots of time-consuming patience. Once the major constellations are recognised it is easier to distinguish the little ones.

The twelve ancient constellations that lie along the ecliptic are easy to recognise, unless one or more planets reside there temporarily and shine brightly. Planets appear as solid lights, they do not twinkle and so they are easy to identify on the way to sorting out the constellation. In your mind, join the dots, meaning, connect the stars to form whatever constellation you are looking for, eg. Scorpius – it looks like a scorpion.

For August we can find: Corona Australis the southern crown. It is found in our East, bordered by Sagittarius to the north, Scorpius to its East, Telescopium to the south, and Ara to the south east of it. A circlet of stars near the feet of the centaur represented by the constellation Sagittarius.

Pavo The Peacock can also be found in the east, lying to the south of Corona Australis and East of Grus with the bright star of Al Nair

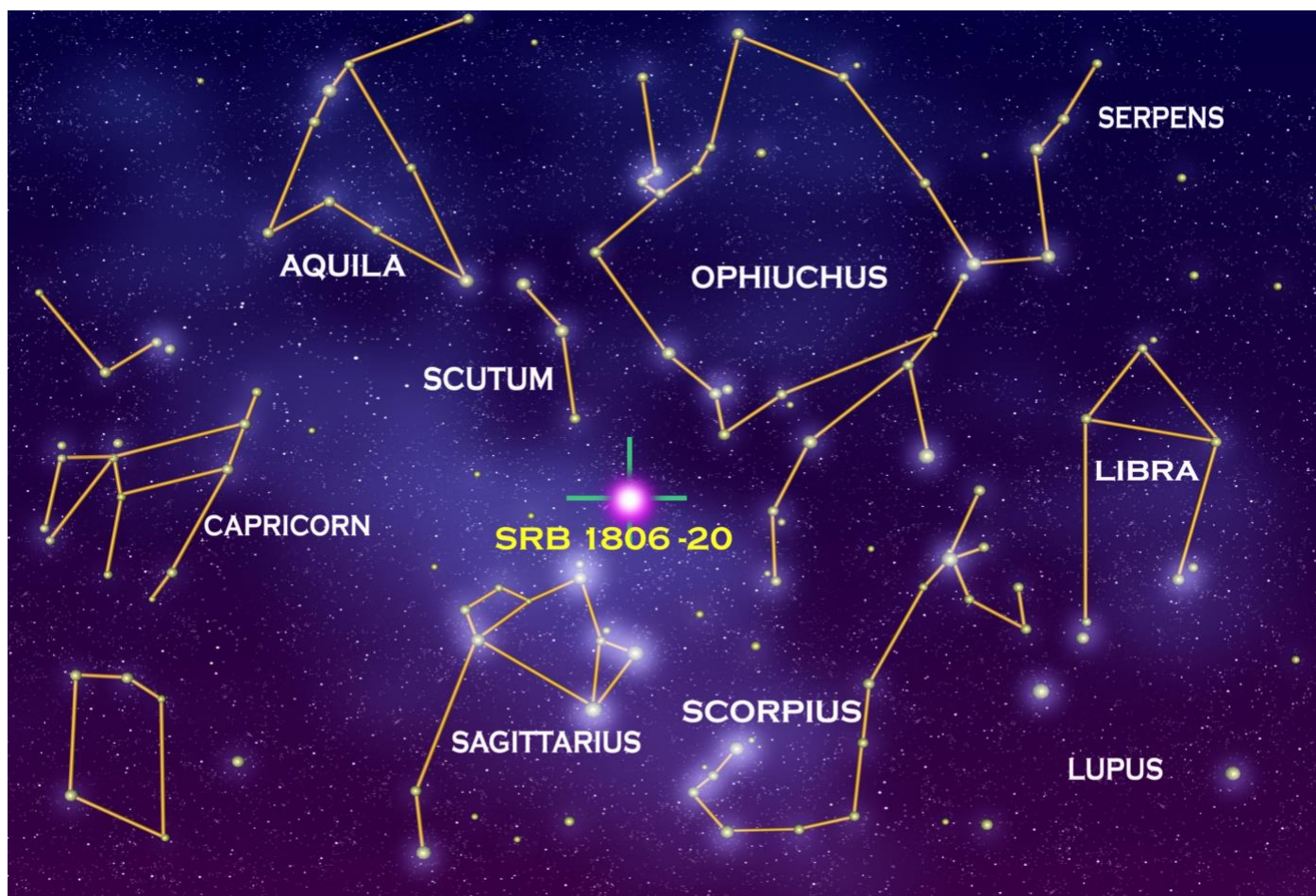
Aquilar the Eagle lies almost North East and makes the third bird constellation we can observe while going down in the West early in the evening we might still catch a glimpse of Corvus the Crow. We still have the Southern Cross and all its splendour. Straddling it is Centaurus while Musca the Fly strives for notice below the Jewel Box.

As always, our rich winter skies give us lots to look at mountains and joy before the real spring nights come up.



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Some constellations look like people or animals. Sagittarius looks like a teapot.

Credits: NASA

TELESCOPES:

Dobs, Dobby's or Dobsonian telescopes, whatever term one wishes to use are the best for visual astronomy. The tube itself is a Newtonian reflector originally designed by Sir Isaac Newton, hence the use of the term Newtonian.

The base is a wooden Base designed and originally built by an astronomer called John Dobson. John Dobson's interest in telescope building was in part to better understand the universe, and in part to inspire in others. Others, being the general public, a curiosity about the cosmos. As a matter of interest

Based on the "Dobby", today, we also have the Truss Design which is a dobby form that is used on larger telescopes. It adds great strength while reducing the weight of the telescope.

There are design challenges when it comes to making large telescopes. Large, generally means the telescope has a primary mirror of over 10 inches in diameter. A truss, which is often seen in pictures of bridges, is a triangular configuration with thin columns forming the triangles.



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When it comes to telescopes there are advantages to using a truss set up:

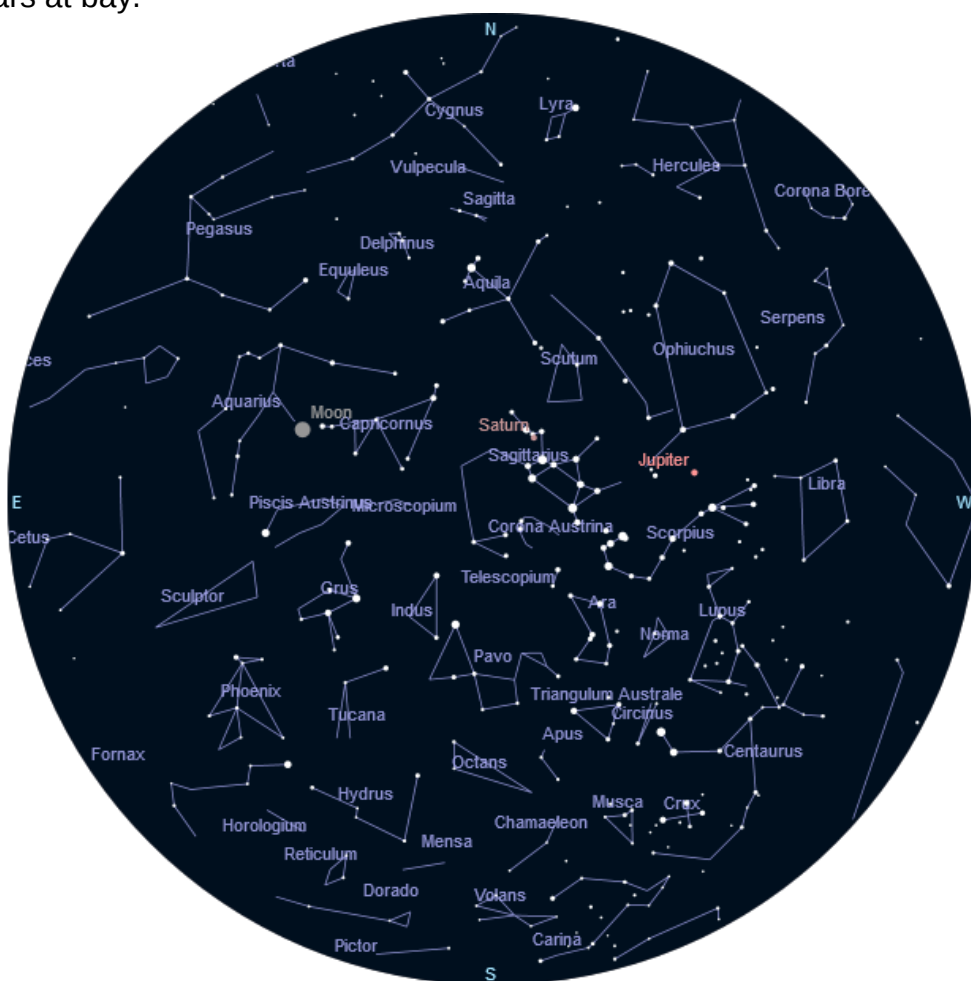
a) it makes for a very strong optical tube with little or no vibrational motion or slipping. This is important with telescopes because the slightest unwanted motion can ruin what one is looking at, for here, one does not stare, but looks for some time, absorbingly at a wonder of the night sky.

b) The truss set up is very light. A large telescope could weigh in excess of 50Kgs. The truss configuration will reduce the overall weight of the scope. This is a consideration when it comes to lugging it around, putting it in the car or setting it up. With a truss configuration, a larger telescope suddenly becomes portable.

THE NIGHT SKIES IN AUGUST::

Summer is on its way
With temperatures rising,
It's not surprising -
that cloud will keep stars at bay.

Fri Aug 16 2019 12:00:00 AM
34.00S, 0.00W



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We get the best views of Jupiter this month as it is high in our skies in the constellation Ophiuchus. Binoculars are enough to reveal Jupiter's four largest moons, the Galilean satellites.

Saturn will appear high in the sky, offering a splendid opportunity to view its rings.

Uranus rises shortly before midnight at the start of August. It lies in the constellation of Pisces.

Neptune rises during the evening in August. This means it can once again be found and seen with binoculars or a small telescope as a bluish star. Don't expect to see any detail with a small instrument.

In the early morning before sunrise one can see Orion and Sirius, the brightest star in our sky. The name, Sirius, comes from the Greek word meaning "glowing" or "scorching". Sirius is also known as the dog star being the main star of Canis Major.

COMETS AND METEORS:

The Perseid meteor shower's peak on August 13 but this is spoilt this year by bright moonlight as the Moon will be close to full phase. However, the shower is already active as August opens and remains so until late in the month, so you may see some in darker skies away from the date of maximum. This is a shower that favours the northern hemisphere so once again, we do not see that much in the southern skies.

The radiant of the Capricornids lies only 10° south of the celestial equator, in the constellation of Capricornus, which means the meteors may appear and be seen from any parts of the world while the radiant is above the local horizon.

Meteor observing is an ideal project for the starting-out stargazer because little more equipment is required than a garden chair to sit in and watch the sky. It is a fun activity to share with friends, but, it can also be of real scientific value if you make proper notes of your observations. Find a watch, notebook, pen and red light and start your vigil.

Find a spot away from streetlights and watch a patch of sky between the horizon and zenith. When you see a meteor appear, note the date, time and direction and whether it leaves, or makes a train or not. If you can estimate the speed, then do that too. Note the sky conditions such as the presence of any haze, cloud or moonlight and the brightness of the faintest stars you can see overhead, termed the limiting magnitude. You can call this your Meteor Diary.

A LIST OF METOR SHOWERS THE THE BALANCE OF 2019:

South.Delta-Aquarids	Jul 12 – Aug 19	Jul 28	20
Perseids	Jul 17 – Aug 24	Aug 13	80
Orionids	Oct 02 – Nov 07	Oct 21	23



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Southern Taurids	Oct 01 – Nov 25	Nov 05 5
Northern Taurids	Oct 01 – Nov 25	Nov 12 5
Leonids	Nov 10 – Nov 23	Nov 18 15+
Puppid/Velids	Dec 01 – Dec 15	Dec 07 10
Geminids	Dec 07 – Dec 17	Dec 14 120
Ursids	Dec 17 – Dec 26	Dec 23 10





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Perseid Meteors over Slovakia
Image Credit & Copyright: Petr Horálek

<https://apod.nasa.gov/apod/ap190812.html>

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; very much like Earth lacks a definite boundary. Although the Earth is finite, a person traveling around it, would never find the "end" but would instead, constantly circle the globe. Stephen Hawking also proposed that the universe would not continue forever but, would eventually end.

Because of the enclosed and finite nature of the universe, we cannot see "outside" of our own universe. It is said that space and time began with the Big Bang. While there are speculations about the existence of other universes, there is no practical way to observe them, and as such for the time being, there will never be any evidence for there being existence outside our universe.

As a matter of interest, how do we know it was a "Big Bang"? As space is a vacuum it could have been a dark and silent, or stressful "ping", a force that caused immense movement and therefore change.

"The term "Big Bang" was named by Sir Fred Hoyle, an English astronomer and cosmologist, remembered today for his contribution to the theory of stellar nucleosynthesis, and his often controversial stance on other cosmological and scientific matters, such as his rejection of the Big Bang theory in favour of a steady state universe." (1)

"In 1949, Hoyle began a popular and often repeated series of BBC radio broadcasts on astronomy, with versions being broadcast in the United States as well as in a book "The Nature of the Universe". It was in the last of these radio lectures that Sir Fred Hoyle coined the phrase "Big Bang" for the creation of the universe, although many people believe he actually intended it as a scornful description of a theory which he did not himself accept."(2)



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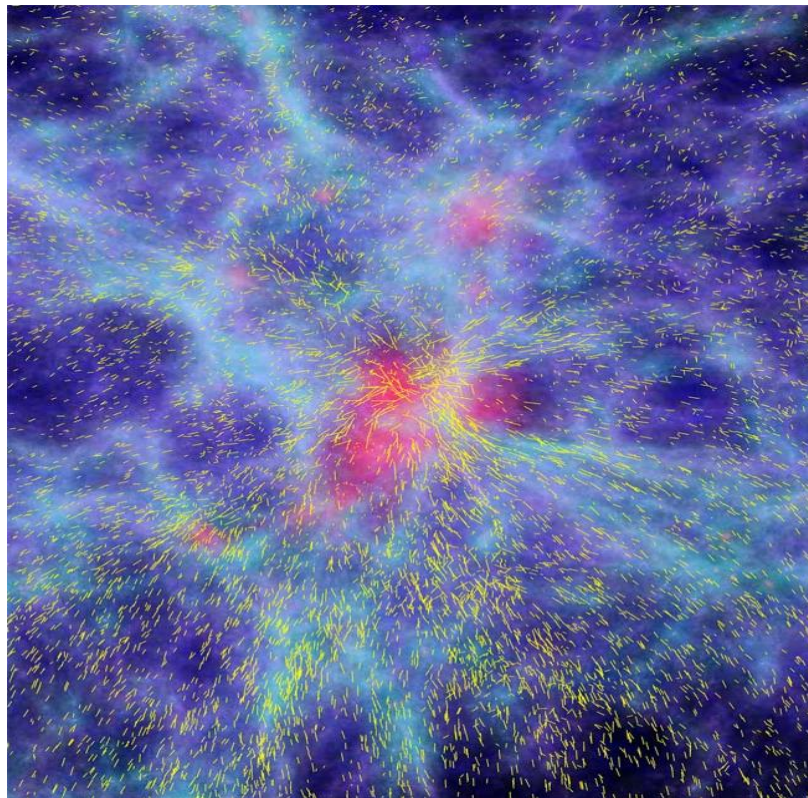


Whether or not the universe will come to an end depends on its density, how spread out the matter within it might be. Scientists have calculated a "critical density" for the universe. If it's true that the density is greater than their calculations, eventually the expansion of the universe will slow 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 put forward. Perhaps it is thoughtless to say we might be blown-up to float in more space, ripped apart, completely frozen up, fried like bacon. 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-grandchildren. If humans are still in existence at that point, it.



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.



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(Image: © ESO)

Wikipedia (1)

https://www.physicsoftheuniverse.com/scientists_hoyle.html (2)

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

<https://www.physicsoftheuniverse.com/cosmological.html>

SPECIAL NOTE:

At the end of July we received a call from Mrs. Pat Lange. She has donated a lot of her husbands books to the Club.

East Rand Astronomy Club wishes to thank Pat Lange for her generosity for this is the start of our Library.

