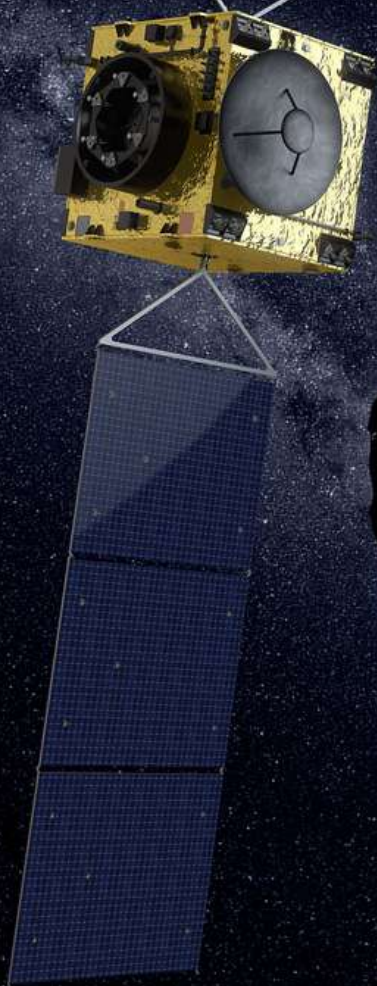


Galactica

Astronomy and Space Science Magazine



What's Inside?
Highlights From September
Moon Phases And Planet Visibility
What's Awaiting in October
Student's Corner
Historical Events Happened In October
Events By SPACE
Train Your Brain

www.space-global.com

Galactica is a monthly magazine about astronomy & space science published by SPACEIndia targeting amateur astronomers. Each monthly issue includes astronomy news, space launches, what's up in the sky every month, events and announcements done by the space team, Astrophotographs and articles on astronomy & astrophysics submitted by the readers for general audience, and the article about historical missions & events of astronomy and more. All of this comes in an easy-to-understand user-friendly style that's perfect for astronomers at any level.

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ABOUT SPACE



Legacy of 22 years



Pioneer Organization



10000+ Activities Developed



1000+ Schools Associated



1M+ Students Engaged



10K+ Outreach Events



10+ Cities Presence

SPACE is the pioneer organization working towards development of science and astronomy in India. It aims to create a scientifically aware society and contribute to the technological and social development of the country. SPACE organization belongs to an astronomical league, diligently working towards development in astronomy and space science through astronomical tutorials, modules, curriculum for education requirements of schools & students in India. We constantly engage in offering introductory astronomy, science about space, astrophysics, telescopes and internet astronomy to masses.

Vision: To popularize hands on space science & STEM Education through various fun filled pioneering concepts, services and programs.

Mission: To develop and popularize space science & STEM Education in India and establish a global association with national & international space science agencies, societies, amateur, professional organisations, government agencies and space observatories.



Mr. Sachin Bahmba
CMD, Space.

CMD'S MESSAGE:

Space and Astronomy is the future for the young generation of our country. This is a great means to inculcate scientific temperament among the masses. Such astronomy sessions will provide a hands on learning platform to students wherein they explore the real world of science. I wish for the young students to let their ambitions soar and think big as they are the future of our country.

SPACE INSIGHTS

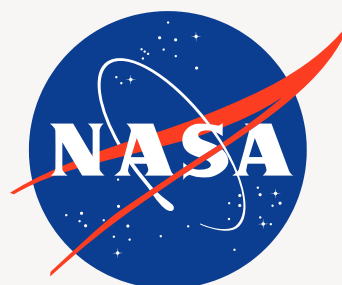
SALLY RIDE EARTHKAM - CAPTURING YOUR FAVORITE PLACE OF EARTH FROM ISS

Sally Ride ISS EarthKAM is an international educational programme of NASA through which students can receive stunning images of the Earth from a digital camera mounted at a nadir pointing window in the International Space Station (ISS). This programme was started by Dr Sally Ride, the first American woman in space and was originally called kidSat. SPACE India brings this unique workshop to our schools, with the enthralling experience of imaging Earth from a unique perspective of space. Description of Activity

Every year 4-5 EarthKAM missions take place in which SPACE India holds workshops where students are guided by SPACE educators to select locations of geographical and environmental interest, based on weather and orbit checking, and through a software, interface submit requests which are sent to ISS. ISS captures images of the locations and makes high-quality images available for download. Images have been taken of regions of interest in geography, environment, ecology and natural disasters.



SPACE™
EMPOWERING LIFE



History

JoBea Holt an Earth scientist from NASA's JPL had the idea for KidSat and worked with Sally Ride, Elizabeth Stork from Johns Hopkins Center for Talented Youth and JPL engineers to implement it in 1995. Holt directed the KidSat program during its first three shuttle flights and established the process through which students and educators could request images. A Special Section of the IEEE Transactions on Geoscience and Remote Sensing presents the KidSat missions along with the science, engineering and education that were integral to the program. The program allowed middle school students to capture images of Earth using a camera aboard the Space Shuttle.

KidSat was renamed EarthKAM (Earth Knowledge Acquired by Middle school students) in 1998 and flew as part of three additional shuttle flights. In 2001, the camera moved to the International Space Station, and the program was renamed ISS EarthKAM. After Ride's death in 2012, NASA renamed the program Sally Ride EarthKAM in her honor.



Astronaut Sally Ride



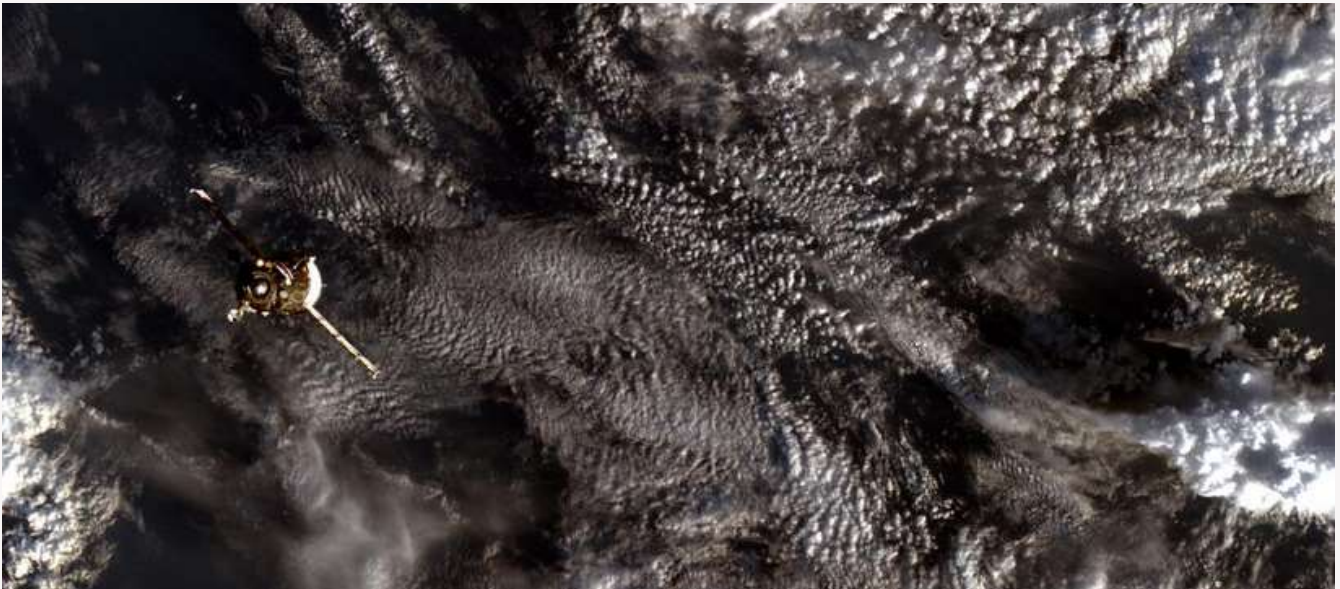
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Space India conducted an online workshop on "Sallyride EarthKAM Mission 80" for the registered participants on 21st September. In this workshop, participants learnt about how to request the images from the camera in ISS and the other criteria required for getting their requested images. below are the Conduction pictures,



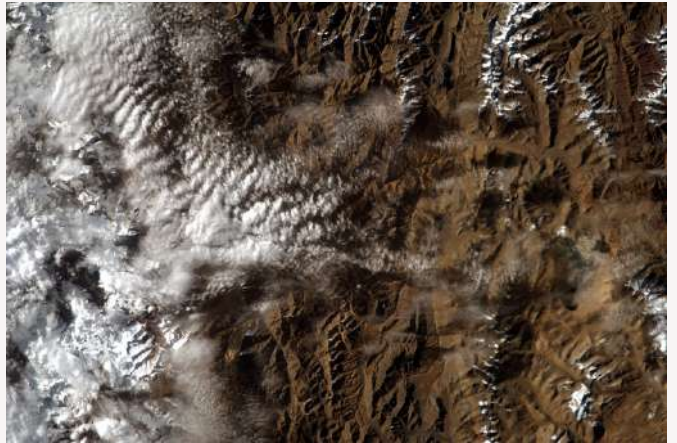
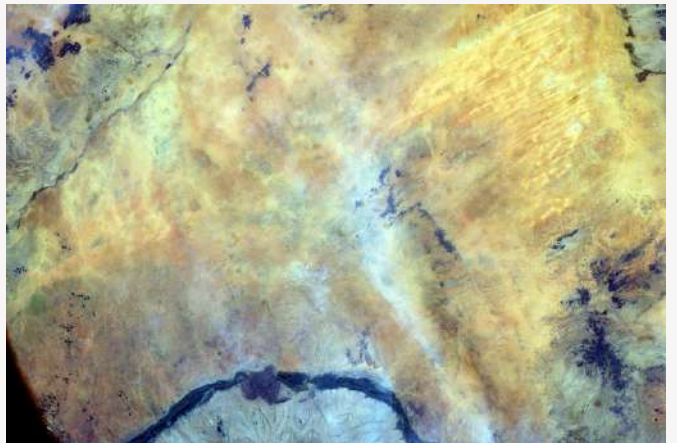
SPACE STUDENTS CAPTURED 'SOYUZ MS-22 SATELLITE' FROM A CAMERA IN ISS

In some of the pictures requested by Space Students, luckily our students captured a satellite named Soyuz MS-22. The Soyuz MS-22 crew ship approached the space station just above the Mediterranean Sea with three new crew members for a docking to the Rassvet module on 21st September 2022.



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Some of the best images requested by Space educators and Participants from the recent EarthKAM mission are,



TEACHER'S DAY CELEBRATIONS

Teachers are real-life heroes! The backbone of any profession. Our SPACE Educators work round the clock, travel to remote locations to teach and never miss a chance to celebrate their students. Teachers' Day is celebrated on September 5 every year in India to acknowledge the contribution of teachers to the society. The day marks the birth anniversary of India's second President and first Vice President Dr.Sarvepalli Radhakrishnan.

Teacher's day is always special for our educators since they keep on Spreading the unique and niche knowledge of Astronomy and Space Science which requires dedication, consistency and daily updates on celestial events. This is the reason our educators have successfully inspired and engaged +1 Million Students across India. Our Educators also went to a Movie named 'Brahmastra' as a part of the celebration.



MONTHLY TELESCOPIC OBSERVATION

SPACE ARCADE team conducted their 3rd Monthly Telescopic Experience session on the 12th of September at two different places such as Delhi and Chennai respectively.

People from various places joined the observation with their own telescopes, binoculars and other astronomical equipment to learn and experience the breathtaking view of the Moon! They also learnt about different types of telescopes and cleared all their queries on the Alignment of various telescopes then did basic Astrophotography.

Everyone had their hands-on telescopic experience and enjoyed the view of the moon and its craters through the 8" Dobsonian telescope setup by Space team.

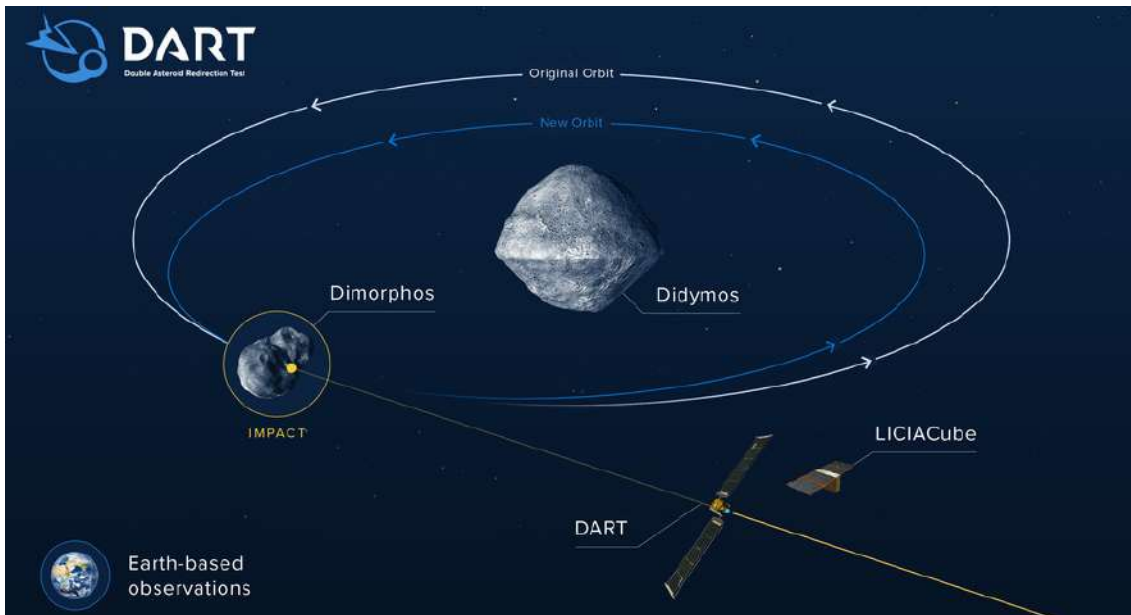


HIGHLIGHTS OF SEPTEMBER 2022

NASA'S DART MISSION HITS ASTEROID IN FIRST-EVER PLANETARY DEFENSE TEST

NASA's DART (Double Asteroid Redirection Test) has successfully crashed into the asteroid Dimorphos. Scientists expect the impact to alter the asteroid's orbit. However, it will take few weeks for NASA to determine how much the asteroid's path was changed due to the impact.

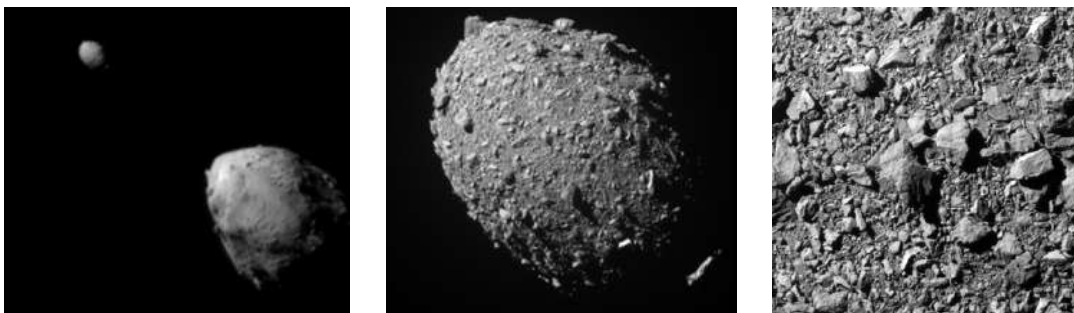
After 10 months of flying in space, NASA's Double Asteroid Redirection Test (DART), the world's first planetary defence technology demonstration, successfully impacted its asteroid target on 26th September – the agency's first attempt to move an asteroid in space. As a part of NASA's overall planetary defence strategy, DART's impact with the asteroid Dimorphos demonstrates a viable mitigation technique for protecting the planet from an Earth-bound asteroid or comet, if one were discovered.



(Illustration of how DART's impact will alter the orbit of Dimorphos about Didymos. Image credit: NASA)

The Target

DART targeted the asteroid moonlet Dimorphos, a small body just 530 feet (160 meters) in diameter. It orbits a larger, 2,560-foot (780-meter) asteroid called Didymos. Neither asteroid poses a threat to Earth. The mission's one-way trip confirmed NASA can successfully navigate a spacecraft to intentionally collide with an asteroid to deflect it, a technique known as kinetic impact.



(From left to right - image showing all of Didymos & Dimorphos; image showing all of Dimorphos; Dimorphos 2 seconds before impact. Image credit: NASA)

What's next

The investigation team will now observe Dimorphos using ground-based telescopes to confirm that DART's impact altered the asteroid's orbit around Didymos. Researchers expect the impact to shorten Dimorphos' orbit by about 1%, or roughly 10 minutes; precisely measuring how much the asteroid was deflected is one of the primary purposes of the full-scale test.

Roughly four years from now, the European Space Agency's Hera project will conduct detailed surveys of both Dimorphos and Didymos, with a particular focus on the crater left by DART's collision and a precise measurement of Dimorphos' mass.

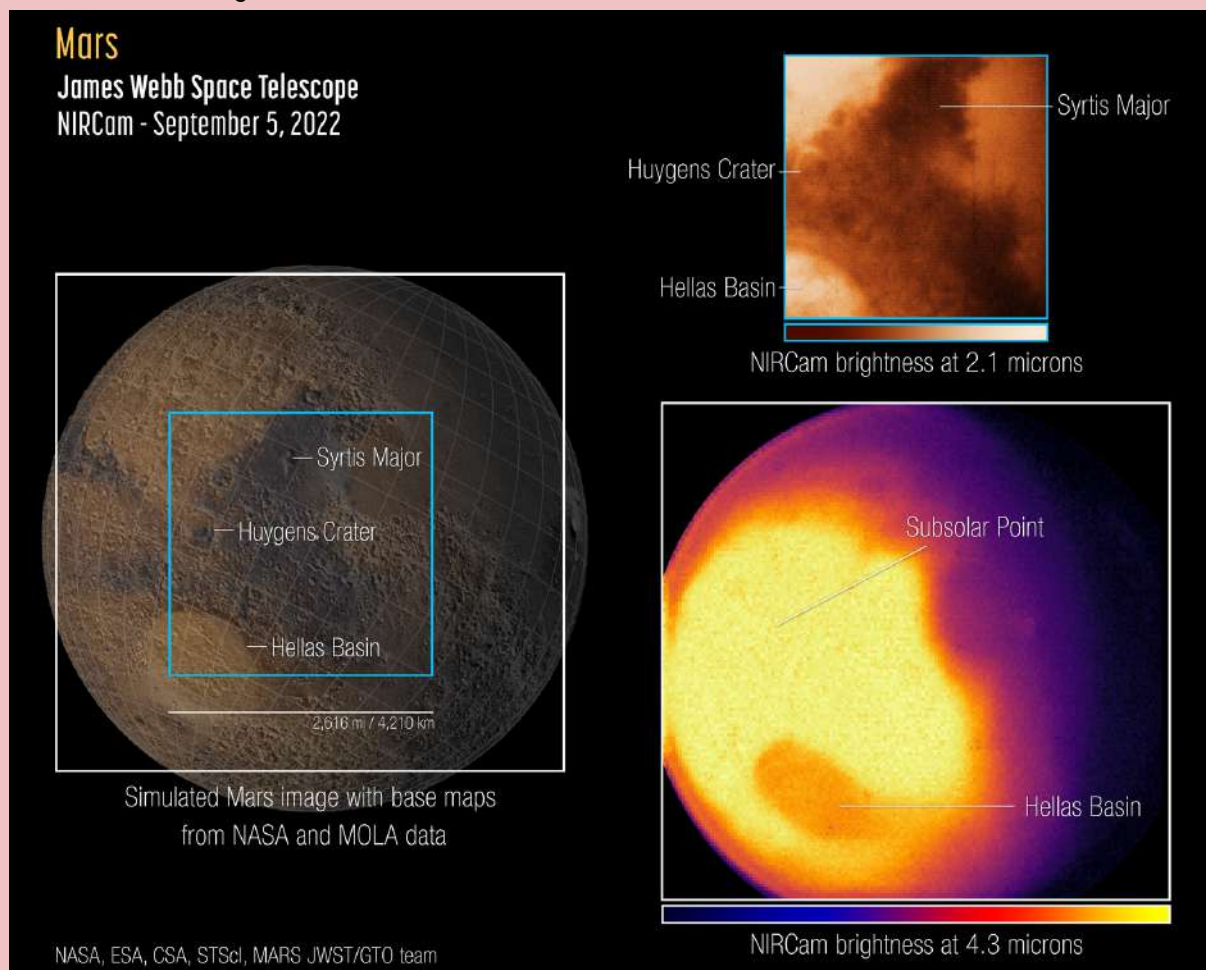
FROM THE EYES OF WEBB - SEPTEMBER 2022

James Webb Captures Its First Images of Mars

NASA's James Webb Space Telescope captured its first images and spectra of Mars on Sept. 5.

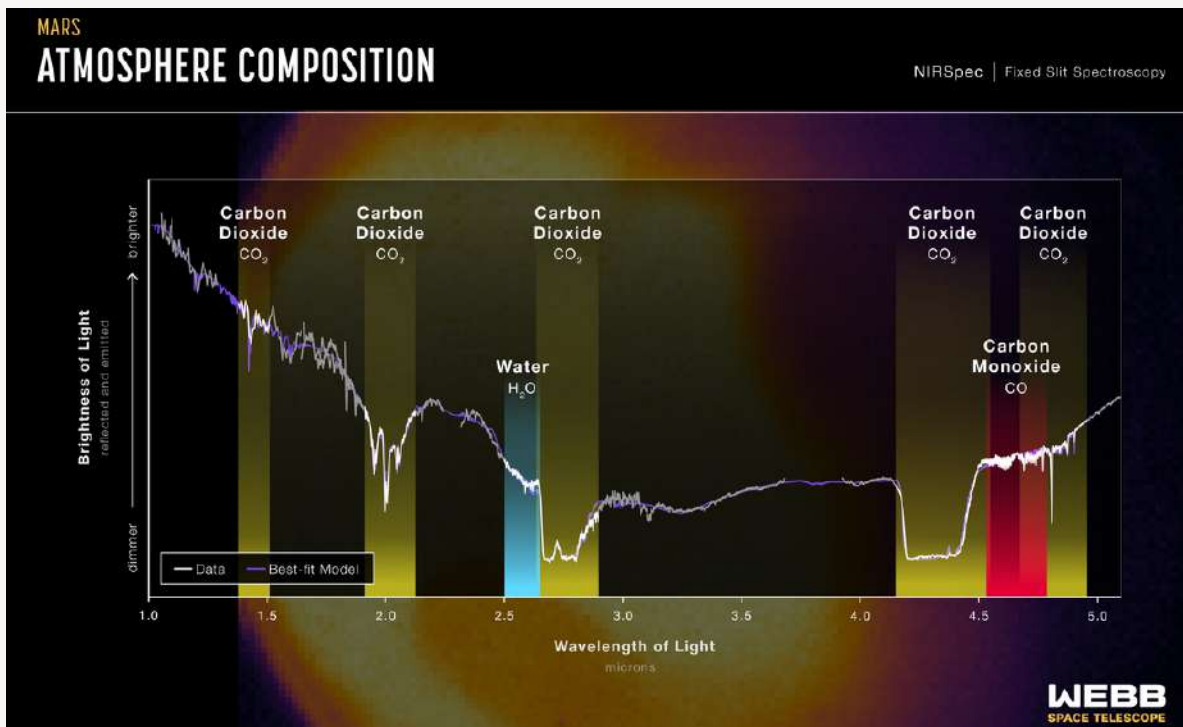
Webb's unique observation post nearly a million miles away at the Sun-Earth Lagrange point 2 (L2) provides a view of Mars' observable disk (the portion of the sunlit side that is facing the telescope). As a result, Webb can capture images and spectra with the spectral resolution needed to study short-term phenomena like dust storms, weather patterns, seasonal changes, and, in a single observation, processes that occur at different times (daytime, sunset, and nighttime) of a Martian day.

Webb's first images of Mars, captured by the Near-Infrared Camera (NIRCam), show a region of the planet's eastern hemisphere at two different wavelengths, or colours of infrared light. This image shows a surface reference map from NASA and the Mars Orbiter Laser Altimeter (MOLA) on the left, with the two Webb NIRCam instrument fields of view overlaid. The near-infrared images from Webb are on shown on the right.



Whereas the images show differences in brightness integrated over a large number of wavelengths from place to place across the planet on a particular day and time, the spectrum shows the subtle variations in brightness between hundreds of different wavelengths representative of the planet as a whole. Astronomers will analyze the features of the spectrum to gather additional information about the surface and atmosphere of the planet.

This infrared spectrum was obtained by combining measurements from all six of the high-resolution spectroscopy modes of Webb's Near-Infrared Spectrograph (NIRSpec). Preliminary analysis of the spectrum shows a rich set of spectral features that contain information about dust, icy clouds, what kind of rocks are on the planet's surface, and the composition of the atmosphere. The spectral signatures – including deep valleys known as absorption features – of water, carbon dioxide, and carbon monoxide are easily detected with Webb.



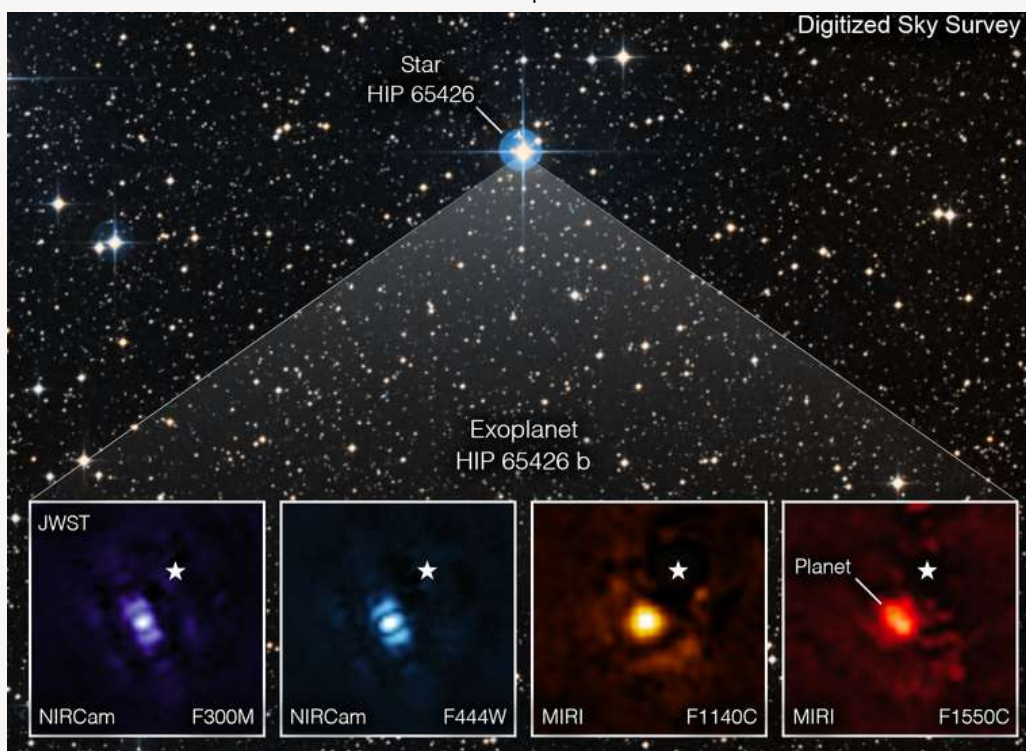
In the future, the Mars team will be using this imaging and spectroscopic data to explore regional differences across the planet and to search for trace gases in the atmosphere, including methane and hydrogen chloride.

These NIRCams and NIRSpec observations of Mars were conducted as part of Webb’s Cycle 1 Guaranteed Time Observation (GTO) solar system program led by Heidi Hammel of AURA.

NASA’s Webb Takes Its First-Ever Direct Image of Distant World

For the first time, astronomers have used NASA’s James Webb Space Telescope to take a direct image of a planet outside our solar system. The exoplanet is a gas giant, meaning it has no rocky surface and could not be habitable.

The image, as seen through four different light filters, shows how Webb’s powerful infrared gaze can easily capture worlds beyond our solar system, pointing the way to future observations that will reveal more information than ever before about exoplanets.



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The exoplanet in Webb's image, called HIP 65426 b, is about six to 12 times the mass of Jupiter, and these observations could help narrow that down even further. It is young as planets go – about 15 to 20 million years old, compared to our 4.5-billion-year-old Earth.

Since HIP 65426 b is about 100 times farther from its host star than Earth is from the Sun, it is sufficiently distant from the star that Webb can easily separate the planet from the star in the image. Webb's Near-Infrared Camera (NIRCam) and Mid-Infrared Instrument (MIRI) are both equipped with coronagraphs, which are sets of tiny masks that block out starlight, enabling Webb to take direct images of certain exoplanets like this one. NASA's Nancy Grace Roman Space Telescope, slated to launch later this decade, will demonstrate an even more advanced coronagraph.

Taking direct images of exoplanets is challenging because stars are so much brighter than planets. The HIP 65426 b planet is more than 10,000 times fainter than its host star in the near-infrared, and a few thousand times fainter in the mid-infrared.

In each filtered image, the planet appears as a slightly differently shaped blob of light. That is because of the particulars of Webb's optical system and how it translates light through the different optics.

A Cosmic Tarantula, Caught by NASA's Webb

Once upon a space-time, a cosmic creation story unfolded: Thousands of never-before-seen young stars were spotted in a stellar nursery called 30 Doradus, captured by NASA's James Webb Space Telescope. Nicknamed the Tarantula Nebula for the appearance of its dusty filaments in previous telescope images, the nebula has long been a favourite for astronomers studying star formation. In addition to young stars, Webb reveals distant background galaxies, as well as the detailed structure and composition of the nebula's gas and dust.

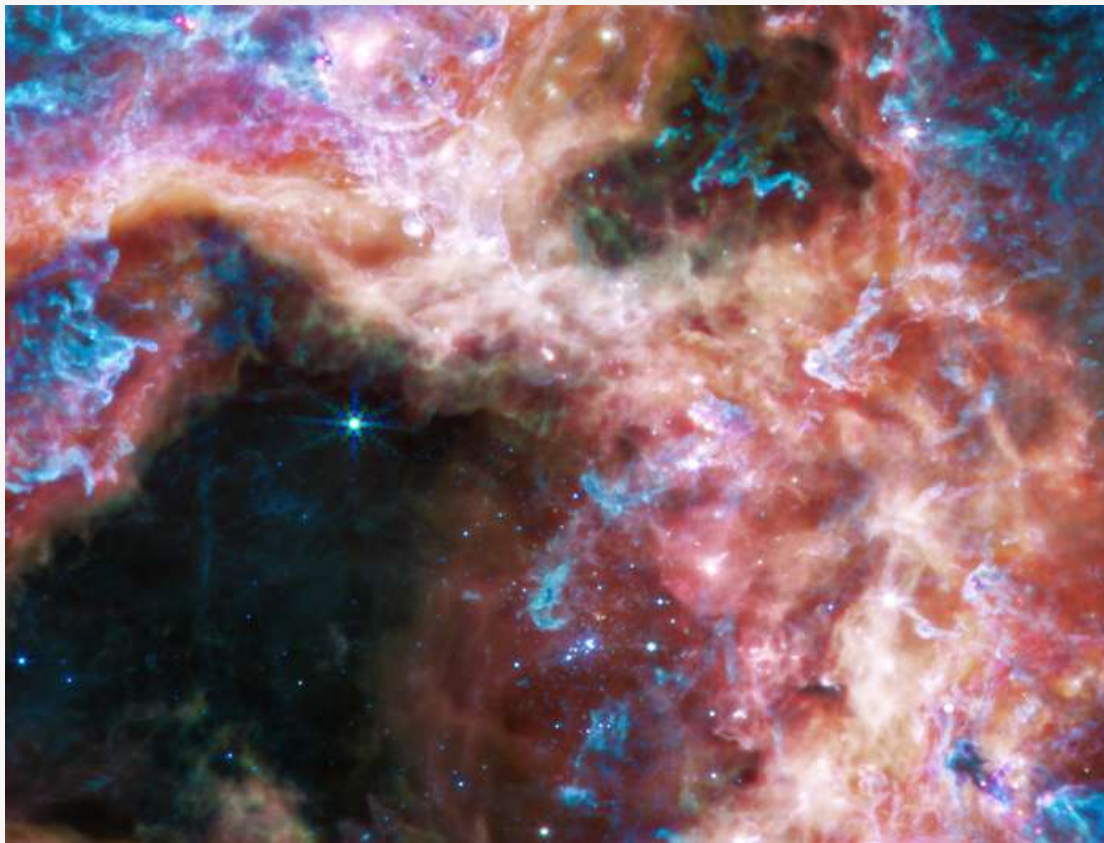


(Webb's Near-Infrared Camera (NIRCam) displays the Tarantula Nebula star-forming region in a new light, including tens of thousands of never-before-seen young stars that were previously shrouded in cosmic dust. The most active region appears to sparkle with massive young stars, appearing pale blue. Image credit: Webbtelescope.org)

Astronomers used three of Webb's infrared instruments to image the Tarantula Nebula. When viewed using Webb's Near-Infrared Camera (NIRCam), you'll see the silky filaments that earned the nebula its name surrounding a cluster of massive young stars sparkling blue in the center of the image above. According to NASA, tens of thousands of these young stars have never been seen before as they were concealed by cosmic dust. Stellar winds and radiation from these young stars had hollowed out the center of the nebula, which is bound to keep shifting and changing shape. The filaments that surround them are hiding even more protostars, after all, and they'll emerge to join the other stars at the center as they blow away the gas and dust obscuring them from our view.

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In fact, Webb's Near-Infrared Spectrograph has observed one such star that has started emerging from behind its dusty veil. NASA says the star's activity wouldn't have been revealed without Webb's high-resolution spectra at infrared wavelengths. The astronomers also used Webb's Mid-infrared Instrument (MIRI) to view the nebula in longer infrared wavelengths and captured an image quite different from the one captured by NIRCam. This time, the young stars at the center of the nebula fade in the background, while the cooler gas and dust surrounding them glow and take the spotlight, as you can see below.



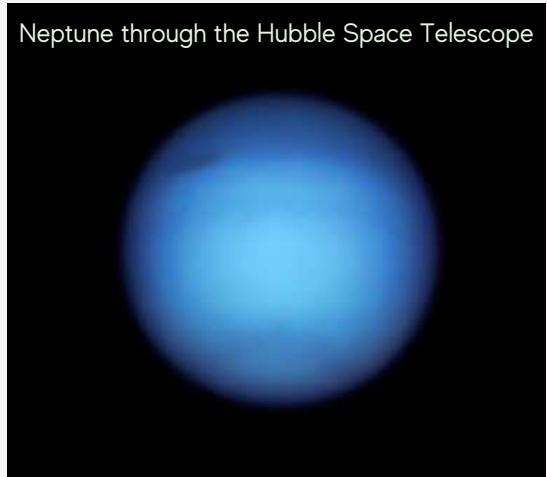
As NASA explains, the Tarantula Nebula is of special interest to scientists studying star formation, because it has a chemical composition similar to the star forming regions during the universe's "cosmic noon." That's the period in time when the universe was only a couple of billion years old and when star formation was at its peak. In our own galaxy, there are no regions producing new stars at a similarly furious pace. Also, star forming regions in the Milky Way have a different composition. By focusing the Webb Telescope on the Tarantula Nebula, scientists now have images to compare against deep observations of much distant galaxies from the actual cosmic noon, which could help them better understand the early years of the universe.

Webb Captured Clearest View of Neptune's Rings

Neptune has fascinated researchers since its discovery in 1846. Located 30 times farther from the Sun than Earth, Neptune orbits in the remote, dark region of the outer solar system. At that extreme distance, the Sun is so small and faint that high noon on Neptune is similar to a dim twilight on Earth.

This planet is characterized as an ice giant due to the chemical makeup of its interior. Compared to the gas giants, Jupiter and Saturn, Neptune is much richer in elements heavier than hydrogen and helium.

This is readily apparent in Neptune's signature blue appearance in Hubble Space Telescope images at visible wavelengths, caused by small amounts of gaseous methane.



Neptune through the Hubble Space Telescope

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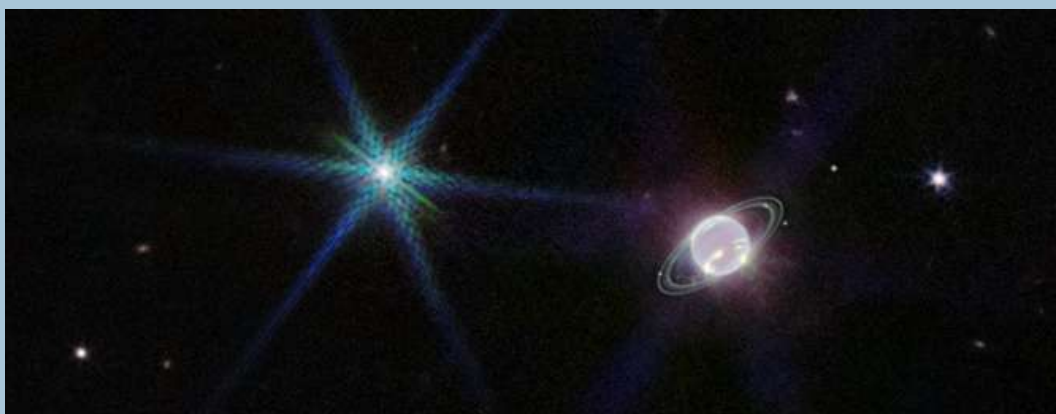


(This composite image provided by NASA on Sept. 21, 2022, shows three side-by-side images of Neptune. From left, a photo of Neptune taken by Voyager 2 in 1989, Hubble in 2021, and Webb in 2022. Credit: NASA, ESA, CSA, STScI)

Webb's Near-Infrared Camera (NIRCam) images objects in the near-infrared range from 0.6 to 5 microns, so Neptune does not appear blue to Webb. In fact, the methane gas so strongly absorbs red and infrared light that the planet is quite dark at these near-infrared wavelengths, except where high-altitude clouds are present. Such methane-ice clouds are prominent as bright streaks and spots, which reflect sunlight before it is absorbed by methane gas. Images from other observatories, including the Hubble Space Telescope and the W.M. Keck Observatory, have recorded these rapidly evolving cloud features over the years.

More subtly, a thin line of brightness circling the planet's equator could be a visual signature of global atmospheric circulation that powers Neptune's winds and storms. The atmosphere descends and warms at the equator, and thus glows at infrared wavelengths more than the surrounding, cooler gases.

Neptune's 164-year orbit means its northern pole, at the top of this image, is just out of view for astronomers, but the Webb images hint at an intriguing brightness in that area. A previously-known vortex at the southern pole is evident in Webb's view, but for the first time Webb has revealed a continuous band of high-latitude clouds surrounding it.



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Webb also captured seven of Neptune's 14 known moons. Dominating this Webb portrait of Neptune is a very bright point of light sporting the signature diffraction spikes seen in many of Webb's images, but this is not a star. Rather, this is Neptune's large and unusual moon, Triton.

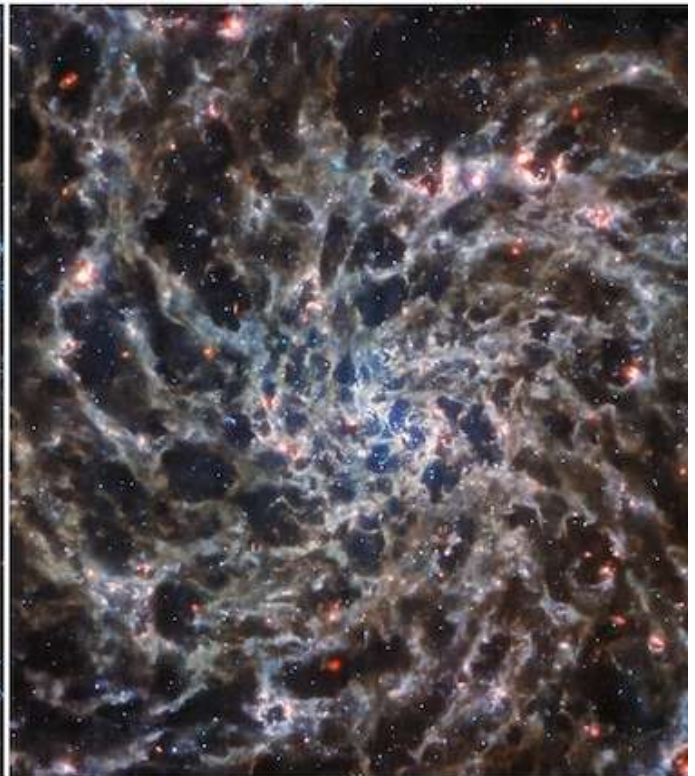
Covered in a frozen sheen of condensed nitrogen, Triton reflects an average of 70 percent of the sunlight that hits it. It far outshines Neptune in this image because the planet's atmosphere is darkened by methane absorption at these near-infrared wavelengths. Triton orbits Neptune in an unusual backward (retrograde) orbit, leading astronomers to speculate that this moon was originally a Kuiper belt object that was gravitationally captured by Neptune. Additional Webb studies of both Triton and Neptune are planned in the coming year.

Webb Reveals IC 5332 Galaxy

Halloween must be approaching. NASA and the European Space Agency are already leaning into the spooky side of the cosmos with a new James Webb Space Telescope view showing the innards of spiral galaxy IC 5332. It looks like a skeletal whirlpool. IC 5332 is a little smaller than our own Milky Way and resides over 29 million light-years away.

Webb's Mid-InfraRed Instrument, or MIRI, sees the universe in a specific set of wavelengths that give it a very special view of space objects. It's able to pierce through veils of dust to reveal underlying structures that are hidden from other telescopes. MIRI has to operate in utterly frigid temperatures in order to work correctly. It has its own cooling system to keep it chilled out.

ESA compared Webb's view of IC 5332 with a visible and ultraviolet image from the Hubble Space Telescope. The dark areas in the Hubble image are full of dust. "Those same dusty regions are no longer dark in the Webb image, however, as the mid-infrared light from the galaxy has been able to pass through them," said ESA.



(Left, a photo of IC 5332 taken by Hubble; Right, Webb image of IC 5332)

NASA CALLS OFF ARTEMIS LAUNCH - NEXT LAUNCH ATTEMPT IN NOVEMBER

The weather-related launch delay will set up NASA for another attempt in mid-November. The space agency had hoped to launch the Artemis-1 in the last week of September but Hurricane Ian caused teams to roll back the 322-foot-tall rocket into the Vehicle Assembly Building for safety.

NASA has decided to skip the Artemis I launch attempt on September 27 due to a Tropical Storm Ian threatening large parts of Florida. The previous attempts were called off due to hydrogen leaks and engine problems.

Recent tests showed positive signs the leak had been fixed and the rocket would again be ready for another launch attempt. But the latest weather models showing Hurricane Ian approaching Florida prompted new worries over whether the rocket could withstand the storm's winds.

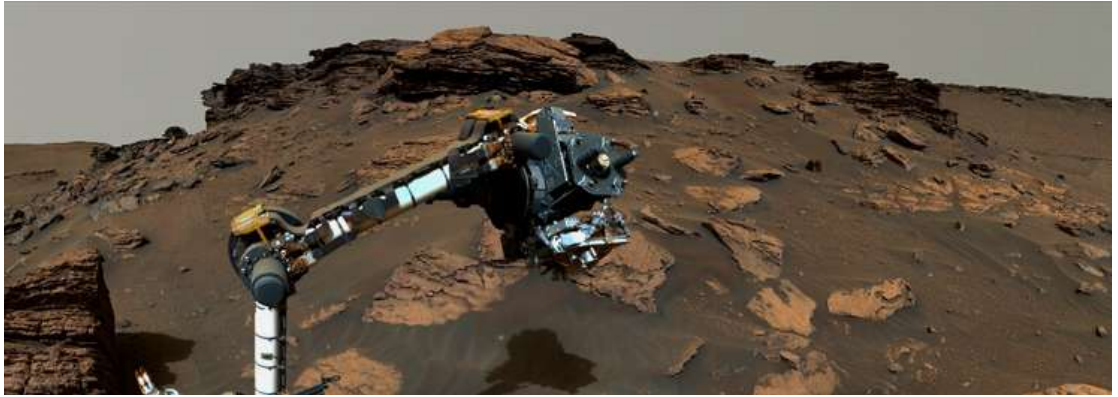
If the rocket remains at the pad, Nasa could try for a 2 October launch attempt, the last opportunity before a two-week blackout period. But a rollback late on Sunday or early on Monday would likely mean a lengthy delay for the test flight, possibly pushing it into November.



Managers met Monday morning and made the decision based on the latest weather predictions associated with Hurricane Ian after additional data gathered overnight did not show improving expected conditions for the Kennedy Space Center area. The decision allows time for employees to address the needs of their families and protect the integrated rocket and spacecraft system. The time of first motion also is based on the best-predicted conditions for rollback to meet weather criteria for the move.

NASA has continued to rely on the most up-to-date information from the National Oceanic and Atmospheric Administration, U.S. Space Force, and the National Hurricane Center throughout its evaluations and continues to closely monitor conditions for the Kennedy area.

PERSEVERANCE COLLECTS MARS SAMPLES RICH IN 'ORGANIC MATTER' FOR FUTURE RETURN TO EARTH



Organic Matter in Perseverance Samples: For the past few months, the Perseverance rover has been exploring the delta of an ancient river that flowed into a lake that existed in the Jezero crater. The sediments of this area consist of sedimentary rocks, which create excellent conditions for life on Earth. Since July, the rover has already taken four samples and they contain a large number of organic substances. This indicates that millions of years ago these rocks were deposited at the bottom of a reservoir, the conditions which supported the stable existence of molecules that are the building blocks for life. In particular, scientists were very interested in a 90 cm long rock called Wildcat Ridge. Perseverance examined this piece of mudstone, which is the result of the recrystallization of clays similar to those found on Earth using the SHERLOC instrument. This tool is specially designed to quickly analyze the organic matter. SHERLOC found that a large amount of organic matter in the sample is combined with sulfates. On Earth, these sulfur-containing compounds preserve organic residues well, so there is a good chance to find out if there was ever life on Mars.



This mosaic, composed of multiple images, shows a rocky outcrop called "Wildcat Ridge," where the rover extracted two rock cores and abraded a circular patch to investigate the rock's composition. (Image credit: NASA/JPL-Caltech/ASU/MSSS)

Awaiting a mission to return samples

At the same time, the researchers note that the organic matter in the sample is not a sign of the presence of life. At least, SHERLOC cannot unequivocally indicate this fact. For this, it is necessary to examine the collected samples in terrestrial laboratories, and scientists hope to get such an opportunity in the future.

In 2027 and 2028, the American Mars Sample Return lander and the European ERO orbiter are due to launch on the red planet. It is expected that after the first one reaches the surface of Mars, Perseverance will reach it and load the collected samples inside.

Next, the Mars Sample Return launches from the surface and connects in orbit with ERO. And it will turn on its engines and deliver them together to Earth. It is expected that scientists will be able to study Martian samples in the laboratory as early as 2033.

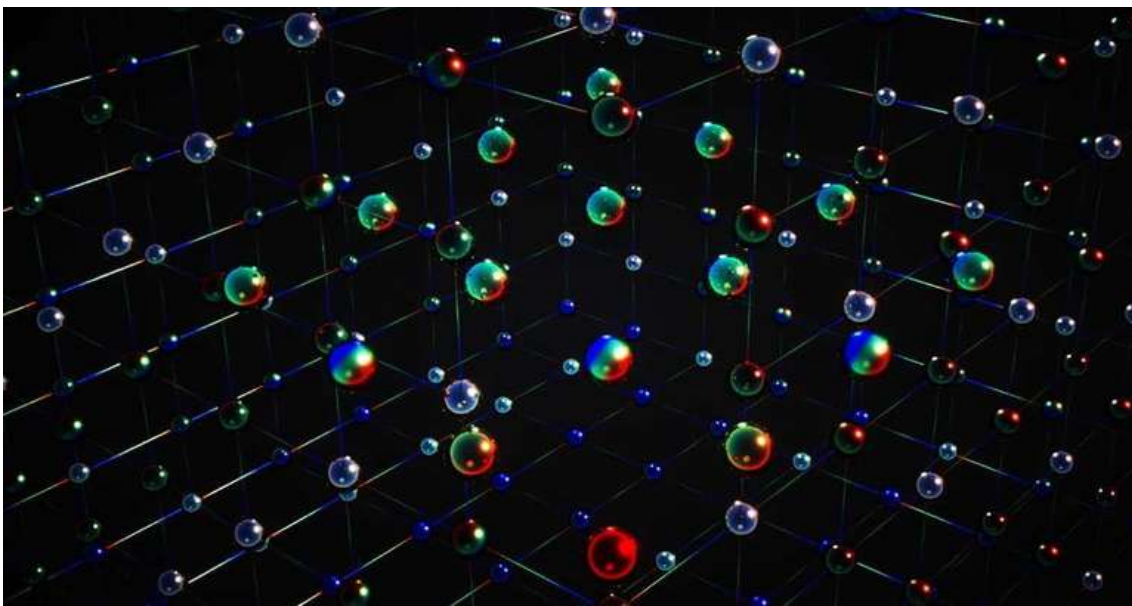
SCIENTISTS CREATED THE COLDEST MATTER IN THE UNIVERSE

Matter chilled to 3 billion times colder than interstellar space

A team of researchers has cooled matter to within a billionth of a degree of absolute zero, colder than even the deepest depths of space, far away from any stars.

Interstellar space never gets this cold due to the fact that it is evenly filled with the cosmic microwave background (CMB), a form of radiation left over from an event that occurred shortly after the Big Bang when the universe was in its infancy. The chilled matter is even colder than the coldest known region of space, the Boomerang Nebula, located 3,000 light-years from Earth, which has a temperature of just one degree above absolute zero.

The experiment, run at the University of Kyoto in Japan and used fermions, which is what particle physicists call any particle that makes up matter, including electrons, protons and neutrons. The team cooled their fermions atoms of the element ytterbium – to around a billionth of a degree above absolute zero, the hypothetical temperature at which all atomic movement would cease.



An illustration shows trapped ytterbium atoms cooled to temperatures about 3 billion times colder than deep space (Image credit: Ella Maru Studio/Courtesy of K. Hazzard/Rice University)

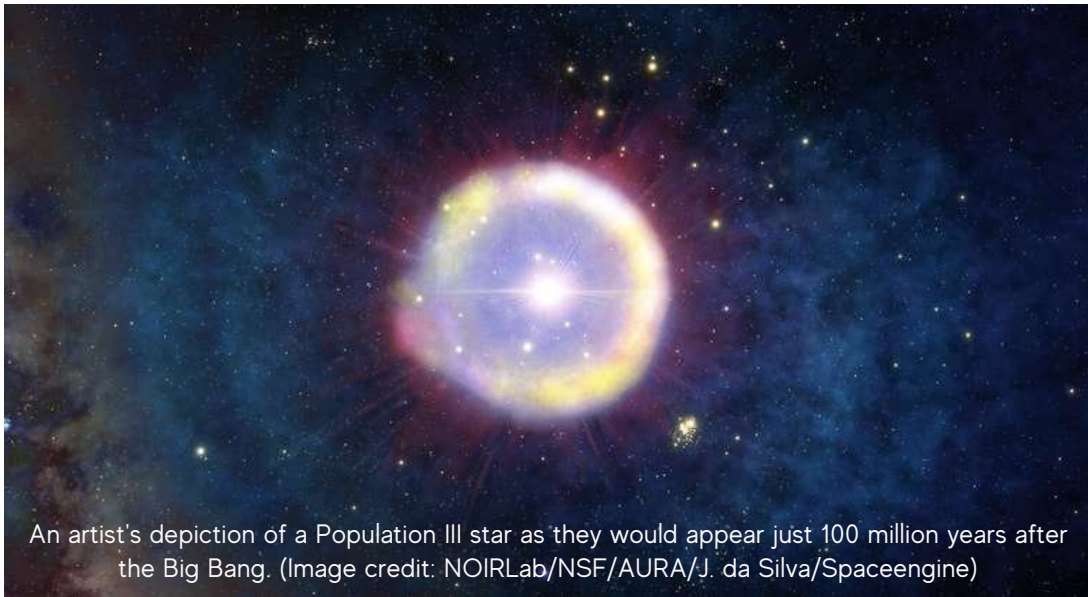
The team used lasers to cool the matter by restricting the motion of 300,000 atoms within an optical lattice. The experiment simulates a model of quantum physics first proposed in 1963 by theoretical physicist, John Hubbard. The so-called Hubbard model allows atoms to demonstrate unusual quantum properties including collective behaviour between electrons like superconduction.

There is one region in the known universe, the Boomerang Nebula, a cloud of gas that surrounds a dying star in the constellation of Centaurus, which is even colder than the rest of the universe – around 1 Kelvin or minus 457.6 °F (minus 272° C). Astronomers believe the Boomerang Nebula is being cooled by cold, expanding gas spat out by the dying star at the nebula's centre. But even the Boomerang Nebula can't compete with the temperatures of the ytterbium atom in the latest experiment. The team behind this experiment is currently working on developing the first tools capable of measuring the behavior that arises a billionth of a degree above absolute zero.



The Boomerang nebula is the coldest place in the universe (Image credit: ESA/NASA)

LIGHT FROM A QUASAR SHOWS HINTS OF ONE OF THE UNIVERSE'S FIRST STARS



We may have found traces of the very first stars in the universe. These strange objects, called Population III stars, are expected to have exploded in massive supernovas that destroyed the stars entirely, and astronomers may have seen remnants from one of these extraordinary events.

Yuzuru Yoshii at the University of Tokyo and his colleagues found these hints while examining the light of a quasar, an extremely bright object at the centre of a galaxy powered by matter falling into a supermassive black hole. This particular quasar, called J1342+0928, is one of the most distant ever spotted at nearly 30 billion light years away. It formed less than 700 million years after the big bang.

The spectrum of the quasar's light revealed a huge amount of iron, more than 20 times as much as the sun has. The quasar also seems to have a very low concentration of magnesium. These elements are important because they are produced in different processes, so their relative abundances can be used to determine what kind of cosmic object they came from. The abundances found in this quasar could not be explained by standard models.

The researchers found that the most reasonable way to produce so much iron so soon after the big bang was in a pair-instability supernova: a special kind of explosion that only occurs in extraordinarily massive stars, wherein they explode completely and leave no stellar core behind, unlike other kinds of supernovae. If such a supernova exploded close to quasar J1342+0928, debris would then fall towards the galaxy's centre, eventually becoming incorporated into the quasar.

The amount of magnesium produced in such a supernova is determined largely by the mass of the star that exploded. "I was delighted and somewhat surprised to find that a pair-instability supernova of a star with a mass about 300 times that of the sun provides a ratio of magnesium to iron that agrees with the low value we derived for the quasar," said Yoshii in a statement.

This is the clearest signature of a pair-instability supernova yet, he said. Because these supernovas can only occur in stars more than about 130 times as massive as the sun, this may also be evidence for the existence of Population III stars, which would have all been destroyed long ago.

These stars are crucial to our understanding of the universe, because they would have been the first to produce elements more massive than helium. They are also often considered to be potential seeds for supermassive black holes, which are so unimaginably huge that it is hard to find a way to create them in the early universe without similarly colossal stars.



An illustration of a distant quasar like the one used by astronomers to investigate the first generation of stars.

THE PRESIDENT OF INDIA INAUGURATED THE INTEGRATED CRYOGENIC ENGINE

The state-of-the-art ICMF, set up over an area of 4,500 square metres houses over 70 hi-tech equipment and testing facilities for manufacturing cryogenic (CE20) and semi-cryogenic (SE2000) engines of Indian rockets.

The President of India, Smt Droupadi Murmu, inaugurated the Integrated Cryogenic Engine Manufacturing Facility of Hindustan Aeronautics Limited (HAL) in Bengaluru today (September 27, 2022).

Addressing the gathering, the President said that the inauguration of the Integrated Cryogenic Engine Manufacturing Facility was indeed a historic moment not only for HAL and ISRO but also for the whole country to have a state-of-the-art facility to manufacture Cryogenic and Semi-cryogenic Engines. She said that HAL had contributed immensely to India's self-reliance in defence. It can be said that HAL has been the force behind the forces. HAL has repeatedly demonstrated its capabilities in the research, development and manufacturing of various Aircraft Platforms.

The President said that ISRO has been the pride of the nation. When this institution started operations in the 1960s, India was still a young Republic, facing challenges of severe poverty and illiteracy. But there was immense potential. The rapid pace, with which ISRO has grown, caught the attention of even the most advanced and technologically developed countries. Sincere efforts and dedication of ISRO have made India emerge as the sixth country in the world to have Cryogenic Engine Manufacturing Capabilities.



The President said that HAL and ISRO together contribute to strategic defence and development. Both organizations have played a major role in the development of various equipment and programmes which have reinforced the security and development of our country. HAL with its high-end facility for manufacturing defence-related equipment has proved to be an invaluable asset for our country.

The President said that the glorious past of HAL and ISRO gives us an assurance that these organisations will continue to play a significant and positive role in the future as India enters the Amrit Kaal. By 2047, when we will celebrate 100 years of Independence, the world around us will have changed drastically. Just as we were in no position 25 years ago to imagine the contemporary world, we cannot visualise today how Artificial Intelligence and automation are going to transform life. We have completed 75 years as an independent country. We are looking ahead at the next 25 years as the period to re-imagine India and make it a developed country. It is our joint responsibility to ensure that the India of 2047 will be a much more prosperous and strong nation.



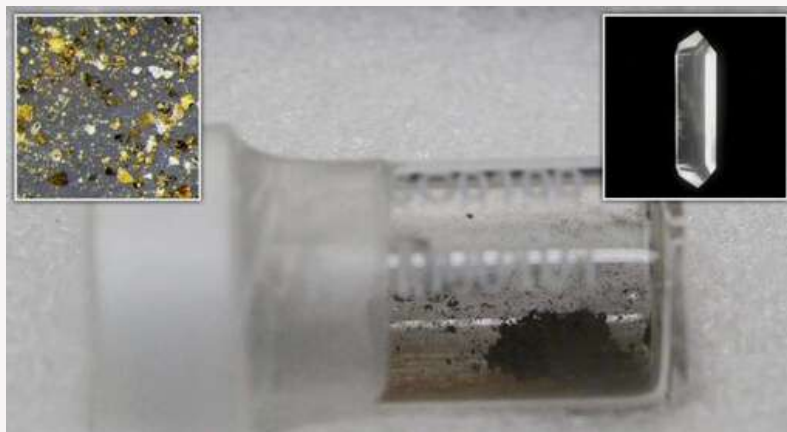
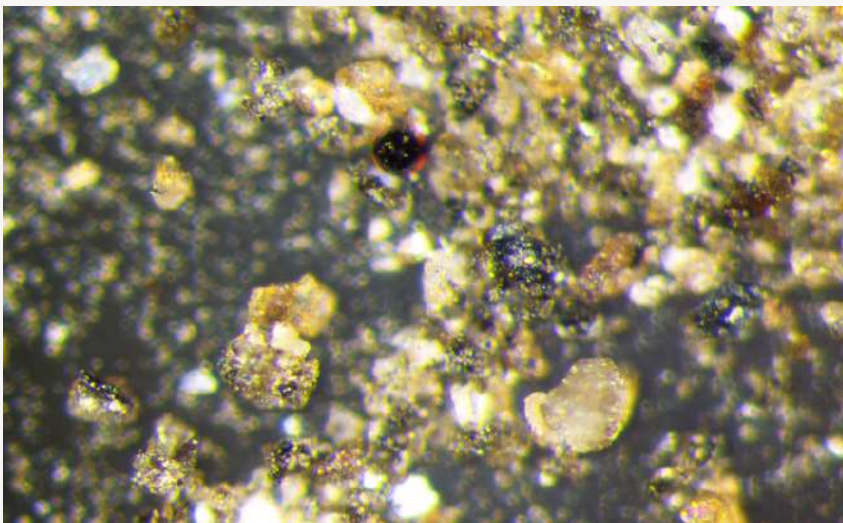
CHINA DISCOVERS NEW MOON MINERAL IN LUNAR SAMPLES

The discovery means China is the third country to discover a new lunar mineral, following the United States and former Soviet Union.

Chinese scientists have found a new lunar mineral in the form of a crystal lurking inside samples collected from the moon in 2020.

Changesite-(Y), named for the mythological Chinese goddess of the moon, Chang'e, is a phosphate mineral and columnar crystal. It was found in lunar basalt particles being examined in laboratories in China. The discovery was made by researchers at the Beijing Research Institute of Uranium Geology who found a single crystal of Changesite-(Y) using X-ray diffraction while studying particles collected on the moon.

The finding was announced at a press conference on Sept. 9. The Commission on New Minerals, Nomenclature and Classification (CNMNC) of the International Mineralogical Association (IMA) confirmed it as a new mineral.



A close up of a crystal of a new lunar mineral called which has been named Changesite-(Y).

(Image credit: Beijing Research Institute of Uranium Geology)

The discovery means China is the third country to discover a new lunar mineral, following the United States and former Soviet Union, which conducted the Apollo crewed lunar landings and Luna sample return missions, respectively.

The Chang'e 5 mission landed in Oceanus Procellarum in December 2020 and was the first lunar sample return mission since the 1970s.

The mission collected 3.81 lbs (1.73 kilograms) of lunar samples and delivered them safely to Earth for study, leading to a range of discoveries.

China's next moon mission is expected to be Chang'e 6. It will attempt to collect the first samples from the far side of the moon which never faces the Earth.

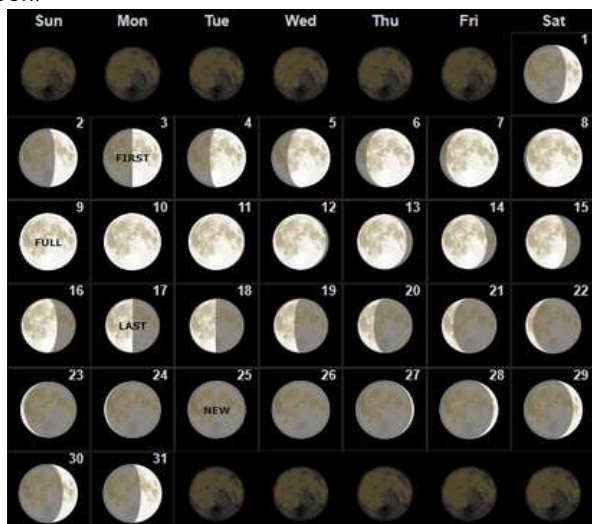
WHAT'S UP IN THE SKY - OCTOBER 2022

LUNAR CALENDAR

IMPORTANCE OF MOON PHASES FOR STARGAZERS

One might wonder why it is important to refer moon phases for star gazing. The reason is that the phases of the Moon reflects a great deal of illumination, and because the Moon is so close to us, it overrides the brightness of other celestial objects.

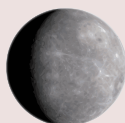
So, What Moon phase is best for stargazing? "The New Moon and the days immediately before and after the new moon (Crescent phases)" are among the best times for stargazing. Whereas the Remaining phases like Full Moon, waxing or waning gibbous, the first or third quarter Moon offers a time to zoom in and witness the features of the Moon.



PLANETS VISIBILITY

Mercury

Good morning planet throughout the month. Greatest Western Elongation on 8th of October.



Venus

Venus will be visible in the morning sky only at the start of October



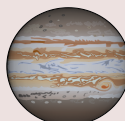
Mars

Rises by mid night, Brightens throughout the month. Near the gibbous moon on 14th of October.



Jupiter

Almost full Moon nearby on evening of 8 October. a bright planet visible throughout the month.



Saturn

Well positioned evening planet. Bright waxing gibbous Moon nearby on evening 5th of October.



Uranus

Evening planet, Approaching opposition on 9th of November.



Neptune

Well positioned binocular planet and near Jupiter throughout the month.



BRIGHT DEEP SKY OBJECTS

The first globular cluster to be added to the Messier catalog, M2 is located roughly 37,000 light-years from Earth in the constellation Aquarius. M2 has a diameter of over 150 light-years and is one of the largest clusters of its kind. It was discovered in 1746 by the Italian astronomer Jean-Dominique Maraldi. The best time to observe M2 is during the month of October.



The Andromeda Galaxy, also known as M31, or NGC 224 and originally the Andromeda Nebula, is a barred spiral galaxy with an apparent magnitude of 3.4, the Andromeda Galaxy is among the brightest of the Messier objects, and is visible to the naked eye from Earth on moonless nights, even when viewed from areas with moderate light pollution.



A spectacular swarm of stars, M15 was discovered in 1746 by Jean Maraldi, an Italian astronomer. This cluster is one of the densest ever discovered with very hot blue & cool orange stars. M15 is located in the constellation Pegasus 33,600 light-years from Earth. Shining with an apparent magnitude of 6.2. This cluster can be spotted with a pair of binoculars.



The Pleiades, also known as The Seven Sisters and Messier 45 has an apparent magnitude of 1.6. It is an asterism and an open star cluster containing middle-aged, hot B-type stars in the north-west of the constellation Taurus. At a distance of about 444 light years, it is among the nearest star clusters to Earth.



ROCKET LAUNCHES IN OCTOBER 2022

THE 'GA'ZELLE SATELLITE LAUNCH BY ELECTRON ROCKET FOR GENERAL ATOMICS

General Atomics Electromagnetic Systems (GA-EMS) announced today that its GAZelle satellite hosting the Argos-4 and RadMon payloads successfully completed the final review process for shipment to Rocket Lab's Complex 1 launch facility on the Mahia Peninsula in New Zealand. The satellite launch date is anticipated for no later than October 10, 2022.

"The Pre-Ship Review, or PSR, is the final review before we pack up and ship the spacecraft. The PSR provides our payload customers verification that all requirements are met, all testing to date is complete, and all ground operations are set to go," said Scott Forney, president of GA-EMS. "This is a very exciting time, as the team gets ready to travel to New Zealand to complete final preparations for satellite launch onboard a dedicated Rocket Lab Electron vehicle."

GA-EMS is launching the satellite as a Hosted Payload Solutions (HoPS) mission delivery order for the Argos Advanced Data Collection System (A-DCS) awarded to GA-EMS by the United States Space Force, Space Systems Command, on behalf of the National Oceanic and Atmospheric Administration (NOAA). The Argos-4 instrument onboard the GA-EMS satellite was provided by France's National Centre for Space Studies.



GA-EMS designed and manufactured the GAZelle satellite at their Centennial, CO facilities and conducted all integration and testing for the Argos-4 instrument and the RadMon space radiation monitoring payloads. GA-EMS owns the satellite and is managing mission operations and control of the satellite throughout its five-year mission lifecycle.

"Our complete ground-to-orbit solutions and flexible, optimized platforms provide a more efficient way for customers to deliver critical technologies to space," said Gregg Burgess, vice president of GA-EMS Space Systems. "We are extremely proud of our team and our partners as we get closer to delivering the Argos-4 instrument on orbit to begin collecting and distributing real-time data for the research, study, and protection of our planet's environment."

The Argos-4 payload will collect, process, and disseminate environmental data from fixed and mobile sensors worldwide. This new satellite will become part of the Argos constellation supported by the NOAA Cooperative Data and Rescue Services Program. Argos is an international program that collects data from thousands of fixed and mobile sensors and transmitters located around the world. Data is collected and distributed for use in numerous applications, including ocean buoy tracking, wildlife and fishery monitoring, and maritime security, as well as non-environmental uses.



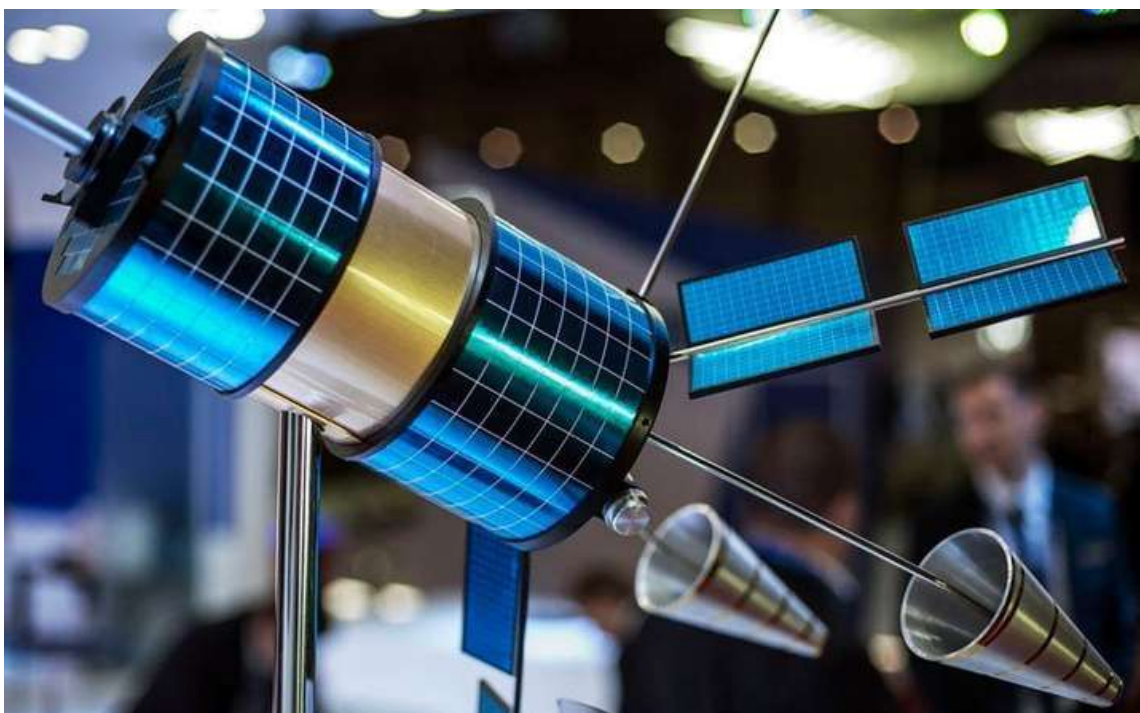
THE FIRST LAUNCH OF THE GONETS SATELLITES IS SCHEDULED FOR OCTOBER 22

The exact timing of the launch will depend on the readiness of the Skif-D spacecraft.

The launch of three spacecraft of Gonets-M family, from the Vostochny-Geomenia cosmodrome, is tentatively planned for October 22. This was announced by Gomets satellite systems.

These satellites are the foundation of the Gonets-D1M personal communication platform. It provides transmission of data and support for mobile-based businesses to the public, globally. The Gonets-D1M infrastructure consists of ground stations in Moscow, Yuzhno-Sakhalinsk and Zheleznogorsk (Krasnoyarsk Territory). The platform helps to communicate with difficult regions, and organize data transmission in the interest of different departments, such as industrial, environmental, scientific, and environmental monitoring.

According to TASS, the timing of the launch of new satellites Gonets-M will depend on the readiness of the first apparatus of the Sphere group Skif-D, which is being developed under the naming of JSC Information Satellite Systems. M.F. Reshetnev.



Gonets-M-communication-satellites

The previous launch of the Gonets spacecraft took place in December 2020 from the Plesetsk cosmodrome in the Arkhangelsk region.

Gonets is the only Russian low-orbit mobile satellite communication system designed for global information exchange with mobile and stationary objects, as well as for the organization of retransmission channels for various purposes.

The state corporation Roskosmos reported that the Fregat area, which was designed to launch Gonets-M communication devices and the Skif-D demonstration satellite for broadband Internet access, has already arrived at Vostochny. Now specialists will have to carry out a whole cycle of electrical and pneumovacuum tests with Fregat.



ROSCOSMOS to launch a Soyuz 2.1a rocket for Progress MS-21 (82P)

Lift Off Date: October 26, 2022

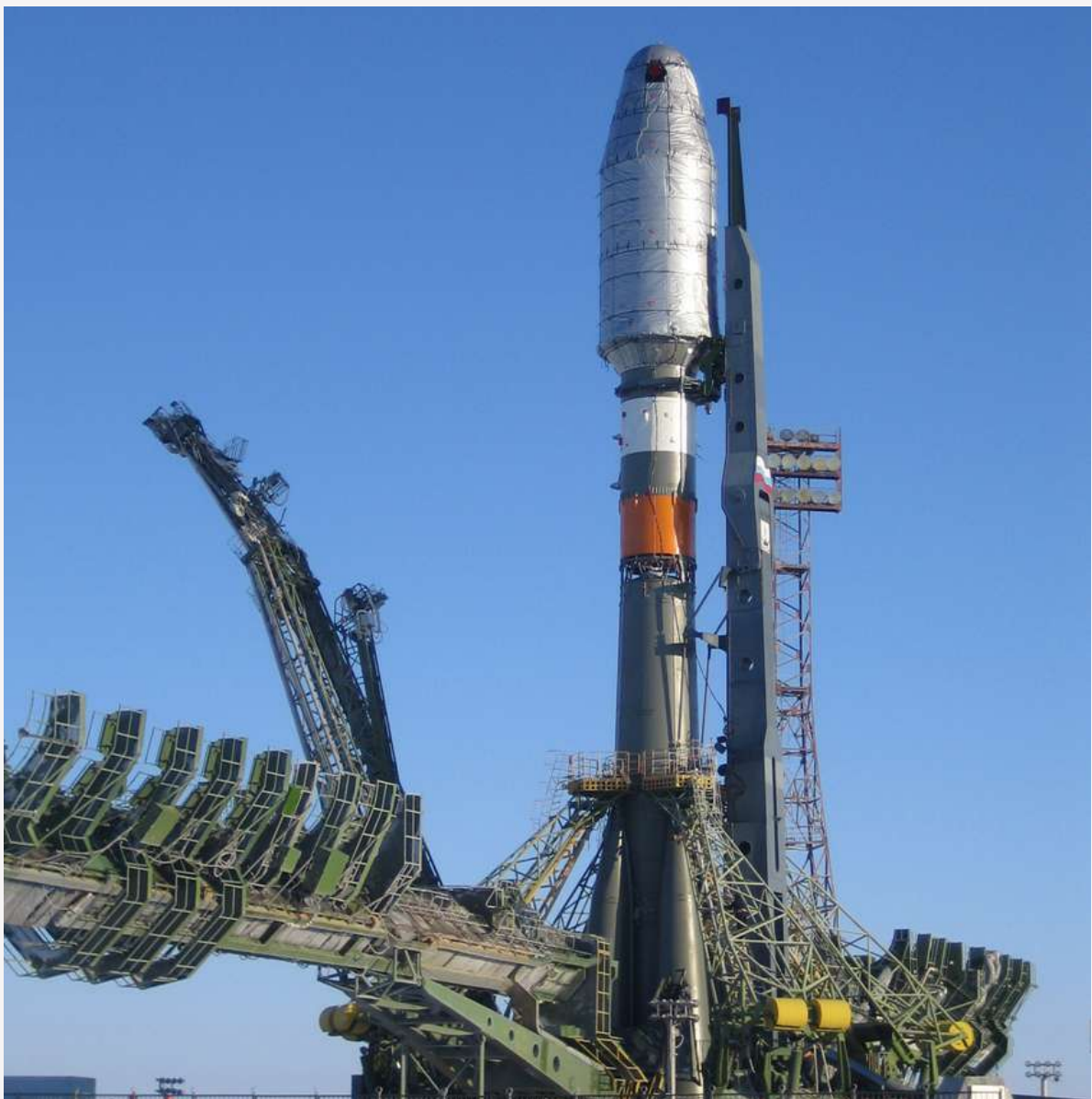
Russian Federal Space Agency (ROSCOSMOS) is scheduled to launch a Soyuz 2.1a rocket as part of the Progress MS-21 (82P) mission. The launch window for the Resupply mission is on 10/26/2022 from Baikonur Cosmodrome, Republic of Kazakhstan.

Mission: Progress MS-21 (82P)

Progress resupply mission to the International Space Station.

Rocket: Soyuz 2.1a

The Soyuz 2.1A converted the flight control system from analog to digital, which allowed launch from fixed platforms. It also allowed big fairings and payloads.



Soyuz 2.1a rocket, built by Russian Federal Space Agency.

Agency: Russian Federal Space Agency (ROSCOSMOS)

The Roscosmos State Corporation for Space Activities, commonly known as Roscosmos, is the governmental body responsible for the space science program of the Russian Federation and general aerospace research. Soyuz has many launch locations the Russian sites are Baikonur, Plesetsk and Vostochny however Ariane also purchases the vehicle and launches it from French Guiana.

SpaceX Launches - October 2022

SPACEX INTELSAT GALAXY 33 & GALAXY 34

The Galaxy series is a family of communications satellites initially developed and operated by Hughes Communications. It has since merged with PanAmSat and is now owned and operated by Intelsat. As one of the earliest geostationary satellites, Galaxy 1 was launched on 28 June 1983. The latest, Galaxy 30, was launched on 15 August 2020. SpaceX will launch with a Falcon 9 Block 5 rocket, the Galaxy 33 & 34 satellites, built by Northrop Grumman and owned by Intelsat. The launch is scheduled for October 5 and the booster will land on an autonomous drone ship located in the Atlantic Ocean. The launch presents SpaceX's 181st mission in total and the 46th of 2022.



EUTELSAT HOTBIRD 13F MISSION - OCTOBER 13

SpaceX is scheduled to launch a Falcon 9 rocket as part of the Eutelsat Hotbird 13F Mission. The launch window for this mission is on 13th October 2022 from Cape Canaveral SFS, Florida, USA.

Mission: Eutelsat Hotbird 13F

Hotbird 13F and 13G are two high-power direct home communications satellites to replace Hotbird 8, 9 and 10 at Eutelsat's 13° East position.

Hotbird 13F and 13G were ordered in August 2018 from Airbus Defence and Space, based on the new Eurostar-Neo bus with a launch mass of 4.5 tons and electric power of 22 kW. They have all-electric propulsion, allowing an increase in payload. The two new satellites provide the same amount of Ku-band capacity as the current trio of Hotbird satellites, with increased resistance to signal jamming.



STARLINK SATELLITE SERIES

Starlink Group 4-29 | Starlink Group 4-36 | Starlink Group 4-37

SpaceX will launch 3 more batches of Starlink satellites in the month of September for their high-speed low earth orbit internet constellation on Falcon 9 Block 5 rocket from Space Launch Complex 4, Vandenberg Space Force Base, California.

Starlink Group 4-29: Tuesday • October 4, 2022

Falcon 9 Block 5 | Cape Canaveral, Florida | Date may change

Starlink Group 4-36: Thursday • October 20, 2022

Falcon 9 Block 5 | Cape Canaveral, Florida | Date may change

Starlink Group 4-37: End of October 2022

Falcon 9 Block 5 | Cape Canaveral, Florida | Date may change

SPACEX'S SATELLITES CAUSE 1,600 NEAR-COLLISIONS EACH WEEK



Elon Musk's SpaceX might be breaking the barriers here on Earth but it will most probably break up satellites in space in the near future. In a bid to offer high-speed internet, SpaceX is launching thousands of minisatellites in what is already a crowded space. The number of close shaves is on the rise and the problem will intensify in the near future.

According to estimates from the European Space Agency, there are 7,520 satellites that are currently in space. As these fly around their orbits, they are bound to encounter other satellites. A close encounter is when two flying objects come within a distance of 0.6 miles (1 km) of each other.

The Satellite Orbital Conjunction Reports Assessing Threatening Encounters in Space (SOCRATES) database keeps a track of the movement of satellites as well as space debris to assess their collision risk. When they seem to be in a close encounter, it sends an alert to satellite operators who then make appropriate manoeuvres to avoid a collision.

With the acute increase in the number of satellites going up due to the **Starlink program**, the number of close encounters has dramatically increased in the past two years according to Hugh Lewis, an expert in space debris at the University of Southampton. Among themselves, the Starlink satellites have 1,600 close encounters every week. They also account for 500 encounters with other satellites in space.

The problem is further compounded by two factors. The first one is that, even with 1,740 satellites launched, SpaceX is still in the initial stages of its program that is expected to launch 12,000 satellites during its decade-long first-generation phase. Secondly, Starlink satellites are designed to avoid collisions autonomously. Therefore, when at risk, the satellites simply change their course and enter a new trajectory, which other satellites are not aware of.

PLANNED INDIAN LAUNCHES

PSLV-XL will Launch Aditya L1

The Aditya-L1 mission will be inserted in a halo orbit around the L1, which is about 1.5 million km from the Earth. The 1,500 kg class satellite carries a total of seven payloads with diverse objectives, including but not limited to, the coronal heating problem, solar wind acceleration, coronal magnetometry, origin and monitoring of near-UV solar radiation (which drives Earth's upper atmospheric dynamics and global climate), coupling of the solar photosphere to chromosphere and corona, in-situ characterizations of the space environment around Earth by measuring energetic particle fluxes and magnetic fields of the solar wind and solar magnetic storms that have adverse effects on space and ground-based technologies.

Location: Second Launch Pad, Satish Dhawan Space Centre, India.



GSLV Mk III to launch OneWeb 14

October 2022

In the wake of new European sanctions, Roscosmos head Dmitry Rogozin announced the suspension of the OneWeb launch campaigns. This situation will last as long as "there are no guarantees that this system [OneWeb] will be used only for civilian purposes," Rogozin said.

Roscosmos gave an ultimatum to OneWeb, stating that this guarantee must be confirmed before March 4, otherwise, the satellites and the launcher will be taken back to the assembly building, and disassembled. OneWeb declared in response to suspend all launches from Baikonur. On April 20, OneWeb announced that part of its future launches will be performed by ISRO starting in late 2022.

Location: Second Launch Pad, Satish Dhawan Space Centre, India.

EOS-06 by PSLV-CA

EOS-06, also named Oceansat-3A, is an Indian satellite designed to provide service continuity for operational users of the Ocean Colour Monitor (OCM) instrument on Oceansat-2. It will also enhance the potential of applications in other areas. The main objectives of OceanSat-3A are to study surface winds and ocean surface strata, observation of chlorophyll concentrations, monitoring of phytoplankton blooms, and study atmospheric aerosols and suspended sediments in the water.

Location: First Launch Pad, Satish Dhawan Space Centre, India.



NASA Delays SpaceX Crew-5 Launch Due to Hurricane Ian

Hurricane Ian's fury has postponed NASA's plan to send a fresh four-person crew to the International Space Station (ISS) on a SpaceX rocket. The agency announced on 27th September that its Crew-5 mission has been pushed back by at least a week and will now launch no earlier than October 4th.

"Mission teams will continue to monitor the impacts of Ian on the Space Coast and NASA's Kennedy Space Center in Florida and could adjust the launch date again, as necessary," NASA said in a blog post. "The safety of the crew, ground teams, and hardware are of the utmost importance to NASA and SpaceX."

Crew-5 is being sent to replace the astronauts of Crew-4, who will be returning to the orbiting outpost after a six-month stay. NASA astronauts Kjell Lindgren, Robert Hines, and Jessica Watkins, as well as European astronaut Samantha Christoforetti, arrived at the ISS on April 28. The Crew-5 mission would be historic in that it would see the first Russian cosmonaut (Kikina) board a commercial US spacecraft bound for the International Space Station. Kikina, who is preparing for her first mission, is Russia's only active cosmonaut, and she would be the first Russian woman to travel in an American-made spacecraft. Her journey is part of an agreement between NASA and Roscosmos under which the latter will also send a NASA astronaut aboard a Soyuz capsule.

These crew members will launch from NASA's Kennedy Space Center's Launch Complex 39A in the Dragon spacecraft "Endurance" atop a Falcon 9 rocket from SpaceX.



About the Crew-5 team members

Nicole Mann: Mann, who was chosen by NASA in 2013, is a Marine Corps colonel who has served as a test pilot for the F/A-18 Hornet and Super Hornet. She has also served on aircraft carriers twice in support of combat operations in Iraq and Afghanistan.

Koichi Wakata: Wakata will go on his fifth space mission after previously serving on long-duration ISS missions such as Expeditions 18, 19, and 20. He travelled into space on the STS-72 satellite retrieval mission in 1996, and again on the STS-92 ISS building mission in 2002.

Anna Kikina: Kikina was chosen as a Roscosmos cosmonaut candidate in 2012 and was added to the Roscosmos cosmonaut corps in 2014. As flight engineer No. 1, she participated in the SIRIUS international isolation experiment in 2017, which replicates a lunar mission and related experiments on the lunar surface. Kikina is a licenced airborne instructor with 153 parachute jumps. She is a Master of Sports in polyathlon and rafting.

Josh Cassada: Cassada, a physicist and US Navy test pilot, was also chosen by NASA in 2013. He received his B.A. in Physics from Albion College and his Ph.D. in Experimental High Energy Physics from the University of Rochester, where he worked at the Fermi National Accelerator Laboratory. Cassada has over 4,000 flight hours in 45 different aircraft after working as an instructor at the US Naval Test Pilot School.



(Image credit: ulalaunch.Com)

ULA Atlas V SES 20 & SES 21

Launch Date: October 5th, 2022

Mission Overview

SES-20 & SES-21 are a pair of C-band communication satellites built by Boeing, using the highly efficient all-electric propulsion BSS-702SP satellite bus.

These satellites will enable SES to clear 280MHz of mid-band spectrum for 5G use while seamlessly migrating SES's existing C-band customers and ensuring the continued delivery of digital television to nearly 120 million American TV homes and other critical data services.

Rocket: The Atlas V 531 was manufactured by United Launch Alliance with the first launch on. Atlas V 531 has 4 successful launches and 0 failed launches with a total of 4 launches. Atlas V with 5m Fairing, 3 SRB, 1 Centaur upper stage engine.

Agency: United Launch Alliance (ULA) is a joint venture of Lockheed Martin Space Systems and Boeing Defense, Space & Security. ULA was formed in December 2006 by combining the teams at these companies which provide spacecraft launch services to the government of the United States. ULA launches from both coasts of the US. They launch their Atlas V vehicle from LC-41 in Cape Canaveral and LC-3E at Vandenberg. Their Delta IV launches from LC-37 at Cape Canaveral and LC-6 at Vandenberg.

****Note: Launch dates of missions are scheduled to be launched in October 2022 but may subject to change.**

ASTRONOMICAL EVENTS - OCTOBER 2022

PARTIAL SOLAR ECLIPSE

We are lucky to have a Partial Solar Eclipse on 25 October 2022, this is the second partial solar eclipse of 2022. It is visible from most of Europe, northern Africa, the Middle East, and western parts of Asia. This is the last eclipse of this decade which can be seen from India, so don't miss it.



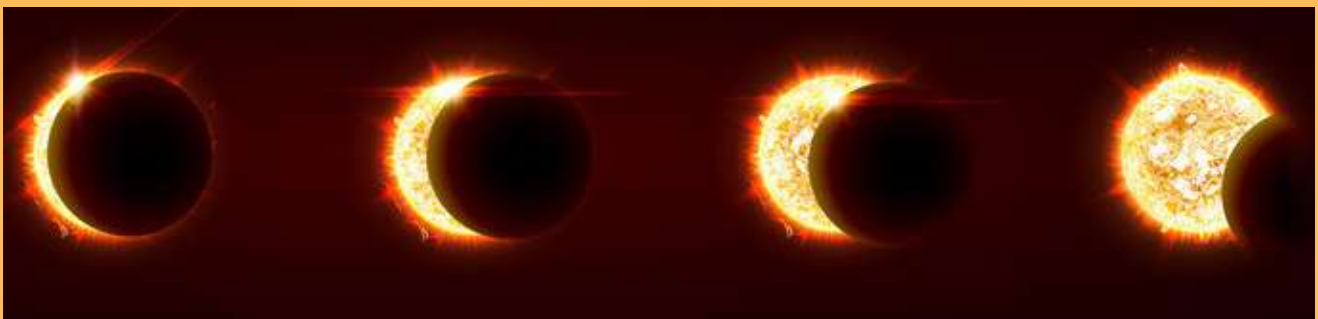
"This eclipse is a member of a semester series. An eclipse in a semester series of solar eclipses repeats approximately every 177 days and 4 hours (a semester) at alternating nodes of the Moon's orbit"

Moon, constellation, saros

This is 4.2 days before the moon reaches perigee, meaning the point nearest to Earth in its orbit. During the eclipse, the sun is in the constellation Virgo.

The Saros catalog describes the periodicity of eclipses. This October 25 partial eclipse belongs to Saros 124.

Solar eclipses of Saros 124 all occur at the Moon's descending node and the Moon moves northward with each eclipse. The series began with a partial eclipse in the southern hemisphere on 1049 Mar 06. The series will end with a partial eclipse in the northern hemisphere on 2347 May 11. The total duration of Saros series 124 is 1298.17 years.



An Eclipse Never Comes Alone!

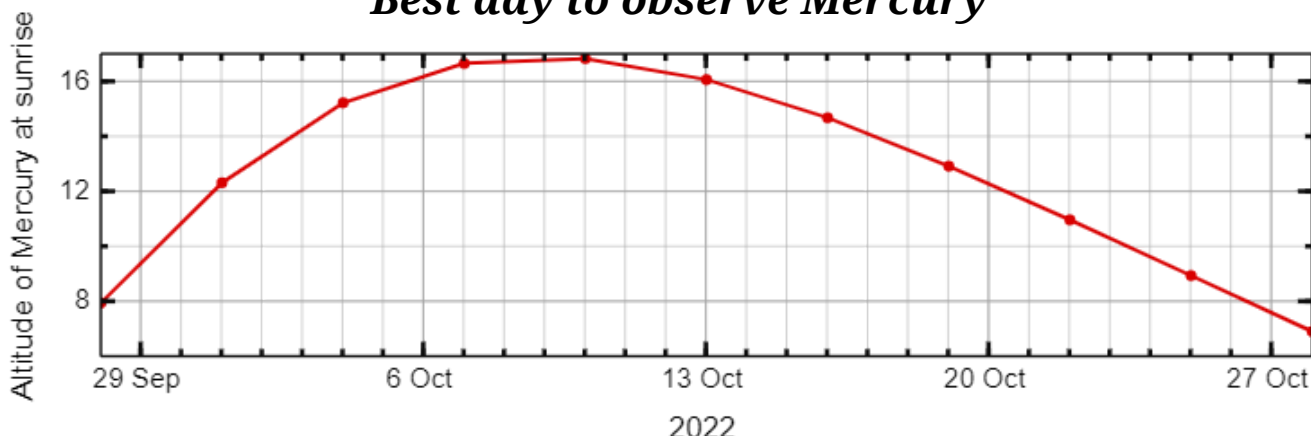
A solar eclipse always occurs about two weeks before or after a lunar eclipse.

Usually, there are two eclipses in a row, but other times, there are three during the same eclipse season.

This will be the first eclipse this season. Second eclipse of this season will be on 8th November 2022 - Total Lunar Eclipse.

MERCURY AT GREATEST WESTERN ELONGATION

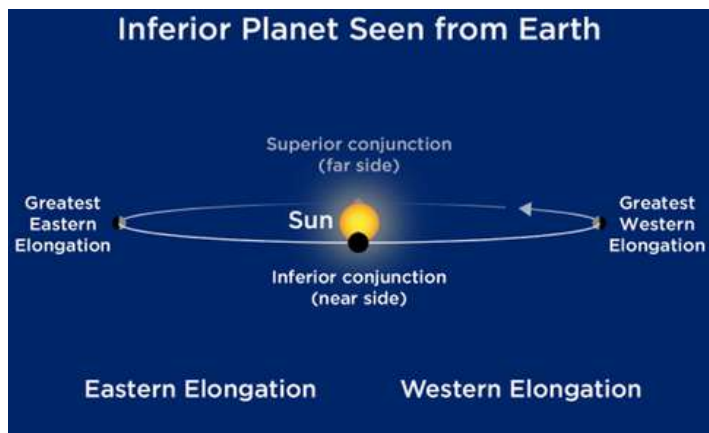
Best day to observe Mercury



(Image credit: Earthsky.org)

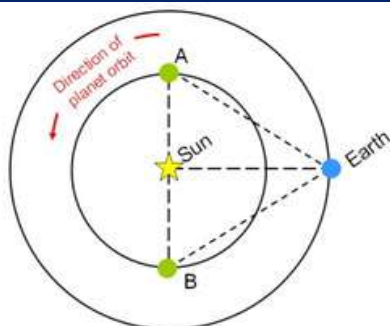
What's Elongation

Astronomers use the word elongation to describe the angular distance - the distance on the sky's dome - between the sun and one of the inner planets in our solar system, Mercury or Venus. Elongations are measured in degrees eastward or westward of the sun. Greatest elongations signal the best time to observe one of the inner planets. At greatest elongation, Venus or Mercury is typically farthest from the sun's glare.



Greatest Western Elongation

On October 08, 2022 Beginning the last few days of September, start watching for Mercury in the eastern sky before sunrise. Greatest elongation - when Mercury will be farthest from the sunrise on our sky's dome - is on October 8. Then afterwards the planet will continue brightening. So, later in October, although it'll be edging back toward the sunrise, Mercury will be easier to see in the morning twilight.



The position of an inferior planet at greatest western elongation (position A) and greatest eastern elongation (position B). In both cases, the elongation measured is less than 90 degree.

"Maximum & Minimum Angular distance of Mercury from the sun (seen from the Earth) at greatest elongation are 28 & 18degrees respectively."

ORIONID METEOR SHOWER

About the Meteor Shower

The Orionids, which peak during mid-October each year, are considered to be one of the most beautiful showers of the year. Orionid meteors are known for their brightness and for their speed. These meteors are fast – they travel at about 148,000 mph (66 km/s) into Earth's atmosphere. Fast meteors can also sometimes become fireballs: Look for prolonged explosions of light when viewing the Orionid meteor shower. The Orionids are also framed by some of the brightest stars in the night sky, which lend a spectacular backdrop for these showy meteors.

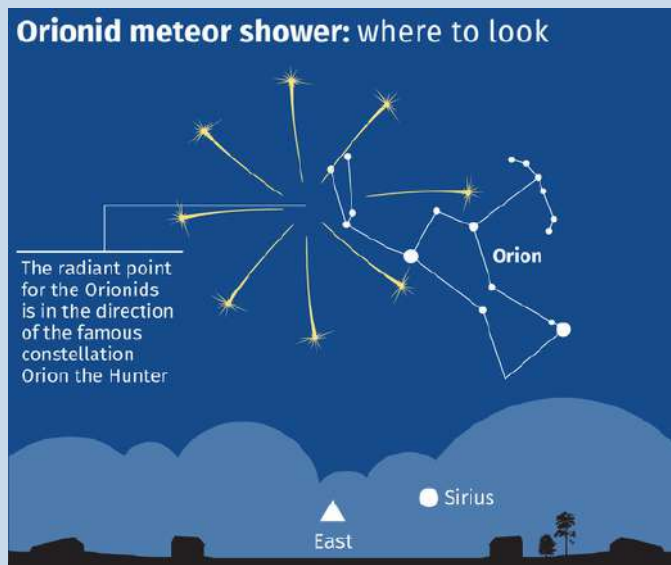
Viewing Tips

The Orionids are viewable in both the Northern and Southern hemispheres during the hours after midnight. Find an area well away from the city or street lights. Come prepared with a sleeping bag, blanket, or lawn chair. Lie flat on your back with your feet facing southeast if you are in the Northern Hemisphere or northeast if you are in the Southern Hemisphere, and look up, taking in as much of the sky as possible. In less than 30 minutes in the dark, your eyes will adapt and you will begin to see meteors. Be patient – the show will last until dawn, so you have plenty of time to catch a glimpse.

Peak date: October 21, 2022.

Overall duration of shower: September 26 to November 22.

Radiant: The radiant rises before midnight and is highest in the sky around 2 a.m.



(Image credit: Press Association Images)



(Image credit: Explorersweb)

The parent comet of the Orionid meteor shower

The pieces of space debris that interact with our atmosphere to create the Orionids originate from comet 1P/Halley. Each time that Halley returns to the inner solar system its nucleus sheds ice and rocky dust into space. The dust grains eventually become the Orionids in October and the Eta Aquarids in May if they collide with Earth's atmosphere.

Comet Halley takes about 76 years to orbit the Sun once. The last time comet Halley was seen by casual observers was in 1986. Comet Halley will not enter the inner solar system again until 2061.

Comet Halley's dimensions are 16 x 8 x 8 km. It is one of the darkest, or least reflective, objects in the solar system, with an albedo of 0.03.



(Halley's comet. Image credit: Australian Observatory Siding spring)

CONJUNCTIONS FOR THE MONTH

Conjunction - Occasionally two or more objects meet up with each other in our sky. Astronomers use the word conjunction to describe these meetings. Technically speaking, objects are said to be in conjunction in that instant when they have the same right ascension on our sky's dome. Practically speaking, objects in conjunction will likely be visible near each other for some days.

The word conjunction comes from Latin, meaning to join together. Maybe you remember the old Conjunction Junction cartoons from the 1970s. In language, conjunctions relate to clauses brought together in sentences with words like and. In astronomy, conjunctions relate to two or more objects brought together in the sky.

An astronomical conjunction describes a few different types of meetings. The first two types we're describing here - inferior and superior conjunctions - involve the sun and thus can't be seen.

Conjunction of Moon with Saturn

On **October 5, 2022**, Moon and Saturn will be very close to together in Early evening sky. The Moon is at a magnitude of -11.61, and Saturn at a magnitude of 0.56.



Close encounter of Moon and Jupiter

On **October 8, 2022**, Moon and the giant planet Jupiter will be very close to together in Early evening sky. The Moon is at a magnitude of -12.74, and Jupiter at a magnitude of -2.92.



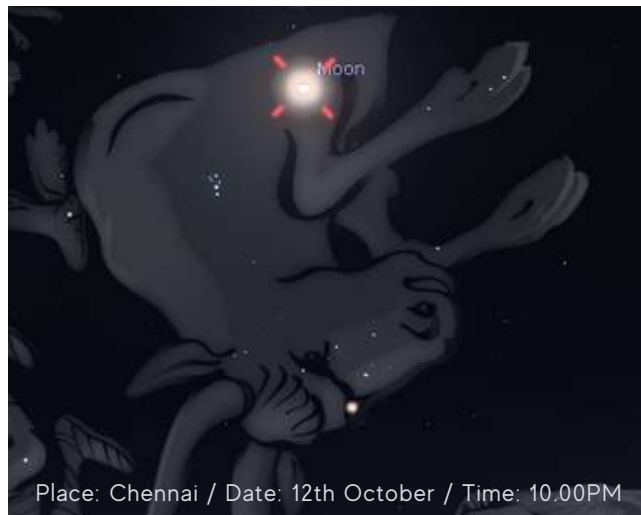
Conjunction of Gibbous Moon with Mars

On the late evenings of October 14, Mars is the bright object near the waning gibbous moon. They will be in the northeast as night begins and will cross the sky throughout the night, following the same path the sun travels during the day.



Conjunction of Moon and Pleiades

Date: 12th October, Moon will have a closer approach with the open star cluster Pleiades. The Moon is at a magnitude of -11.83, and Pleiades at a magnitude of 3.88. They will be in the northeast as night begins and will cross the sky throughout the night.



WORLD SPACE WEEK 2022

WHAT IS WORLD SPACE WEEK?

The United Nations General Assembly declared in 1999 that World Space Week (WSW) will be held each year from October 4-10. The dates were in recognition of the October 4, 1957 launch of the first human-made Earth satellite, Sputnik 1, thus opening the way for space exploration and the October 10, 1967 signing of the Treaty on Principles Governing the Activities of States in the Exploration and Peaceful Uses of Outer Space, including the Moon and Other Celestial Bodies.

World Space Week is an international celebration of science and technology and their contribution to the betterment of the human condition. World Space Week aims to:

- Provide unique leverage in space outreach and education
- Educate people around the world about the benefits that they receive from space
- Encourage greater use of space for sustainable economic development
- Demonstrate public support for space programs
- Excite young people about science, technology, engineering, and math
- Foster international cooperation in space outreach and education



The Association's Board each year selects a theme for World Space Week to provide a focus of the activities and events that take a place in over 80 nations during 4-10 October. WSW event organizers are encouraged to incorporate the theme into their activities and promotional materials.

The 2022 World Space Week theme, "**Space and Sustainability**" allows World Space Week to address sustainability from two angles:

1. How space benefits society and contributes to sustainable development on Earth.
2. What are the challenges ahead of us to keep space activities and the space environment safe and sustainable.



WORLD SPACE WEEK 2021

The 2021 theme of World Space Week is "Women in Space." With this theme, we will bring more awareness to the issue of gender diversity in the space sector and identify the obstacles that women are facing when entering space-related careers and contribute to discussions on how we can overcome these challenges. According to reports, 20-22 percent of the entire space industry workforce consists of women. We are mindful of women from different backgrounds and from different regions facing different issues, and we are aiming to shed light on this difference.

UNOOSA is working to promote women's empowerment in space. Through the Space4Women project, we are ensuring that space benefits reach women and girls and that they play an active and equal role in space science, technology, innovation and exploration.

STUDENT'S CORNER

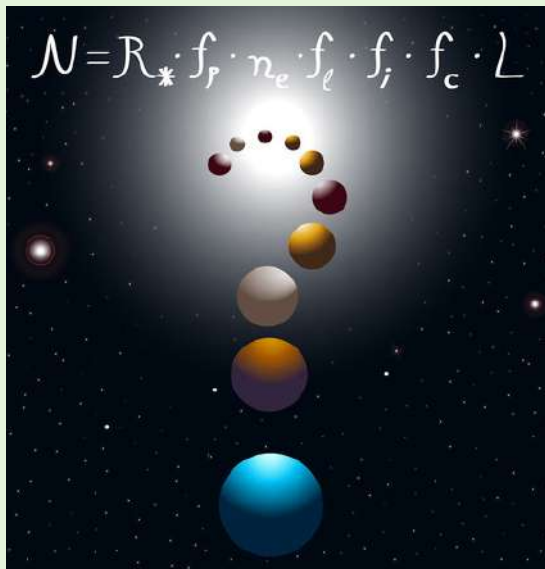
The Drake Equation

Sourajit Mandal

iAstronomer member, Space India.

"Other intelligent life-forms will differ in appearance - they may resemble the creature in E.T. or startle us with their beauty - but life itself is common, I am certain".

- Frank Drake



The possibility to contact other civilizations

The possibility of communicating to other cosmic civilizations is exciting. This is one of the reasons why legendary films like Alien (1979), A space odyssey (1968), Arrival II (2016), E.T The Extra-Terrestrial (1982) and District 9 (2009) got so much popularity. These films not only excite the common people but also the scientists. One such scientist was Dr. Frank Drake. He was born on May 28, 1930, in Chicago, Illinois, the U.S. He showed an early interest in Electronics and Chemistry. He first considered the possibility of alien life on other planets as an eight-year-old boy after guessing the fact that if human civilization was a matter of chance, then civilizations might exist on other planets in the universe as well.

Most people try to approach the possibility of contacting alien civilizations qualitatively. Drake was the first person who tried to quantify the number of civilizations. His quantitative approach led to the publications of the Drake equation in 1961.

Search for extraterrestrial intelligence

The Drake equation is used to approximate the number of communicating extraterrestrial civilizations that might exist within the Milky Way today. It helps us understand what we need to know to figure out the likelihood of finding other civilizations. The Drake equation was proposed to stimulate scientific discussion at the first meeting for SETI (Search for extraterrestrial intelligence). Even though it is just an approximation and is not a precise number, it forms the base for astrobiology.

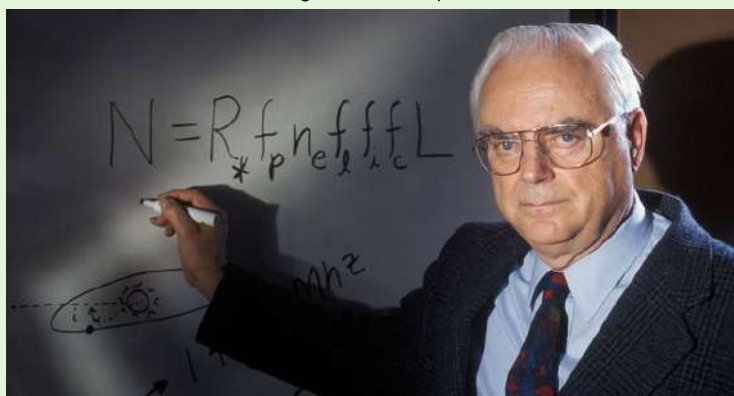
The Drake equation is

$$N = R_* \times f_p \times n_e \times f_l \times f_i \times f_c \times L$$

It states seven factors like:

- Number of technologically advanced civilizations in the Milky way.
- Rate of star formation in the galaxy.
- Fraction of those stars with planetary systems.
- Number of planets per solar system that can support life.
- Number of planets that develop life.
- The fraction of planets that develop intelligent life
- The fraction of planets that develops a technology that releases detectable signs of their existence
- The duration of time for which such civilizations release detectable signals into space

The Drake equation has motivated thousands of scientists to try to contact to alien life. It is also probably the motivation for the discoveries of thousands of exoplanets and stars. Even though the Drake equation cannot give us a correct estimate for the number of planets with alien life but, certainly it gives countless scientists a motivation for searching. This year September 2nd Dr. Frank Drake passed away at the age of ninety-two. His work is always going to keep reminding us about him and motivate us to contact other civilizations.

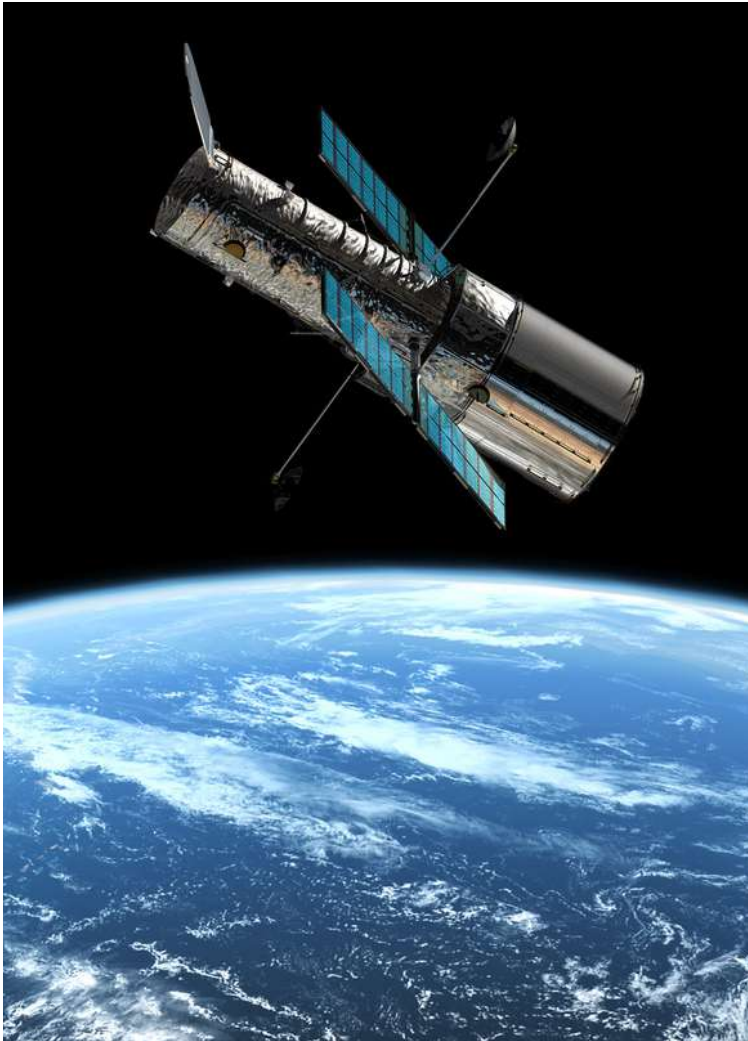


(Dr. Frank Drake. Image Credits: NGC)

Hubble Space Telescope

Daksh Rathi

iAstronomer member.



Named in honour of the trailblazing astronomer Edwin Hubble, the Hubble Space Telescope is a large, space-based observatory, which has revolutionized astronomy since its launch and deployment by the space shuttle Discovery in 1990. Far above rain clouds, light pollution, and atmospheric distortions, Hubble has a crystal-clear view of the universe. Scientists have used Hubble to observe some of the most distant stars and galaxies are yet seen, as well as the planets in our solar system.

Hubble's capabilities have grown immensely in its over 30 years of operation. This is because new, cutting-edge scientific instruments have been added to the telescope over the course of five astronaut servicing missions. By replacing and upgrading ageing parts, these servicing missions have significantly extended the telescope's lifetime.

Telescopes have a particular range of light that they can detect. Hubble's domain extends from the ultraviolet through the visible (which our eyes see) and into the near infrared.

This range has allowed Hubble to deliver stunning images of stars, galaxies, and other astronomical objects that have inspired people worldwide and changed our understanding of the universe.

Hubble has made more than 1.5 million observations over the course of its lifetime. Over 19,000 peer-reviewed scientific papers have been published on its discoveries, and every current astronomy textbook includes contributions from the observatory. The telescope has tracked interstellar objects as they soared through our solar system, watched a comet collide with Jupiter, and discovered moons around Pluto. It has found dusty disks and stellar nurseries throughout the Milky Way that may one day become fully fledged planetary systems and studied the atmospheres of planets that orbit other stars. Hubble has peered back into our universe's distant past, to locations more than 13.4 billion light-years from Earth, capturing galaxies merging, probing the supermassive black holes that lurk in their depths, and helping us better understand the history of the expanding universe.

Hubble released an image on 10 September 2022 of 2 galaxies colliding and below is the picture,



(Image Credits: Nasahubble)

In its over 30 years of operation, Hubble has made observations that have captured humanity's imaginations and deepened our knowledge of the cosmos. It will continue to do so for years to come.



THE ARTEMIS PROGRAM

Vetrivel V
iAstronomer member.

Between 1968 and 1972, America launched 9 human missions to the Moon, 6 of which successfully touched down, allowing 12 men to walk on the lunar surface. NASA's next chapter of lunar exploration, called Artemis, has the task of not just going to the Moon, to create a long-term human presence on and around it, but also to prepare for ever-more-complex human missions to Mars. In short, everything we must be able to do here, we must first do here.

The plan and the reason behind the name: By 2024, NASA will land the first woman and next man on the Moon, the first step to sustainably working and living on a world other than our home planet by 2028. Star Wars actress Kelly Marie Tran narrates in a NASA video introducing the Artemis Mission, named for the Greek goddess who was a huntress and the patron and protector of girls.

Apollo, the Greek god who inspired the name of the 1968-1972 Project Apollo missions to the moon, was Artemis' twin.

The Artemis Mission will combine the Orion spacecraft, the SLS or Space Launch System, the most powerful rocket in the world, an orbiting lunar outpost called The Gateway, modern lunar landers for human transport, and "Artemis-generation" spacesuits.



Along with Artemis 1, NASA will send ten small satellites they call these cube sats. They use it for ten different works. In that one for lunar surface infrared imaging, one to search the landing place, one cube sat will search where is ice or water particles. Another satellite will go near an asteroid named Bennu that satellite research about it because Bennu asteroid comes near our earth.



No humans are going to with the Artemis 1 mission but the Artemis-2 program will happen in 2024. It will have two people and they take a big payload. In 2025 Artemis-3 will go to space, in this mission four persons will go near the moon. Among the four, one will be a girl. This will mark the first women to land on the moon. Also, on the moon's south pole they are going to build a moon base since the southern part of the moon is rich in ice cubes, they can convert it into water. After the lunar missions, Nasa planned to go to mars within 2035.

DESIGNED FOR DEEP SPACE SPACE LAUNCH SYSTEM



THE ONLY ROCKET BUILT TO SEND MORE THAN 57,000 POUNDS TO DEEP SPACE

INTERIM CRYOGENIC PROPULSION STAGE

ONE RL10 ENGINE PROVIDES OVER 20,000 POUNDS OF THRUST TO SEND MORE THAN 26 METRIC TONS TO THE MOON THAT INCLUDES ORION, ASTRONAUTS AND SUPPLIES.

CORE STAGE

212-FOOT TALL STAGE HOLDS 733,000 GALLONS OF PROPELLANT TO POWER 4 RS-25 ENGINES FOR 8 MINUTES, SENDING THE ROCKET TO SPACE SOARING AT 17,000 MPH.

SOLID ROCKET BOOSTERS

EACH 17-STORY-TALL BOOSTER GENERATES 3.6 MILLION POUNDS OF THRUST, PROVIDING 75 PERCENT OF TOTAL THRUST DURING THE SLS ROCKET'S FIRST TWO MINUTES OF FLIGHT.

ORION SPACECRAFT

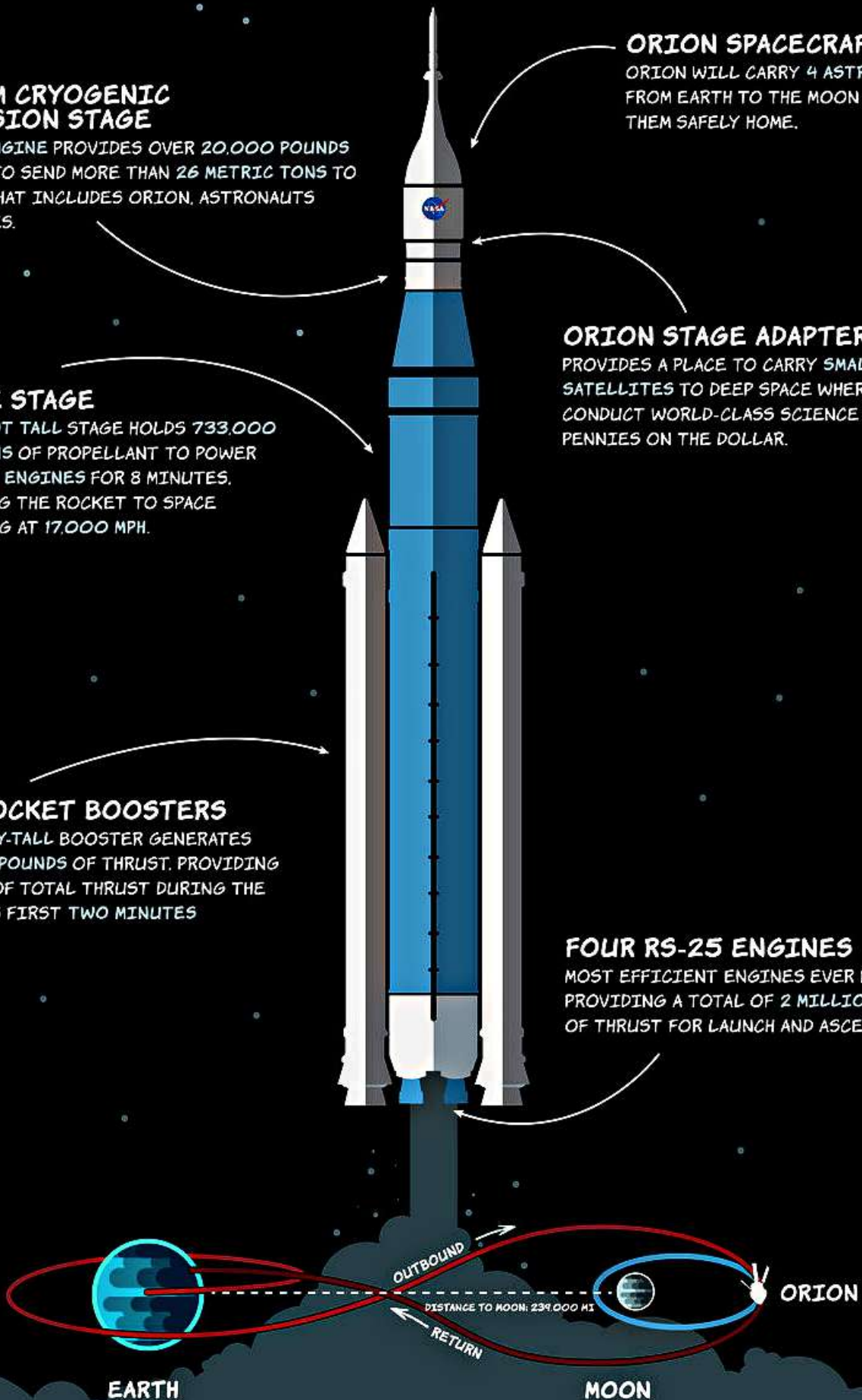
ORION WILL CARRY 4 ASTRONAUTS FROM EARTH TO THE MOON AND BRING THEM SAFELY HOME.

ORION STAGE ADAPTER

PROVIDES A PLACE TO CARRY SMALL SATELLITES TO DEEP SPACE WHERE THEY CONDUCT WORLD-CLASS SCIENCE FOR PENNIES ON THE DOLLAR.

FOUR RS-25 ENGINES

MOST EFFICIENT ENGINES EVER BUILT, PROVIDING A TOTAL OF 2 MILLION POUNDS OF THRUST FOR LAUNCH AND ASCENT TO SPACE.



EARTH

MOON

ORION



ASTROPHOTOGRAPHS BY STUDENTS



Daksh Rathi
iAstronomer member.



Vetrivel Thirunavukkarasu
iAstronomer member.



Prasanna Kollu
iAstronomer member.



Vani Goyal
iAstronomer member.

ASTROPHOTOGRAPHS BY SPACE



The above Milkyway galaxy arm picture was captured by SPACE Educator Mr. Ranjith Kumar.

HISTORICAL EVENTS HAPPENED IN OCTOBER

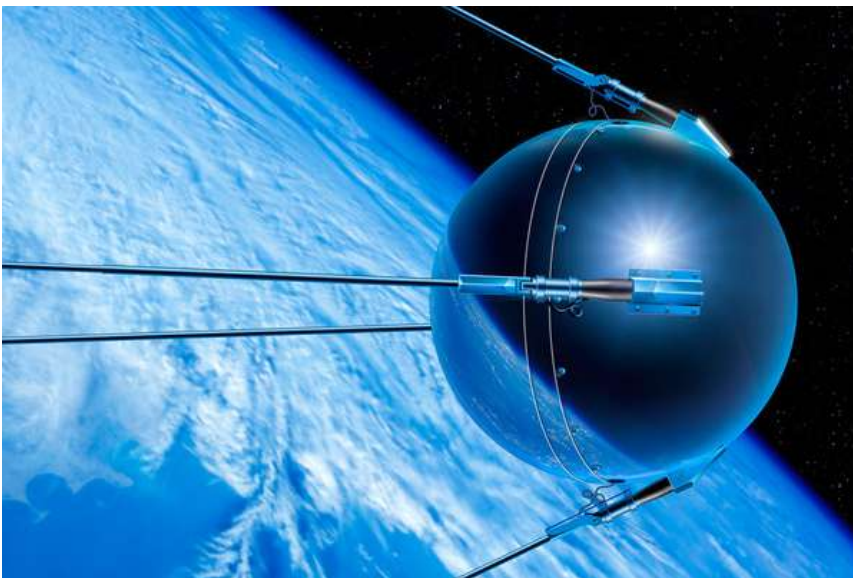
Sputnik & the Dawn of the Space Age

History changed on October 4, 1957, when the Soviet Union successfully launched Sputnik I. The world's first artificial satellite was about the size of a beach ball (58 cm in diameter), weighed only 83.6 kg. or 183.9 pounds, and took about 98 minutes to orbit Earth on its elliptical path. That launch ushered in new political, military, technological, and scientific developments. While the Sputnik launch was a single event, it marked the start of the space age and the United States and the Soviet Union space race. The Russian word "Sputnik" means "companion" ("satellite" in the astronomical sense).

In 1885 Konstantin Tsiolkovsky first described in his book, *Dreams of Earth and Sky*, how such a satellite could be launched into a low-altitude orbit. It was the first in a series of four satellites as part of the Sputnik program of the former Soviet Union and was planned as a contribution to the International Geophysical Year (1957-1958). Three of these satellites (Sputnik 1, 2, and 3) reached Earth's orbit.

The primary scientific aim of Sputnik 1 was to test if it was possible to place a satellite into orbit. But despite its simplicity, it also provided other scientific opportunities. Sputnik made it possible to test satellite pressurisation, study radio wave transmission and the density of the atmosphere, and allowed scientists to learn how to track objects in orbit.

The Sputnik 1 satellite was a 58.0 cm-diameter aluminum sphere that carried four whip-like antennas that were 2.4-2.9 m long. The antennas looked like long "whiskers" pointing to one side. The spacecraft obtained data pertaining to the density of the upper layers of the atmosphere and the propagation of radio signals in the ionosphere.



Since the sphere was filled with nitrogen under pressure, Sputnik 1 provided the first opportunity for meteoroid detection (no such events were reported), since losses in internal pressure due to meteoroid penetration of the outer surface would have been evident in the temperature data. The satellite transmitters operated for three weeks, until the onboard chemical batteries failed, and were monitored with intense interest around the world. The orbit of the then inactive satellite was later observed optically to decay 92 days after launch (January 4, 1958) after having completed about 1400 orbits of the Earth over a cumulative distance travelled of 70 million kilometres. The orbital apogee declined from 947 km after launch to 600 km by Dec. 9th.

Where it is now?

The Sputnik 1 rocket booster also reached Earth orbit and was visible from the ground at night as a first magnitude object, while the small but highly polished sphere, barely visible at sixth magnitude, was more difficult to follow optically. Several replicas of the Sputnik 1 satellite can be seen at museums in Russia and another is on display in the Smithsonian National Air and Space Museum in Washington, D.C.

**Voskhod 1:**

Soviet Union's Voskhod 1 spacecraft achieved a number of 'firsts' in the history of crewed spaceflight on October 12, in 1964. From being the first space flight to carry more than one crewman into orbit to being the first flight without the use of spacesuits, the spacecraft was also the first to carry either engineer or physician into outer space. The Voskhod spacecraft was a vehicle used by the Soviet Union during the cold war space race to carry crews of up to three cosmonauts.

Voskhod, which means 'sunrise' in Russian, archived major milestones with flight, however, it only flew two missions. The spacecraft brought the first multi-person crew into space and even helped carry out the first spacewalk in history. USSR's Voskhod programme was the country's second human spaceflight project, following the earlier successes of the Vostok programme, which ran from 1960 to 1963 and took single-person crews into orbit.



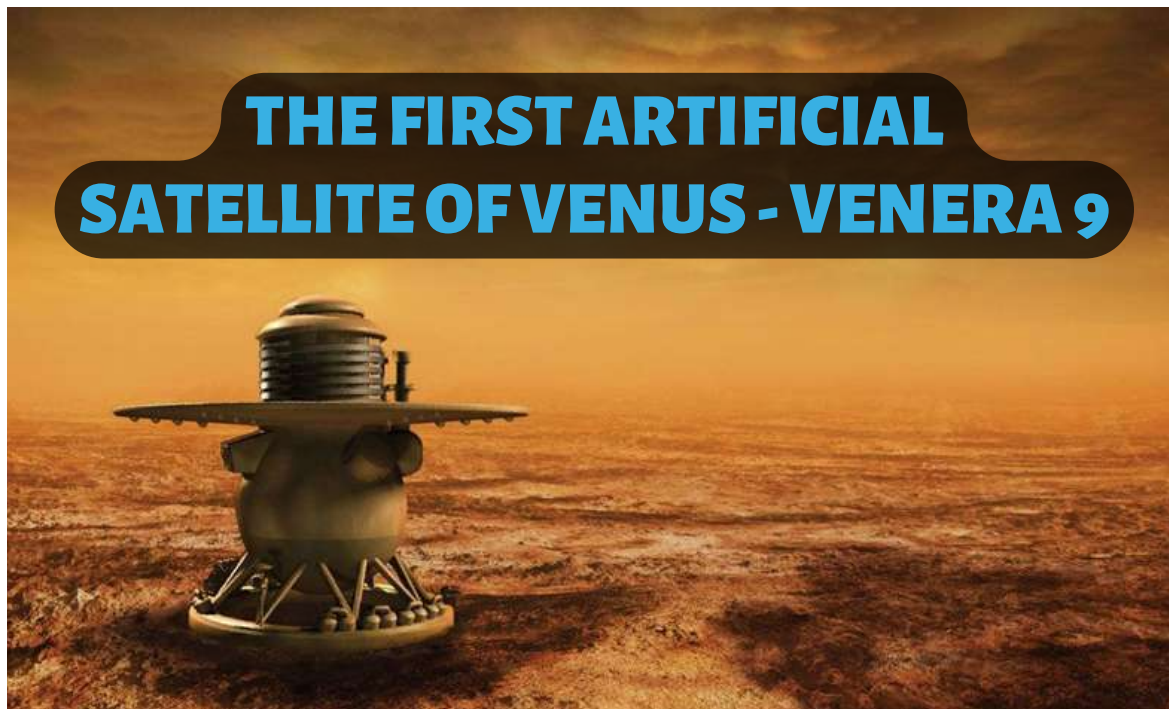
(The founder of the Soviet space program Sergei Korolev (left) and the crew of Voskhod 1: Vladimir Komarov, Konstantin Feoktistov and Boris Yegorov on the launch pad in Tyuratam before their launch. Credit: RKK Energia)

On October 12, 1964, Voskhod 1 carried three cosmonauts, including Vladimir Komarov, engineer Konstantin Feoktistov, and doctor Boris Yegorov, into Earth orbit. The spacecraft was 950kg and in order to accommodate the Voskhod 1 crew, no spacesuits were worn in flight. It was the first space mission to yield significant biomedical data and Yegorov, who was a physiologist, was assigned to monitor the physical condition of his fellow crew members. Yegorov measured his crew member's blood pressure. He took blood samples, recorded brain waves and even tested muscle coordination.

USSR's risky race into space

The Voskhod spacecraft had a backup solid-fuel retrorocket placed on the top of the descent module. In a bid to fit the three crew members, the ejection seat was removed and three crew couches were added to the interior at a 90-degree angle. Due to the cramped conditions, the cosmonauts also had to go on a diet to fit in the couches.

Additionally, a solid-fuel braking rocket was also added to the space capsule's parachute lines to provide for a softer landing at touchdown. The spacecraft also did not have a launch escape system, which meant that the mission could not be aborted until three minutes after liftoff when the payload shroud was jettisoned and so a low-altitude booster accident would have also meant the loss of the crew. Further, as the cosmonauts rode the gantry elevator to the top of the launch vehicle, they could look across the steppe which was strewn with debris from previous failed R-7 launches, a grim reminder of what could potentially happen on their flight.



THE FIRST ARTIFICIAL SATELLITE OF VENUS - VENERA 9

The USSR's Venera 9 became the first lander to return images from the surface of another planet on October 22, 1975.

The Venera 9 orbiter had become the first spacecraft to orbit Venus just two days earlier. The 2300kg orbiters (at Venus orbit insertion) were designed to spend their missions photographing the planet in ultraviolet light and conducting other scientific investigations.

Using a completely new design, the lander employed aerodynamic braking during Venusian atmospheric entry and contained a panoramic photometer to take images of the surface.

Findings: Venera 9 measured clouds that were 30 to 40 km thick with bases at 30 to 35 km altitude. It also measured atmospheric chemicals including hydrochloric acid, hydrofluoric acid, bromine, and iodine. Other measurements included surface pressure 90 times that of Earth, temperature of 460°C (860°F), and surface light levels comparable to those at Earth mid-latitudes on a cloudy summer day. In its 53 minutes of transmissions, Venera 9 became the first probe to send back black and white television broadcasts from the Venusian surface showing shadows, no apparent dust in the air, and a variety of 30 to 40 cm rocks that were not eroded. 360-degree panoramic pictures had been planned but could not be taken because one of two camera lens covers failed to come off, limiting pictures to 180 degrees. This failure recurred with Venera 10.



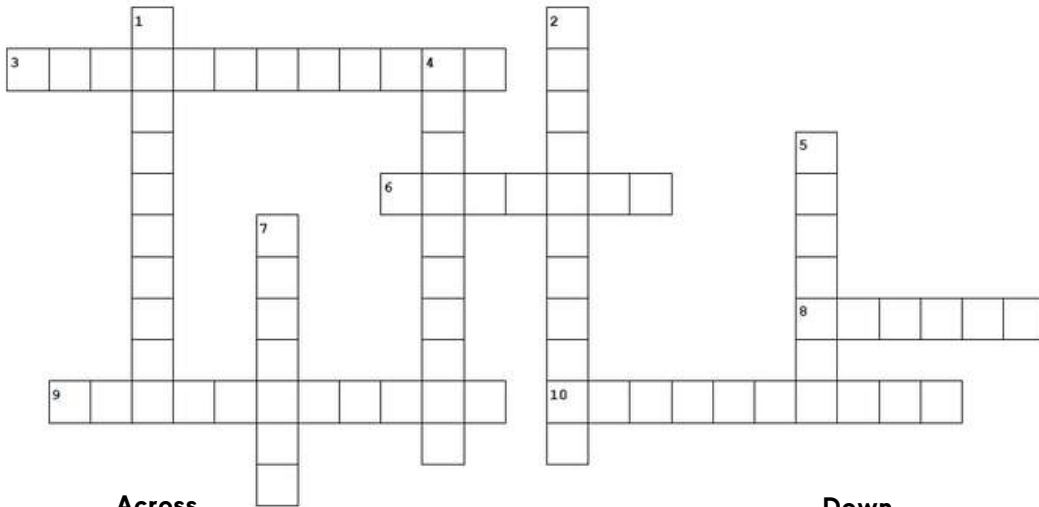
(Venera 9 (top) and 10 (bottom) Landing site panoramas prior to transformation sites)

Venera 10

Venera 10 landed on Venus on October 25, 1975, to take more photographs and study the rocks on the surface. The mission concluded on Christmas of 1975 after launching more than six months before. The Soviets announced on March 22, 1976, that the orbiter's primary mission had been fulfilled.

TRAIN YOUR BRAIN

CROSSWORD



Across

Down

- 3. A celestial event in which a number of meteors are observed to originate, from one point in the night sky.
- 6. Type of solar eclipse occurs when the Moon is positioned farthest from the earth.
- 8. The nearly straight-line configuration of three celestial bodies (such as the sun, moon, and planet/planets) in a gravitational system is called?
- 9. Close appearance of celestial objects seen from earth.
- 10. The best time/day to observe outer planets

- 1. What is the day called when the Earth is closest to the sun?
- 2. A celestial event occur when a big object like the moon, moves in front of a smaller appearing object, like a planet.
- 4. The best time/day to observe inner planets
- 5. A celestial event occur when a planet passes between a star and its observer?
- 7. The sun is positioned directly above the equator of the Earth is called?

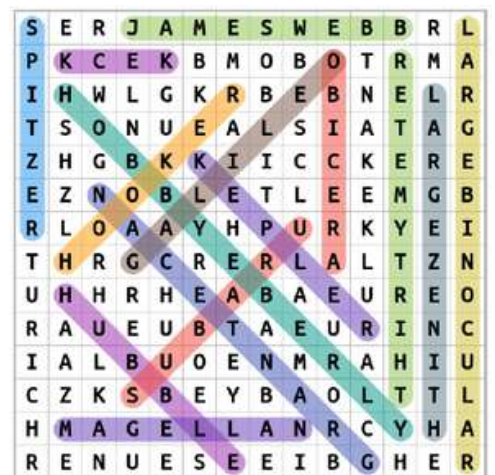
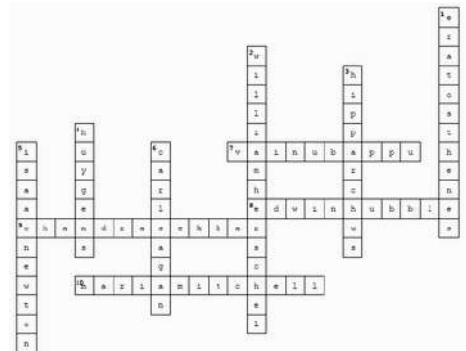
ASTRONOMY WORD PUZZLE

Find the names of some famous Planetary missions from the mixed letters and mark them.



- CASSINI
- BEPICOLOMBO
- VIKING
- JUNO
- MESSENGER
- GALILEO
- SHUKRAYAAN
- MAGELLAN
- SOJOURNER
- HOPE
- PHOBOSGRUNT
- MAVEN
- MANGALYAAN
- AKATSUKI
- PHOENIX

Answers for last month puzzles.



**Answers for this month puzzles will be shared in next magazine.

THERE IS A SCIENTIST IN EVERY CHILD LET'S DISCOVER IT



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MOUNT: ALT-AZ
APERTURE: 60MM
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- CELESTRON POWERSEERER 60EQ
TYPE: REFRACTOR
MOUNT: EQ
APERTURE: 60MM
FOCAL LENGTH: 900MM
- SPACE PROBE 80EQ
TYPE: REFRACTOR
MOUNT: EQ
APERTURE: 80MM
FOCAL LENGTH: 400MM

REFLECTOR TELESCOPES

- SPACE LAUNCHER 76MM
TYPE: REFLECTOR
MOUNT: ALT-AZ
APERTURE: 76MM
FOCAL LENGTH: 700MM
- ASON 80MM NEWTONIAN
TYPE: REFLECTOR
MOUNT: ALT-AZ
APERTURE: 80MM
FOCAL LENGTH: 800MM
- BRESSER 127EQ NEWTONIAN
TYPE: REFLECTOR
MOUNT: EQ
APERTURE: 127MM
FOCAL LENGTH: 650MM

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Brands

OCTOBER 2022

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