

Galactica

Astronomy and Space Science Magazine

What's Inside?

Highlights From May
Moon Phases And Planet Visibility
What's Awaiting in June
Student's Corner
Historical Events Happened In June
Events By SPACE
Train Your Brain

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

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.

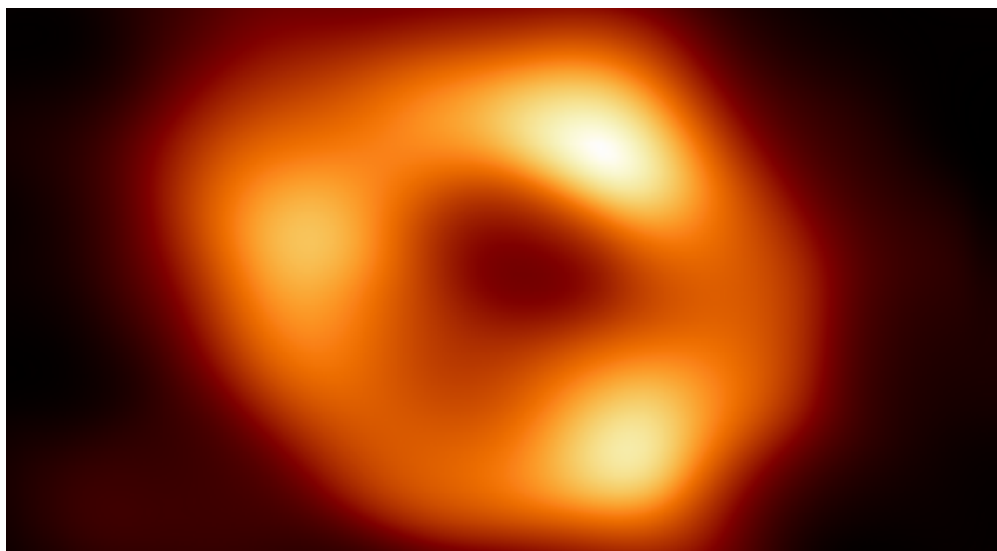
HIGHLIGHTS OF MAY 2022

ASTRONOMERS REVEAL FIRST IMAGE OF THE BLACK HOLE AT THE HEART OF OUR GALAXY

Astronomers have unveiled the first image of the supermassive black hole at the centre of our own Milky Way galaxy. This result provides overwhelming evidence that the object is indeed a black hole and yields valuable clues about the workings of such giants, which are thought to reside at the centre of most galaxies. The image was produced by a global research team called the Event Horizon Telescope (EHT) Collaboration, using observations from a worldwide network of radio telescopes.

The image is a long-anticipated look at the massive object that sits at the very centre of our galaxy. Scientists had previously seen stars orbiting around something invisible, compact, and very massive at the centre of the Milky Way. This strongly suggested that this object – known as Sagittarius A* (Sgr A*, pronounced "sadge-ay-star") – is a black hole, and today's image provides the first direct visual evidence of it.

Although we cannot see the black hole itself, because it is completely dark, glowing gas around it reveals a telltale signature: a dark central region (called a "shadow") surrounded by a bright ring-like structure. The new view captures light bent by the powerful gravity of the black hole, which is four million times more massive than our Sun. "We were stunned by how well the size of the ring agreed with predictions from Einstein's Theory of General Relativity," said EHT Project Scientist Geoffrey Bower from the Institute of Astronomy and Astrophysics, Academia Sinica, Taipei. "These unprecedented observations have greatly improved our understanding of what happens at the very centre of our galaxy and offer new insights on how these giant black holes interact with their surroundings."



(This is the first image of Sgr A*, the supermassive black hole at the center of our galaxy. It's the first direct visual evidence of the presence of this black hole. It was captured by the Event Horizon Telescope (EHT), an array that linked together eight existing radio observatories across the planet to form a single "Earth-sized" virtual telescope. The telescope is named after the event horizon, the boundary of the black hole beyond which no light can escape. Credit: EHT Collaboration)

Because the black hole is about 27,000 light-years away from Earth, it appears to us to have about the same size in the sky as a donut on the Moon. To image it, the team created the powerful EHT, which linked together eight existing radio observatories across the planet to form a single "Earth-sized" virtual telescope. The EHT observed Sgr A* on multiple nights, collecting data for many hours in a row, similar to using a long exposure time on a camera. The breakthrough follows the EHT collaboration's 2019 release of the first image of a black hole, called M87*, at the centre of the more distant Messier 87 galaxy.

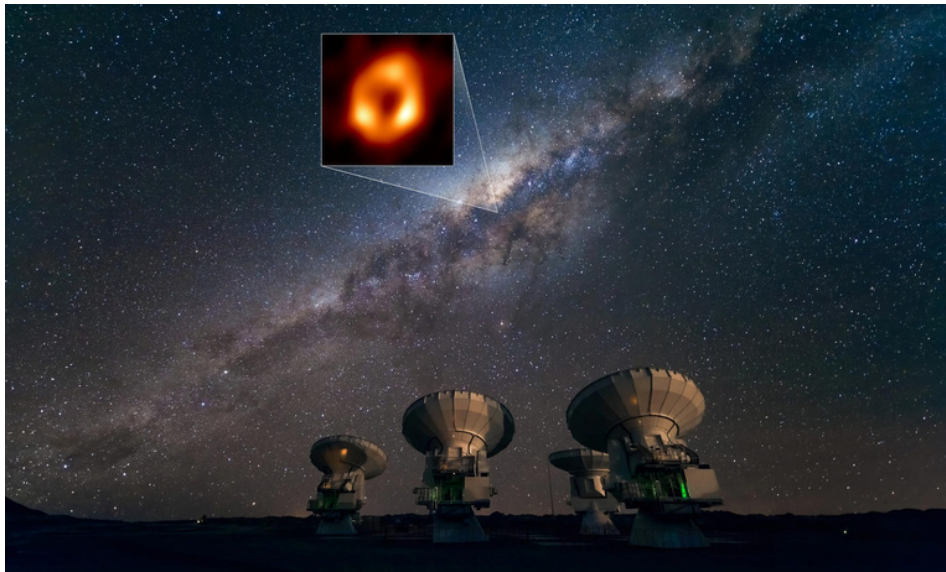
The two black holes look remarkably similar, even though our galaxy's black hole is more than a thousand times smaller and less massive than M87*. "We have two completely different types of galaxies and two very different black hole masses, but close to the edge of these black holes they look amazingly similar," says Sera Markoff, Co-chair of the EHT Science Council and a professor of theoretical astrophysics at the University of Amsterdam, the Netherlands. "This tells us that General Relativity governs these objects up close, and any differences we see further away must be due to differences in the material that surrounds the black holes." This achievement was considerably more difficult than for M87*, even though Sgr A* is much closer to us.

GALACTICA

EHT scientist Chikwan Chan, from Steward Observatory and the Department of Astronomy and the Data Science Institute of the University of Arizona, US, explains: "The gas in the vicinity of the black holes moves at the same speed nearly as fast as the light around both Sgr A* and M87*. But where gas takes days to weeks to orbit the larger M87*, in the much smaller Sgr A*, it completes an orbit in mere minutes. This means the brightness and pattern of the gas around Sgr A* was changing rapidly as the EHT Collaboration was observing it a bit like trying to take a clear picture of a puppy quickly chasing its tail."

The researchers had to develop sophisticated new tools that accounted for the gas movement around Sgr A*. While M87* was an easier, steadier target, with nearly all images looking the same, that was not the case for Sgr A*. The image of the Sgr A* black hole is an average of the different images the team extracted, finally revealing the giant lurking at the centre of our galaxy for the first time.

The effort was made possible through the ingenuity of more than 300 researchers from 80 institutes around the world that together make up the EHT Collaboration. In addition to developing complex tools to overcome the challenges of imaging Sgr A*, the team worked rigorously for five years, using supercomputers to combine and analyse their data, all while compiling an unprecedented library of simulated black holes to compare with the observations.

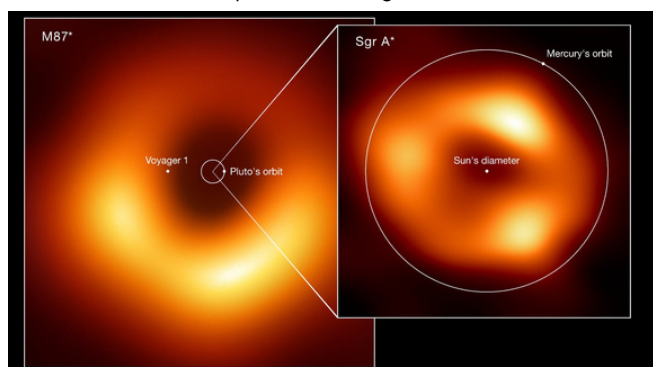


(This image shows the Atacama Large Millimeter/submillimeter Array (ALMA) looking up at the Milky Way as well as the location of Sagittarius A*. Highlighted in the box is the image of Sagittarius A* taken by the Event Horizon Telescope (EHT) Collaboration. Located in the Atacama Desert in Chile, ALMA is the most sensitive of all the observatories in the EHT array, and ESO is a co-owner of ALMA.)

Scientists are particularly excited to finally have images of two black holes of very different sizes, which offers the opportunity to understand how they compare and contrast. They have also begun to use the new data to test theories and models of how gas behaves around supermassive black holes. This process is not yet fully understood but is thought to play a key role in shaping the formation and evolution of galaxies.

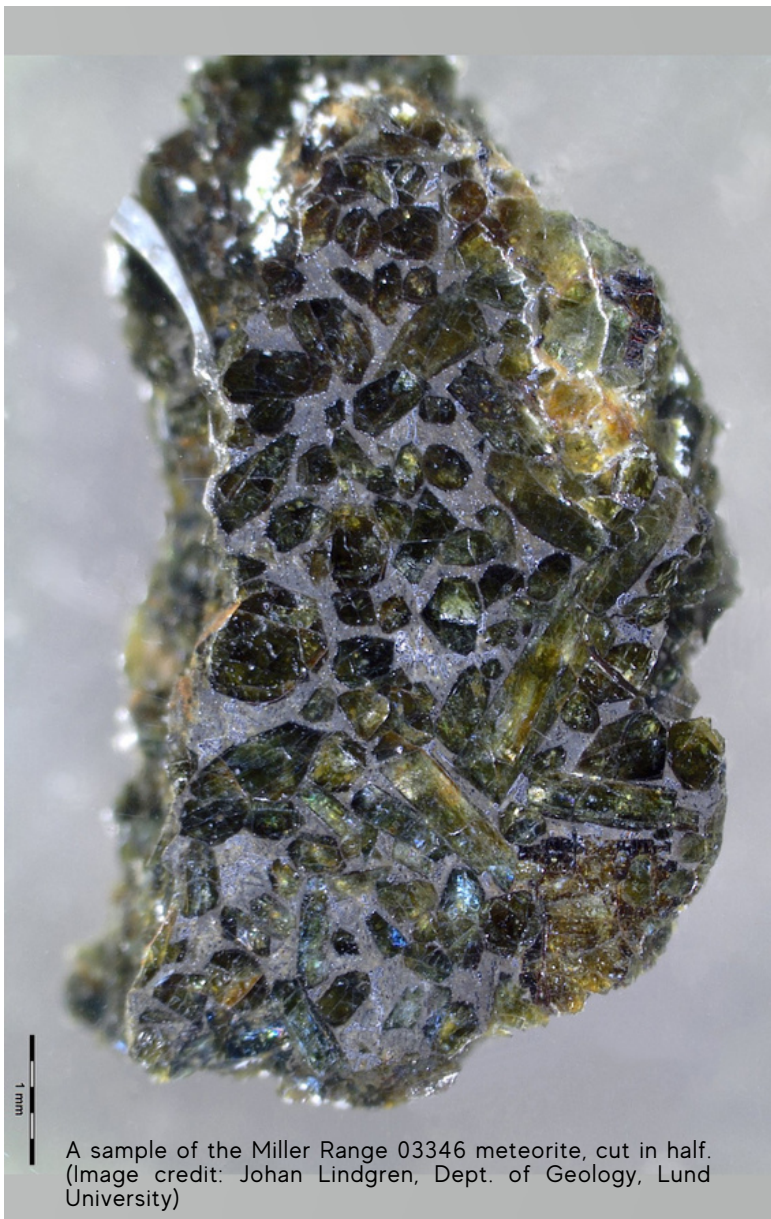
"Now we can study the differences between these two supermassive black holes to gain valuable new clues about how this important process works," said EHT scientist Keiichi Asada from the Institute of Astronomy and Astrophysics, Academia Sinica, Taipei. "We have images for two black holes – one at the large end and one at the small end of supermassive black holes in the Universe – so we can go a lot further in testing how gravity behaves in these extreme environments than ever before."

Progress on the EHT continues: a major observation campaign in March 2022 included more telescopes than ever before. The ongoing expansion of the EHT network and significant technological upgrades will allow scientists to share even more impressive images as well as movies of black holes in the near future.



This image shows the scale of Sgr A* in comparison with both M87* and other elements of the Solar System such as the orbits of Pluto and Mercury. Also displayed is the Sun's diameter and the current location of the Voyager 1 space probe, the furthest spacecraft from Earth. M87*, which lies 55 million light-years away, is one of the largest black holes known. While Sgr A*, 27 000 light-years away, has a mass roughly four million times the Sun's mass, M87* is more than 1000 times more massive. Because of their relative distances from Earth, both black holes appear the same size in the sky. Credit: EHT collaboration.

SCIENTISTS PEER INSIDE A MARS METEORITE TO CHECK FOR SIGNS OF A HABITABLE WORLD



A sample of the Miller Range 03346 meteorite, cut in half. (Image credit: Johan Lindgren, Dept. of Geology, Lund University)

Liquid water once shaped the rock inside a meteorite from Mars, but likely did not support any microbial life, a new study finds.

The rock is part of a class of meteorites known as nakhlites, which by birth are volcanic rocks that an asteroid impact blasted off Mars about 11 million years ago. Previous research has suggested that nakhlites might shed light on the Red Planet's ancient hydrothermal systems, and particularly its hot springs. Hot springs are an intriguing target because scientists think these environments may have been cradles for early life on Earth, so wonder whether the same holds true on Mars and beyond.

In the new study, researchers examined the Miller Range 03346 nakhlite, a 1.58-pound (715 grams) rock that scientists discovered in the Miller Range of mountains in Antarctica in 2003.

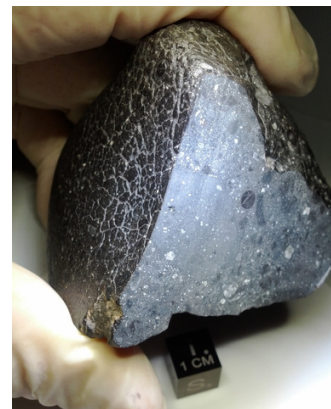
"From previous research, we know that minerals in this specific meteorite reacted with water about 630 million years ago," study lead author Josefin Martell, a planetary scientist at Lund University in Sweden.

But Martell and her colleagues wanted more detail about the rock's history. The scientists used non-destructive neutron and X-ray scans to estimate how much liquid water altered the rock's minerals, and therefore whether its former location on Mars hosted a hydrothermal system potentially capable of supporting life.

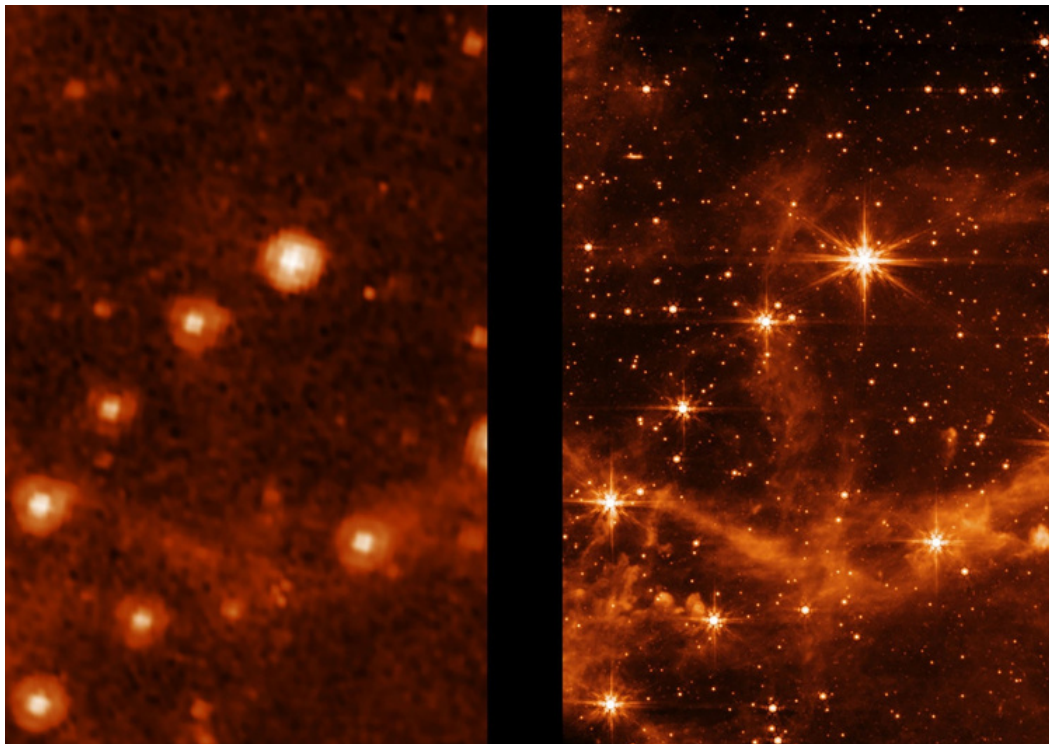
"I think it's really exciting that we can study meteorites without having to cut them open," Martell said. "We scanned our samples using X-rays and neutrons, and basically got a 3D image showing what our sample looked like on the inside."

The scientists found that minerals within the meteorite that liquid water had altered were concentrated within isolated patches. This pattern suggests that the water responsible for altering these minerals did not leak into the rock from a hydrothermal system. Instead, the researchers argued that the water likely came from ice buried within the rock itself that melted during the impact that blasted the nakhlite off Mars. These findings suggest that at the area where the nakhlite originated from, "the conditions were not fruitful for life to emerge or thrive," Martell said. However, these conclusions are "only for this time and place," and not for Mars as a whole, she cautioned. "For some, it might be tempting to draw conclusions about life on Mars in general. We only report what we see in our particular sample."

These findings suggest that neutron and X-ray scans may prove useful in analyzing rocks from other planets – "for example, when NASA brings back samples from Mars," Martell said. "Perseverance is right now drilling for samples that are expected to be brought back around 2030. When dealing with rare samples, you want to do as many non-destructive analyses as possible before cutting them."



"Black Beauty," this Martian meteorite weighs approximately 11 ounces (320 grams).



NASA released a comparison of an image taken by the Spitzer Space Telescope with one at a similar wavelength by JWST: Credit: NASA/JPL-Caltech (left), NASA/ESA/CSA/STScI (right)

The James Webb Space Telescope is operating better than expected as the spacecraft enters the final stages of commissioning, project officials said May 9.

In a call with reporters, scientists and mission managers said they have completed the alignment of the telescope's optics with all its instruments and now are moving into setting up the instruments for science operations, the final step in a commissioning process that started shortly after the telescope's launch on Christmas Day last year.

"The performance is even better than we anticipated," said Michael McElwain, JWST observatory project scientist at NASA's Goddard Space Flight Center. "We've basically reached a perfect telescope alignment. There are no adjustments of the telescope optics that would make material improvements to our science performance."

Asked later to quantify that "better than expected" performance, he said a parameter known as the static wavefront error is "significantly better" than planned for. "What that means is that we put the telescope mirrors into position with better accuracy and precision than what we had budgeted for, so we're doing much better than requirements." That reduced error, he said, improved both the sensitivity and resolution of the instruments.

Marcia Rieke, the principal investigator of one of JWST's instruments, the Near-Infrared Camera (NIRCam), said that images taken by the instrument show that the telescope resolution is diffraction limited at key wavelengths, meaning its images are as sharp as possible under the laws of physics. "It's just amazing that the image quality is that excellent, and that's going to help our science quite a bit," she said.

With the telescope alignment completed, the project is moving to the final phases of commissioning, which include preparing the instruments for science operations. "It's the time we're doing all the requisite checkouts and calibrations before we start science," McElwain said.

"I would also call this the home stretch," he added. "We've had about 1,000 activities planned for all of commissioning, and there are only about 200 activities left to complete."

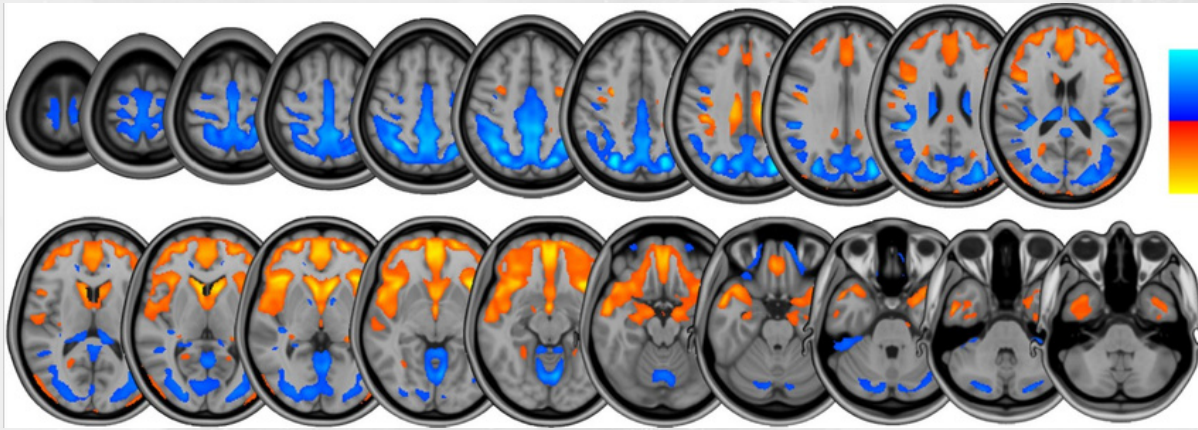
That process will take about two months. The mission will wrap up that commissioning with the public release of what it calls "early release observations," an initial set of images designed to showcase the telescope's capabilities.

"Their objective is to demonstrate, at the end of commissioning, to the world and to the public, that Webb is fully operational and it produces excellent results," said Klaus Pontoppidan, JWST project scientist at the Space Telescope Science Institute. Formal science operations through a program of observations called Cycle 1 will begin after the early release observations are made public, which he said is tentatively planned for mid-July.

Those early release observations will involve all four science instruments and cover a range of objects. Pontoppidan said a committee developed a ranked list of objects to include among the early release observations but declined to say what objects are included in that list. One reason, he said, is that the objects selected could change depending on when observations can be scheduled. Also, he added, "we'd really like to be a surprise."

JAMES WEBB SPACE TELESCOPE ENTERS 'HOMESTRETCH' OF COMMISSIONING WITH STUNNING IMAGE

ASTRONAUTS IN THEIR FIRST LONG-DURATION SPACE MISSIONS SHOW CHANGES IN THEIR BRAINS



These slides show changes in volume in certain areas of the brain that occur with long-duration, head-down tilt bed rest. The Neuromapping Flight Study examines whether similar changes occur with spaceflight. Credits: University of Michigan

It was long known that being in space could potentially cause brain damage, like concussions. It has also been well-documented that staying in space for too long has negative effects on the body. However, identifying the specific aspect of brain health in a group of astronauts who have been in space for the first time has not been addressed until a new study on the effect of spaceflight on the human brain was conducted. Researchers found that astronauts who go on their first long-duration space mission show changes in their brains compared to brains of more experienced astronauts or those who have never been to space. According to the study published in the journal *Scientific Reports*, humans exposed to extreme environmental stressors during spaceflight develop alterations in brain structure and grow spaces in their brain where cerebrospinal fluid flows - the clear fluid that surrounds the brain and spinal cord.

How Being in Space Affects the Human Brain

To date, the effects of spaceflight on perivascular spaces (PVSs) within the brain have not been studied, nor evaluated. PVS, also known as a Virchow-Robin space, fluid-filled space surrounding certain blood vessels in several organs, including the brain. It is also believed to facilitate fluid drainage and brain homeostasis, according to researchers.

In a new study, researchers intend to examine how this aspect of the human brain is affected by spaceflight, including prior spaceflight experience.

"These findings have important implications as we continue space exploration," senior author Dr. Juan Piantino, an assistant professor of pediatrics in the Oregon Health & Science University School of Medicine's Division of Neurology, said in EurekaAlert.

Fifteen astronauts underwent a brain scan using magnetic resonance imaging (MRI), where nine were "novices" and had no prior spaceflight experience. For comparison purposes, sixteen ground-based employees of NASA's Johnson Space Center in Houston served as a control group.

Changes in Brain Volume

Researchers examined the perivascular spaces (PVS) of each astronaut before and immediately after their time in space, then subsequently took scans one, three and six months after their return to Earth.

Findings show that the total PVS volume of novice astronauts increased after their trips to space, while PVS of experienced astronauts did not show this growth. In fact, the latter's total PVS volume actually decreased, which may indicate that their brains "reached some kind of homeostasis," Piantino said. This means their brains may have already adjusted to microgravity, although their total PVS volume before their current flight tended to be higher.

Statistically, these "trends" were not that significant and could have happened by chance, but findings coincide with other studies suggesting that alterations in the brains of astronauts depend on the how long they've spent in space and how frequent they go to space missions.

Normally, PVS volume gradually increases as people age. However, these kinds of changes in novice astronauts were not shown in members of the Earth-based control group.

"These findings not only help to understand fundamental changes that happen during spaceflight, but also for people on Earth who suffer from diseases that affect circulation of cerebrospinal fluid," Piantino concluded.





SCIENTISTS GROW PLANTS IN LUNAR SOIL

NASA-funded study breaks new ground in plant research

Making a new stride towards space exploration, scientists revealed last week that they were successful in growing plants in soil collected from the moon. The details of this breakthrough study were revealed in a research paper published recently in the journal *Communications Biology*. The NASA-funded study was run by scientists at the University of Florida who were successful in growing the hardy and well-studied *Arabidopsis thaliana* in the nutrient-poor lunar regolith.

The soil was brought to Earth during the Apollo missions 11, 12 and 17, by the American space agency. According to NASA, the lunar surface material, known as regolith, was brought to Earth where it could be studied with state-of-the-art equipment and saved for future research. For this experiment, researchers planted the seeds of the plant related to mustard greens, as well as other cruciferous vegetables, including broccoli and cauliflower, in lunar soil. In a press release, NASA explained that the plant also plays a key role for scientists due to its small size and ease of growth, it is one of the most studied plants in the world. *Arabidopsis thaliana* is used as a model organism for research into all areas of plant biology.

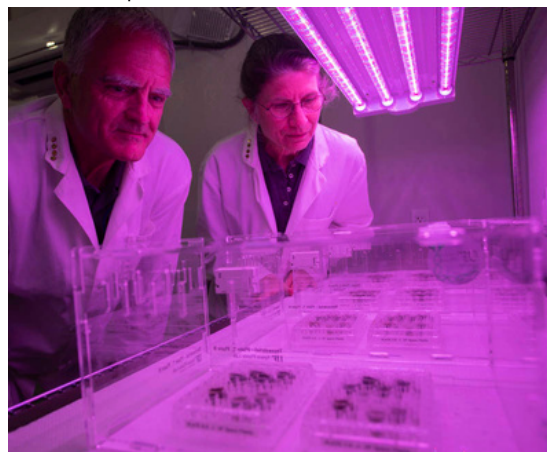


Anna-Lisa Paul, a research professor in the horticultural sciences department at the University of Florida and the study's first author, described the lunar soil as "fine" and "powdery" that "sticks to everything."

Researchers added water and then seeds to the samples of lunar soil and then put the trays into terrarium boxes in a clean room. A nutrient solution was also added daily to the mix. The study found that the seeds started to sprout within days of planting. However, the scientists observed that all of the seeds that grew in lunar soil did not grow as "robust" as those in the control. The study mentions that some of the plants grown in the lunar soil samples had "stunted" roots and leaves, as well as some "reddish pigmentation."



However, it is a significant advancement in space biology as Sharmila Bhattacharya, program scientist with NASA's Biological and Physical Sciences (BPS) Division said in a statement, "Not only is it pleasing for us to have plants around us, especially as we venture to new destinations in space, but they could provide supplemental nutrition to our diets and enable future human exploration."



Rob Ferl, left, and Anna-Lisa Paul looking at the plates filled part with lunar soil and part with control soils, now under LED growing lights. At the time, the scientists did not know if the seeds would even germinate in lunar soil. Credits: UF/IFAS photo by Tyler Jones.



(Image credit: SpaceX)

SpaceX rocket launches 53 Starlink satellites into orbit and aces landing at sea

A used SpaceX rocket launched a new fleet of Starlink internet satellites into orbit and returned to Earth for a stunning landing at sea early Wednesday (May 18).

The two-stage Falcon 9 rocket topped with 53 Starlink spacecraft soared into the Florida morning sky from NASA's Pad 39A at the Kennedy Space Center. Liftoff was at 6:59 a.m. EDT, about 39 minutes later than SpaceX initially planned.

"Falcon 9 has successfully lifted off carrying our 53 Starlink satellites into space," SpaceX production manager Jessie Anderson said during a live webcast. The launch marked SpaceX's third Starlink mission in five days following missions on May 13 and May 14.

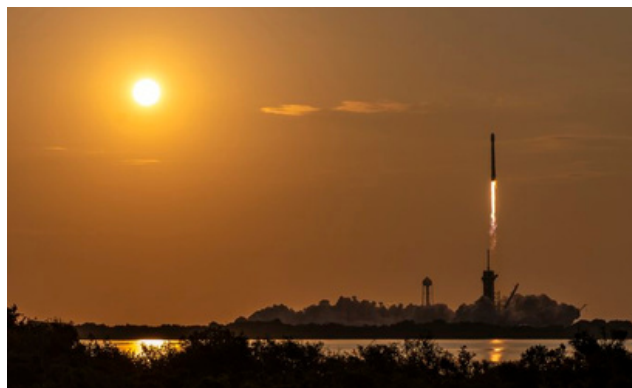
About nine minutes after liftoff, the Falcon 9 rocket returned to Earth with a smooth landing on SpaceX's dronship A Shortfall of Gravitas in the Atlantic Ocean, with onboard cameras capturing stunning video of the entire descent. It was landing number 121 for a SpaceX booster, Anderson said.

Starlink is SpaceX's broadband constellation, which currently consists of more than 2,300 satellites (opens in new tab), according to astrophysicist and satellite tracker Jonathan McDowell. That number has been growing rapidly lately; SpaceX has launched 21 missions already in 2022, and 14 of them have been dedicated Starlink flights as of Wednesday's launch.

But the Starlink population could get truly huge in the not-too-distant future; the next-generation version of the constellation may eventually consist of up to 30,000 satellites, according to a Reuters report.

Wednesday's mission marked the fifth for this particular Falcon 9 first stage. SpaceX previously used the rocket booster to launch its Arabsat-6A mission and the Space Test Project-2 flight for the U.S. Space Force (both as one of two side boosters on a Falcon Heavy rocket); as well as the COSMO-SkyMed Second Generation FM2 satellite for Italy and an earlier Starlink flight.

Such reuse is a priority for SpaceX and its founder and CEO, Elon Musk, who views rapid and repeated reflight as the key breakthrough needed to make ambitious exploration feats such as Mars settlement economically feasible.



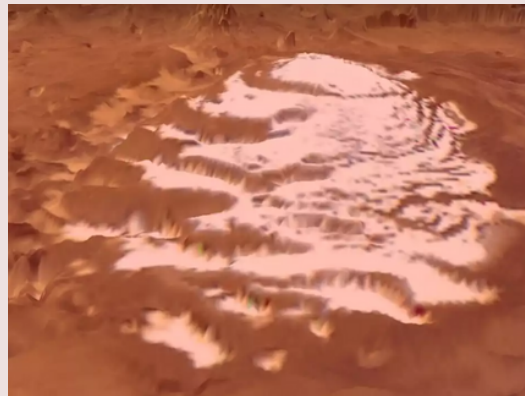
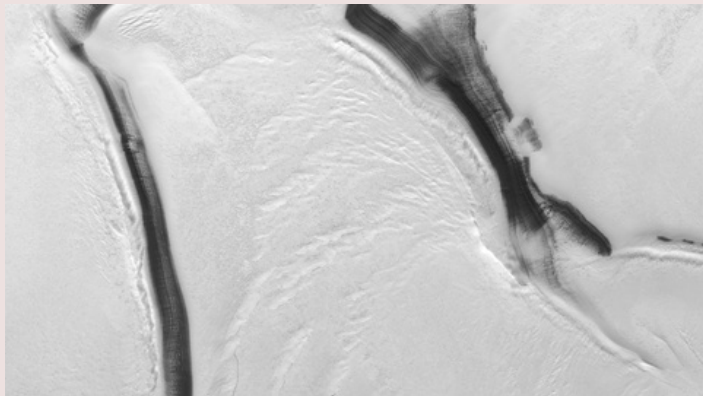
(Image credit: SpaceX)

THE DRY ICE GLACIERS ON MARS ARE MOVING AT ITS SOUTH POLE

Dry ice flows closer to 100 times quicker than water ice in the thin atmospheres of Mars, according to recent research conducted on the planet's high-altitude slopes. According to the researchers, carbon dioxide glaciers in the south polar area of Mars were used to confirm this process, and modeling implies that this migration has been occurring for the last 600,000 years.

Observations like this have ramifications for our understanding of ice development across the universe. Earth, Mars, and Pluto have all been confirmed as having fast-flowing ice, but the non-profit Planetary Science Institute in Arizona believes the number of confirmed sites may grow in the future.

A variety of ice exists throughout the solar system, and as the number of dwarf planets grows, it is likely that some of them will have glaciers of carbon monoxide or methane, which would be even more exotic than the dry ice glaciers recently discovered on Mars, according to NASA's Space Telescope Science Institute.

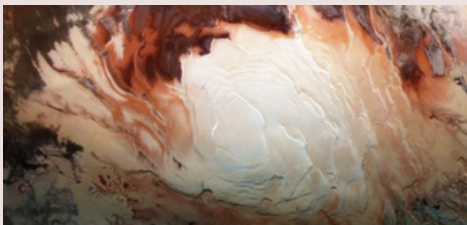


(A top down view of the largest carbon dioxide glacier on the south polar cap of Mars. The data comes from the High-Resolution Stereoscopic Camera aboard Mars Express, a European Space Agency mission. (credit: NASA))

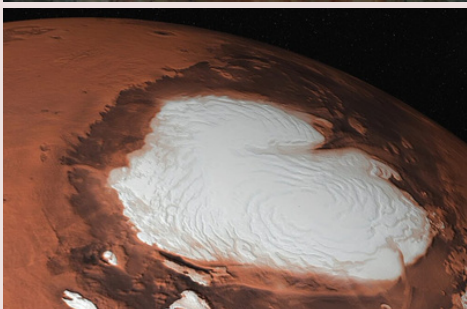
The dry ice has grown in both volume and mass since it was initially generated more than half a billion years ago, albeit the process has been halted "by periods of mass loss via sublimation," according to lead author Isaac Smith, a PSI research scientist, who made the announcement. (Sublimation is the process by which ice is transformed directly into gas.)

"As Smith pointed out, "if the ice had never flowed," the ice would still be mainly where it was first deposited, and the thickest ice layer would only be around 45 meters [147 feet] thick at its thickest point. Because it flowed downhill and into basins and spiral troughs (curvilinear basins), where it accumulated, it was able to build deposits that were up to one kilometer [0.6 miles] thick and up to one kilometer [0.6 miles] thick."

Using NASA's Ice Sheet and Sea-Level System Model, which was modified to function on Mars from its present duty to follow the history of the polar ice caps in Greenland and Antarctica, researchers were able to simulate the melting of the polar ice caps. That glacial activity is the major factor underlying dry ice motions on Mars, rather than atmospheric deposition, which would more uniformly distribute the dry ice across a smaller depth, was shown by the research team.



"ICE IS POURING DOWNHILL INTO BASINS IN THE SAME WAY THAT WATER IS FLOWING DOWNHILL INTO RESERVOIRS. THE DISPERSION CAN ONLY BE EXPLAINED BY GLACIAL MOVEMENT"



(Image credit: NASA.gov)

Smith said himself. While the flow rate is believed to have peaked 400,000 years ago, when the deposition was at its pinnacle, the slowly receding ice cap still has an outstanding presence in terms of size. According to Smith, based on previous studies conducted by PSI senior scientist Than Putzig, the longest glacier is about 25 by 124 miles (40 by 200 kilometers) in length.

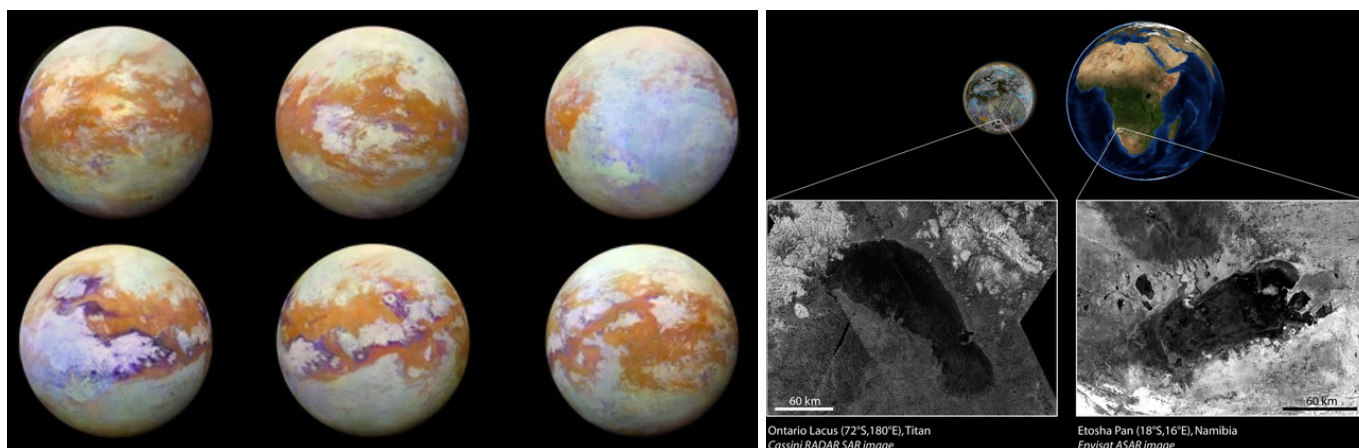
The new research was published in the Journal of Geophysical Research: Planets on Tuesday, April 25th, and are available online. Several aspects of the research were validated using terrestrial glaciers, which have characteristics such as compression ridges that have been seen on Mars.

SATURN'S WEIRD MOON TITAN LOOKS A BIT LIKE EARTH, AND SCIENTISTS MIGHT FINALLY KNOW WHY

Saturn's largest moon titanium features some very Earth-similar landscapes: lakes and rivers, labyrinthine canyons and soft sand dunes. However, these geological formations on Titan are made of completely different materials. Instead of water, it is liquid methane flowing through rivers, and instead of sand, it's hydrocarbons blowing in dunes.

For years, scientists have been puzzled as to how these landscapes formed, given their non-Earth-like composition. But now they have identified a very plausible theory.

Because Titan's sediments are theoretically composed of solid organic compounds, they should be far more fragile than the silicate-based sediments found on Earth. Therefore, nitrogen winds and liquid methane should grind Titan's sediments into a fine dust that could not support such diverse structures.



A team led by Mathieu Lapôtre, an assistant professor of geological sciences at Stanford University has found a possible solution: A combination of sintering, wind and seasonal changes could be enough on Titan. Researchers studied a type of sediment called ooids found on Earth, which has a composition similar to Titan.

Ooids are found in tropical waters where they form very fine grains. These grains simultaneously enrich material through chemical precipitation and erode in the sea. As a result, they maintain a uniform size. Researchers believe something similar could happen on Titan.

"We hypothesized that sintering – in which adjacent grains fuse into one piece – might equalize attrition as the wind transports the grains," Lapôtre said in a statement.

The team then analyzed Titan's atmospheric data recorded during the Cassini Mission to determine how these sediments could have formed such widely differing geological features observed around the planet.

Researchers discovered that winds were more frequent around the lunar equator, creating optimal conditions for dune development. Elsewhere, however, the team suspects that weaker winds allowed for the formation of coarser grains and thus the formation of firmer sedimentary rocks. From there, the wind could erode the harder rock into finer sediments, just like on Earth.

Also, because Titan is known to be the only celestial body in our solar system, Aside from saying that Earth has a seasonal fluid transport cycle, Lapôtre's team then hypothesized that the movement of liquid methane also likely contributes to erosion and sediment development.

"We show that on Titan – just like on Earth and what used to be the case on Mars – we have an active sedimentary cycle that can explain the latitudinal distribution of landscapes through episodic attrition and sintering driven by Titan's seasons." said Lapotre. "It's quite fascinating to think about how there is this alternate world so far out there, where things are so different and yet so similar."

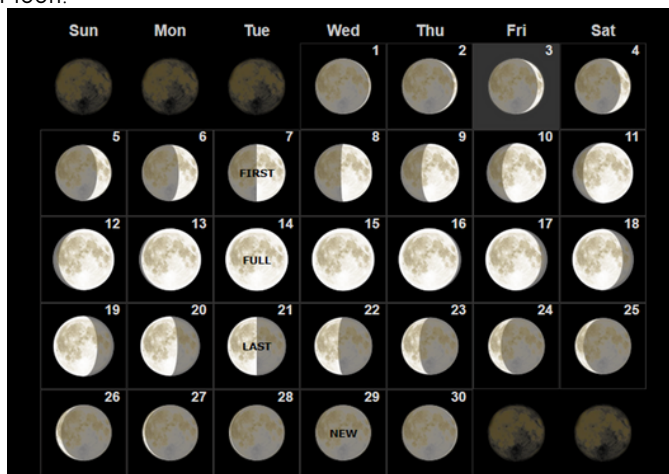
WHAT'S UP IN THE SKY - JUNE 2022

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.

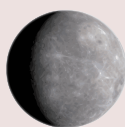
So, What Moon phase is best for stargazing? "The New Moon and the days immediately before and after the new moon (Crescent phases)" are among the best times for stargazing. Whereas the Remaining phases like Full Moon, waxing or waning gibbous, the first or third quarter Moon offers a time to zoom in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



PLANETS VISIBILITY

Mercury

Best at end of month (mag-0.6), rising 70 minutes before Sun. It will reach its greatest elongation on 16th June.



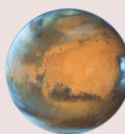
Venus

Venus will be visible in the late morning sky. 7% waning crescent Moon nearby on morning of 26 June.



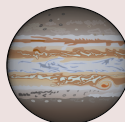
Mars

Morning planet. Prominently visible through the whole month in the eastern direction before sunrise.



Jupiter

Morning planet, near Mars at the start of June. Last quarter Moon nearby on 21st June.



Saturn

Morning planet. Waning gibbous Moon nearby on the mornings of 18th and 19th June.



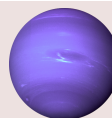
Uranus

Morning planet Uranus is not visible this month.



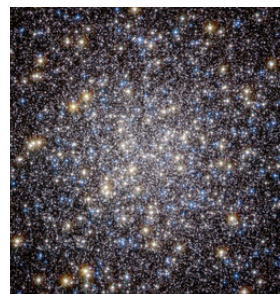
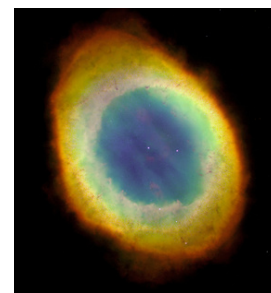
Neptune

Neptune is a morning planet, but not visible this month.



BRIGHT DEEP SKY OBJECTS

Ring Nebula (Messier 57), is a planetary nebula, the glowing remains of a sun-like star. The tiny white dot in the center of the nebula is the star's hot core, called a white dwarf. M57 is about 2,000 light-years away in the constellation Lyra. In fact, the Ring Nebula takes its common name from its ring-like appearance.



The Hercules Cluster (Messier 13) in the constellation Hercules also known as M13 is considered to be the finest globular cluster in the northern half of the heavens. It's found in a star pattern called the Keystone a lopsided square between the two brightest stars of northern spring and summer, Vega and Arcturus.

Messier 58 is an intermediate barred spiral galaxy with a weak inner ring structure located within the constellation Virgo, approximately 68 million light-years away from Earth. It was discovered by Charles Messier on April 15, 1779, and is one of four barred spiral galaxies that appear in Messier's catalogue.



The Pinwheel Galaxy is a face-on spiral galaxy 21 million light-years away from Earth in the constellation Ursa Major. It was discovered by Pierre Méchain in 1781 and was communicated that year to Charles Messier, who verified its position for inclusion in the Messier Catalogue as one of its final entries.

ROCKET LAUNCHES IN JUNE 2022

SSLV: EOS-02 (Demo 1)

DATE: June 30, 2022.

VEHICLE: SSLV rocket.

MISSION: First test flight of Indian SSLV (Small Satellite Launch Vehicle).

LAUNCH SITE: Satish Dhawan Space Center, Sriharikota, India.



(Image credit: ISRO.in)

Rocket: SSLV

The Small Satellite Launch Vehicle (or SSLV) is a launch vehicle being developed by the Indian Space Research Organisation (ISRO) with a payload capacity of 500 kg to Low Earth orbit or 300 kg to Sun synchronous orbit for launching small satellites, with the capability to support multiple orbital drop-offs.

India's Small Satellite Launch Vehicle (SSLV) will launch on its first orbital test flight. Consisting of three solid-fueled stages and a liquid-fueled upper stage, the SSLV is a new Indian launch vehicle designed to carry small satellites into low Earth orbit.

ATLAS V TO LAUNCH USSF-12

DATE: Wednesday, June 29, 2022.

VEHICLE: Atlas V 541 rocket.

MISSION: A United Launch Alliance (ULA) Atlas V 541 rocket will launch the USSF-12 mission for the U.S. Space Force's Space Systems Command (SSC).

LAUNCH SITE: Cape Canaveral Space Force Station, Florida.

Mission Details

A United Launch Alliance Atlas 5 rocket will launch the USSF 12 mission with Wide Field Of View, or WFOV, experimental missile warning satellite for the U.S. Space Force. WFOV hosts a new type of infrared staring sensor in geosynchronous orbit to detect the heat from missile launch plumes. The USSF 12 mission will include additional rideshare payloads. The rocket will fly in the 541 vehicle configuration with a five meter fairing, four solid rocket boosters and a single engine Centaur upper stage.



Astra Space | Astra Rocket 3 | TROPICS 1 & 2

DATE: June 30, 2022.

VEHICLE: Astra Rocket launch vehicle.

MISSION: Astra Rocket 3.0 is the third version and first orbital version of Astra Space's small satellite launch vehicle. It is designed to carry 100kg in LEO.

LAUNCH SITE: Cape Canaveral Space Force Station in Florida.



Astra Rocket 3 - Astra Space

Low Earth Orbit Capacity: 100 kg

The Astra Rocket 3 was manufactured by Astra Space with the first launch on 2020-09-12. Astra Rocket 3 has 2 successful launches and 4 failed launches with a total of 6 launches. Astra Rocket 3.0 is the third version and first orbital version of Astra Space's small satellite launch vehicle. It is designed to carry 100kg in LEO.

Progress MS-20 (81P), A Resupply Mission to ISS

Lift Off Date: June 03, 2022

Mission Name: Progress MS-20 (81P), a resupply mission to the International Space Station (ISS)

Roscosmos is scheduled to launch a Soyuz 2.1a rocket with the Progress MS-20 (81P) to resupply cargo craft to the International Space Station.

Progress MS-20, Russian production No.450, identified by NASA as Progress 81P, is a Progress spacecraft launched by Roscosmos to resupply the International Space Station (ISS). This will be the 173rd flight of a Progress spacecraft.

Around 3 hours 20 minutes after the launch, Progress MS-20 will automatically dock to the zenith (space-facing) port of the MIM2 Poisk module and continue its mission for 196 days, supporting Expedition 67 and Expedition 68 missions aboard the ISS.

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.

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.

Progress MS-20 (81P) Mission Profile

Progress MS will separate from the third stage of the Soyuz 2.1a at ~9 min after launch. The capsule is scheduled to arrive at the ISS on the same day, June 3, around 3 hours and 20 min after the launch. On this mission, the spacecraft will use a one-orbit rendezvous scheme, some elements of which were tested on the Progress MS-17 and Progress MS-18 missions. The Progress MS capsule will autonomously dock to the Poisk module (Poisk is the Russian word for "exploration"). It is used as a research facility, as well as a docking compartment for both Soyuz spacecraft and Progress capsule.

Progress MS Spacecraft

The Progress module is a space "truck" for delivering cargo to the ISS. Its design is largely derived from the Soyuz spacecraft that serves for the transportation of astronauts to the ISS. The Progress capsule is 7.9 meters in length and 2.7 meters in diameter. It consists of three parts: a pressurized cargo module, a propellant compartment, and a rear service module (like the Soyuz spacecraft). Unlike Cargo Dragon 2, it is not designed to bring cargo back to Earth. This is because the three modules on Progress are not capable to split before re-entry. Therefore, after unloading the cargo, the crew progressively fills it only with trash. At the end of its mission, the spaceship separates from the ISS, performs a deorbit burn, and entirely burns up upon re-entry into Earth's atmosphere.

The MS series is the latest modernized variation of the Progress spacecraft that began flying in December 2015. Among the introduced upgrades are improved orbital debris shielding, a new flight-control and navigation systems, as well as a new external compartment that can be used for satellite deployment.

Kurs-NA Automatic Docking System

Like the Soyuz spacecraft, Progress MS is equipped with a Kurs-NA automatic docking system that was first tested on the Progress M-15M mission in July 2012. Compared to its ancestor, Kurs-A, the new system has only one AO-753A rendezvous antenna. Kurs-A had five (two 2AO-VKA and three AKR-VKA) of them. This antenna broadcasts radar pulses that are needed to determine the altitude and relative position of the spacecraft to the ISS. Moreover, Kurs-NA uses less power than Kurs-A.



NSIL'S DEDICATED SATELLITE MISSION FOR TATASKY ON JUNE 22; WILL BE LAUNCHED ON ARIANE-5

A pair of satellites from Malaysia and India are slated to launch in late June on the Ariane 5 rocket's first flight of the year. Aboard the rocket will be Malaysian satellite operator Measat's Measat-3d and state-funded New Space India Limited's GSAT-24. Both are communications satellites bound for geostationary orbit.

Measat-3d, built by Airbus Defense and Space, will co-locate with Measat-3a and Measat-3b at the 91.5 degrees East orbital slot to provide satellite broadband to areas with limited or no terrestrial network throughout Malaysia. Measat-3 will also provide redundancy and additional capacity for video distribution in the Asia-Pacific region.

The multipurpose satellite is equipped with C- and Ku-band payloads for direct-to-home television broadcasting and other telecom services, and a high-throughput Ka-band payload for internet connectivity. Measat-3d will also carry an L-band navigation payload for South Korean satellite operator KT SAT as part of the Korea Augmentation Satellite System effort to boost GPS accuracy in the region.

GSAT-24 is a Ku-band communications satellite built by the Indian Space Research Organization (ISRO) for the New Space India Limited (NSIL), ISRO's commercial arm. It will provide high-quality television, telecommunications and broadcasting services over India.

India's newest space PSU NSIL's first demand-driven communication satellite for Tata Sky will be launched by Arianespace on June 22, the France-based satellite launch service providers said.

The Ku-Band four-tonne GSAT-24, developed by the Indian Space Research Organization (ISRO) for New Space India Limited (NSIL), will provide high-quality television, telecommunications, and broadcasting services over India.

"This Ariane 5 launch from the Guiana Space Center, Europe's Spaceport, is scheduled for June 22, during a launch window from 21:03 to 22:43 UTC," Arianespace said.



arianespace
arianeGROUP

(Image credit: Arianespace.com)



(Image credit: NSIL)

MEASAT-3d, to be co-located with MEASAT-3a and MEASAT-3b at the 91.5°E orbital slot, is a multi-mission telecommunications satellite built by Airbus Defense and Space. "This new satellite will significantly enhance broadband speeds of up to 100 Mbps per user in areas with limited or no terrestrial network throughout Malaysia while continuing to provide redundancy and additional capacity for video distribution in HD, 4K, and ultimately 8K in the Asia-Pacific region," Arianespace added.

Last year, NSIL had announced that the entire satellite capacity on-board GSAT-24 will be leased to its committed customer Tata Sky for meeting their DTH application needs.



(Artist's concept of GSAT-24. Credit: NewSpace India Limited (NSIL))



(MEASAT-3b before launch)

SpaceX Launches - June 2022

SPACEX FALCON 9 CRS-25: JUNE 9, 2022

MISSION: A SpaceX Falcon 9 rocket will send a Dragon spacecraft with new science investigations, supplies, and equipment for the International Space Station (ISS) crew. These include a study of immune aging and the potential for reversing those effects. It also will carry an investigation from a Stanford University student team that will test the process of creating biopolymer soil composite, which is a concrete alternative, in a microgravity environment. The Falcon 9's first stage booster will land on a drone ship in the Atlantic Ocean. The flight is the 25th mission by SpaceX conducted under a Commercial Resupply Services contract with NASA.



FALCON 9 • NILESAT 301: JUNE 10, 2022

Launch Site: SLC-40, Cape Canaveral Space Force Station, Florida

A SpaceX Falcon 9 rocket will launch the Nilesat 301 geostationary communications satellite. Nilesat 301, built by Thales Alenia Space, will provide digital broadband and internet connectivity services for the Egyptian operator Nilesat. The Falcon 9's first stage booster will land on a drone ship in the Atlantic Ocean. Delayed from April 30.



FALCON 9 • STARLINK 4-19

Launch Site: LC-39A, Kennedy Space Center, Florida

A SpaceX Falcon 9 rocket will launch with another batch of Starlink internet satellites. The Falcon 9's first stage booster will land on a drone ship in the Atlantic Ocean.



SARah 1 Spacecraft

SpaceX is scheduled to launch a Falcon 9 rocket as part of the SARah 1 mission.

Mission: SARah 1

First of three radar remote sensing satellite built by Airbus for the German military.

Rocket: Falcon 9

Falcon 9 is a two-stage rocket designed and manufactured by SpaceX for the reliable and safe transport of satellites and the Dragon spacecraft into orbit. The Block 5 variant is the fifth major interval aimed at improving upon the ability for rapid reusability.

Agency: SpaceX

Space Exploration Technologies Corp., known as SpaceX, is an American aerospace manufacturer and space transport services company headquartered in Hawthorne, California. It was founded in 2002 by entrepreneur Elon Musk with the goal of reducing space transportation costs and enabling the colonization of Mars. SpaceX operates from many pads, on the East Coast of the US they operate from SLC-40 at Cape Canaveral Space Force Station and historic LC-39A at Kennedy Space Center. They also operate from SLC-4E at Vandenberg Space Force Base, California, usually for polar launches.

China to launch three Astronauts to Space Station in June



(Image credit: CNSA.Com)

China will launch three astronauts to its under-construction space station in June. The six-month mission is aimed at bringing Tiangong close to being fully ready for science.

The China National Space Administration (CNSA) will launch the third crewed mission to the under-construction space station in June as it rolled the Shenzhou-14 spacecraft on the launchpad. The China Manned Space Engineering Office (CMSEO) rolled out the mission at the Jiuquan Satellite Launch Center in northwest China.

The Shenzhou-14 mission will carry three astronauts to the Tiangong space station on top of a Long March-2F carrier rocket on a six-month mission in zero gravity. Huang Weifen, the chief designer of the country's astronaut system in a media briefing said that crewed spacecraft will send three astronauts to the Tianhe core module of China's space station in June.

Standing tall at 60 meters in height, the spaceship and rocket combo weighing 39 tonnes rolled out of the assembly test building and approached the launch tower after traveling 1.5 kilometers. Completing the journey in over an hour, the spacecraft arrived at the pad in a healthy condition.

"We have completed all the final assembly and tests including the propellant filling of the spacecraft. We will conduct a large-scale system interface test on the rocket system and then proceed to a whole system drill which marks the entry of the combo into the prelaunch status," CGTN quoted Zhang Fusheng, chief designer for the manned spacecraft system as saying.

The mission is aimed at bringing China closer to the completion of the space station construction by forming a T-shaped complex in the coming October. Beijing had in May launched the Tianzhou-4 cargo spaceship that carried equipment and supplies for the astronauts headed to space.

China is yet to announce the names of the three astronauts who will strap themselves on the Shenzhou-14 spacecraft on launch day.

The latest mission comes over a month after three Chinese astronauts returned to Earth after six months aboard their country's newest orbital station. The Shenzhou 13 space capsule landed in the Gobi desert in the northern region of Inner Mongolia. During the mission, astronaut Wang Yaping carried out the first spacewalk by a Chinese woman. Wang and crewmates Zhai Zhigang and Ye Guangfu beamed back physics lessons for high school students.

China launched its first astronaut into space in 2003 and landed robot rovers on the moon in 2013 and on Mars last year. Officials have discussed a possible crewed mission to the moon.

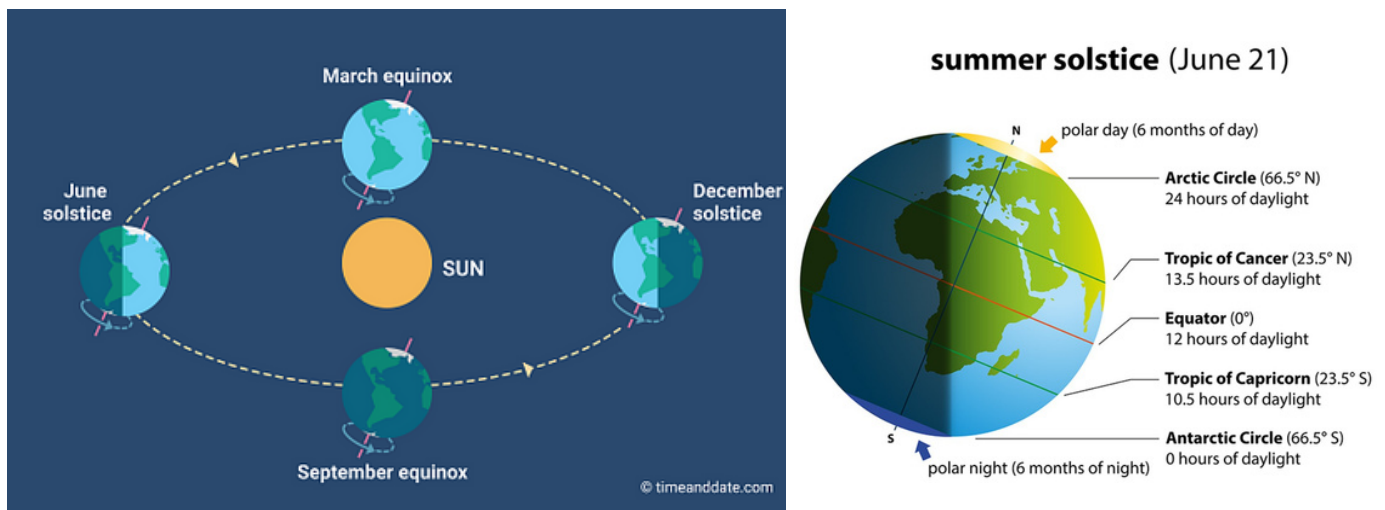
China was the third nation to launch an astronaut into space on its own after the former Soviet Union and the United States. Tiangong is China's third space station following predecessors launched in 2011 and 2016.

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

ASTRONOMICAL EVENTS - JUNE 2022

THE SUMMER SOLSTICE

There are two solstices every year: one in June and one in December. The June solstice (June 21) marks the longest day in northern part of the earth and the shortest day in the south.



(Image credit: timeanddate.com)

Why Is It Called a "Solstice?"

During a year, the subsolar point—the spot on the Earth's surface directly beneath the Sun slowly moves along a north-south axis. Having reached its southernmost point at the December solstice, it stops and starts moving northward until it crosses the equator on the day of the March equinox. At the June solstice, which marks the northernmost point of its journey, it stops again to start its journey back toward the south.

This is how the solstices got their name: the term comes from the Latin words *sol* and *sistere*, meaning "Sun" and "to stand still".

Initially, the naming arose from observations of how the Sun's apparent path across the sky changes slightly from one day to the next, which is caused by the same process as the subsolar point's movement described above.

In the months leading up to the June solstice, the position of sunrise and sunset creeps northward. On the day of the solstice, it reaches its northernmost point. After that, the daily path of the Sun across the sky begins to creep southward again.

Why Does the Sun Move North and South?

The subsolar point moves north and south during the year because the Earth's axis is tilted at an angle of about 23.4° in relation to the ecliptic, an imaginary plane created by Earth's path around the Sun. In June, the Northern Hemisphere is tilted toward the Sun, and the subsolar point is north of the equator. As the Earth travels toward the opposite side of its orbit, which it reaches in December, the Southern Hemisphere gradually receives more sunlight, and the subsolar point travels south.

Why Does the Date Vary?

The date of the equinoxes and solstices varies because a year in our calendar does not exactly match the length of the tropical year—the time it takes the Earth to complete an orbit around the Sun.

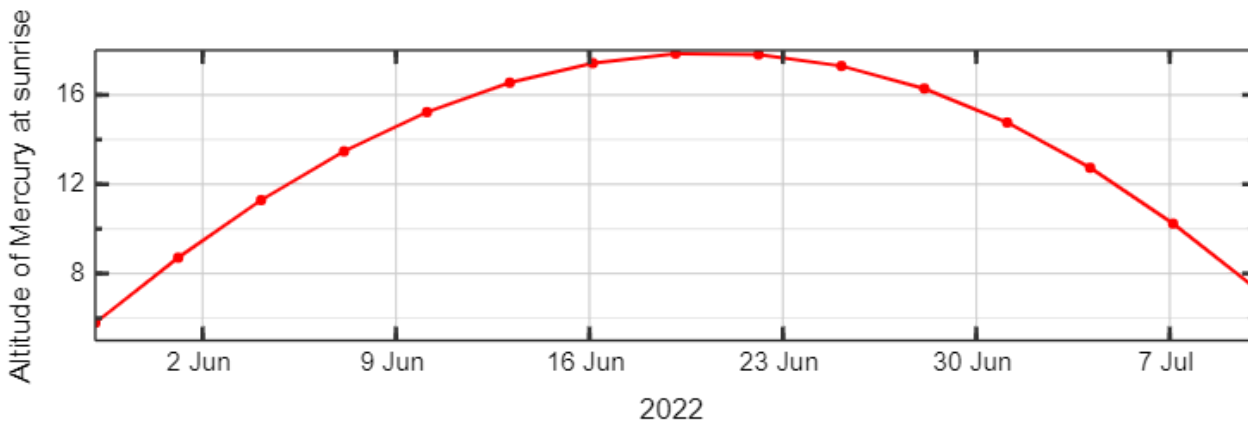
Today's Gregorian calendar has 365 days in a common year and 366 days in a leap year. However, our planet takes about 365.242199 days to orbit the Sun. This means that the timing of the equinoxes and solstices slowly drifts apart from the Gregorian calendar, and the solstice happens about 6 hours later each year. Eventually, the accumulated lag becomes so large that it falls on the following date.

To realign the calendar with the tropical year, a leap day is introduced (nearly) every four years. When this happens, the equinox and solstice dates shift back to the earlier date again.

Other factors influencing the timing of the equinoxes and solstices include variations in the length of a tropical year and in the orbital and daily rotational motion of the Earth, such as the "wobble" in the Earth's axis (precession).

MERCURY AT GREATEST WESTERN ELONGATION

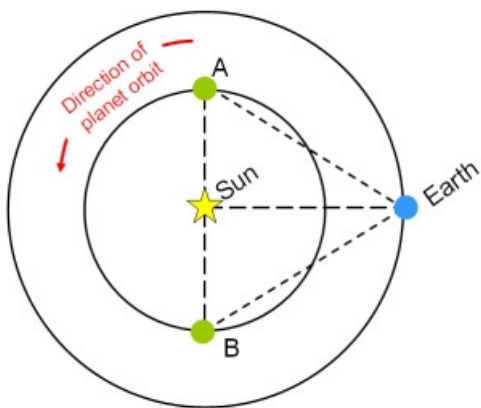
Best day to observe Mercury



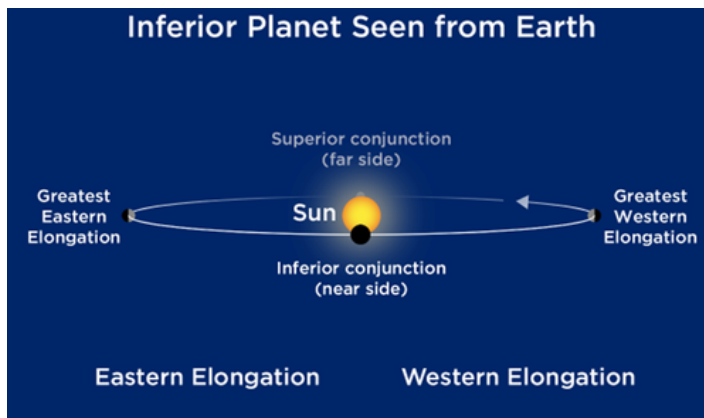
(Image credit: Earthsky.org)

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.



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 90degree.



Greatest Western Elongation

On June 16, 2022 Mercury will reach its greatest separation from the Sun in its 2022 morning apparition. It will be shining at magnitude -0.5 but afterwards brightens for the rest of June. Through a telescope, Mercury appears 36% illuminated, in a waning crescent phase. Its farthest point from the Sun in the early-morning sky is called its greatest elongation west.

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

CONJUNCTIONS FOR THE MONTH

Conjunction - Occasionally two or more objects meet 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.

Pleiades, Venus and Moon Conjunction

Date: 26th June, Venus and Crescent Moon will be seen near the Pleiades open star cluster.



Place: Chennai / Date: 26th June / Time: 3AM

(Image credit: Stellarium)

Planetary Parade with the Moon

Date: 24th June, Mercury, Venus, Mars, Jupiter and Saturn are all bright enough to be seen with the naked eye, and they will align in order before sunrise near the end of June.

The rare alignment will appear just before sunrise on June 24 across the eastern sky. The crescent moon will also be in line with the planets, shining between Venus and Mars.

Although the planets will appear to be in a line in the sky, they will not be lined up perfectly in the solar system. This is just how they will appear from the perspective of the Earth.



Place: Chennai / Date: 24th June / Time: 5AM

(Image credit: Stellarium)

GALACTICA

Conjunction of Mercury, Venus and Pleiades

Date: 16th June, Mercury disappeared into the sun's glare in May 2022 with the dipper-shaped Pleiades star cluster. The 2 reappear together, before sunrise in June. Brilliant Venus is also nearby.



(Image credit: Stellarium)

Conjunction of Mars and Jupiter

Date: 1st & 2nd June Morning, the king of planets meets the red planet. During this Mars and Jupiter conjunction, the 2 will be separated by about a 1/2 degree.



(Image credit: Stellarium)

Conjunction of Moon and Beehive

Date: June 4th, Moon will have a closer approach of Beehive Star cluster (M44) during the evening of 4th June. Below is the Binocular view of the crescent Moon with Beehive cluster.



(Image credit: Stellarium)

Conjunction of Moon and Saturn

Date: 19th June, In the early morning hours of June 19, the waning gibbous moon lies near Saturn. The bright star close to them is Fomalhaut.



(Image credit: Stellarium)

1st Super Moon of the year

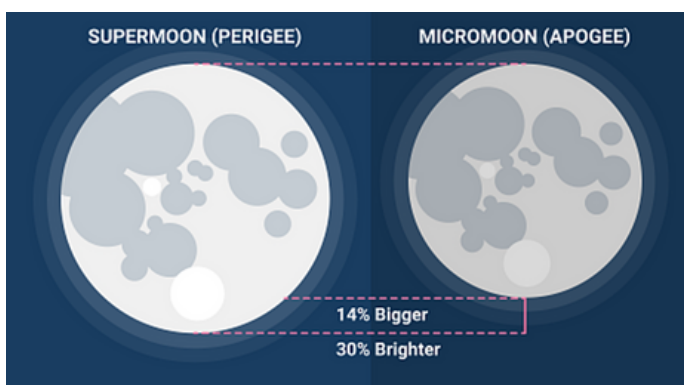
Date: 14th June, there are no official rules as to how close or far the Moon must be to qualify as a Supermoon or a Micro Moon. Different outlets use different definitions. Due to this, a Full Moon classified as a Supermoon by one source may not qualify as a Super Full Moon by another.

Supermoon: A Full or New Moon that occurs when the center of the Moon is less than 360,000 kilometers (223,694 miles) from the center of Earth.

Micromoon: A Full Moon or New Moon takes place when the center of the Moon is farther than 405,000 kilometers (ca. 251,655 miles) from the center of Earth.

A Super Full Moon's angular size is 12.5%-14.1% bigger than a Micro Full Moon, and 5.9%-6.9% bigger than an average Full Moon.

the Full Moon in June and the last Full Moon of spring, the Algonquin tribes called this the Strawberry Moon. The name comes from the relatively short season for harvesting strawberries in the north-eastern United States.



(Image credit: Timeanddate.com)

STUDENT'S CORNER

Understanding the Zodiacs

Ananya Nandakumar

iAstronomer member, Space India.

Did you know that your Zodiac Sign or at least what you perceive to be yours, is incorrect? If you think that you're a Sagittarius because you were born between the dates 22nd November to 21st December, then you're misinformed. The nature of the Zodiac sign itself was to help people navigate through the year (back when calendars didn't exist). These constellations fall on the ecliptic, that is the path of the sun across the sky. The constellation itself rises and sets with the sun, for roughly a month, and that's how your Zodiac sign is calculated. There are 12 of these constellations that fall on the ecliptic starting from Aries to Pisces. You might not be aware of this, but there is a 13th constellation called Ophiuchus that falls to the north of Scorpius. But it is not a part of the Zodiacs as it didn't "fit into" the 12 divisions of the sky done by the Babylonians 2500-3000 years ago, according to some sources. The reason could also be Earth's wobble that causes the stars and constellations to appear differently now, than 30 centuries ago. So, that means your actual Zodiac Sign is different, and let's try to understand how. First of all, not many people know this, but the Earth engages in what's called a Precession Motion, that causes its axis to wobble like a spinning top.



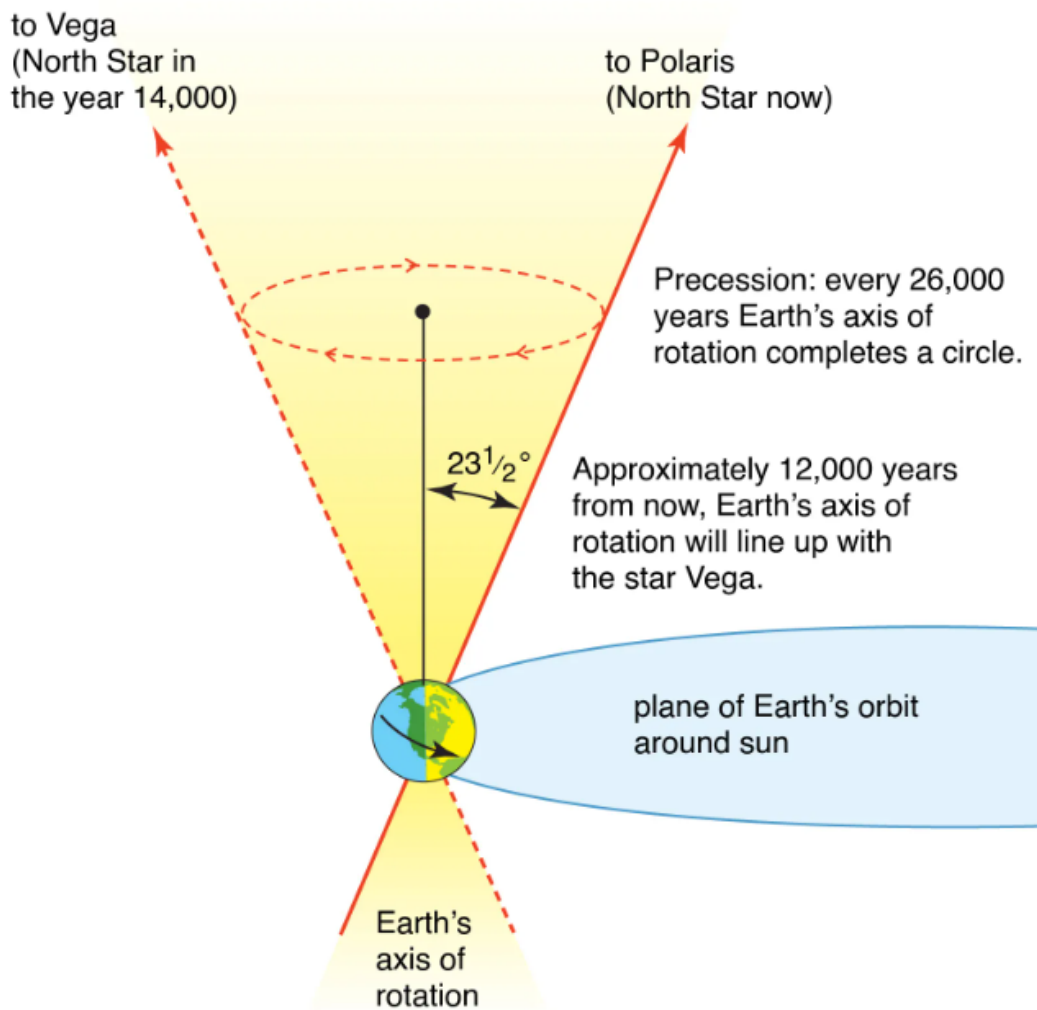
(Image credit: Allthesky.com)

It completes 360° rotation every 26,000 years. This wobble itself happens due to the shape of the Earth. It is not a perfect sphere, but more of an Oblate Spheroid. So, spinning at about 450m/s at the Equator, the body of the Earth (which isn't uniform throughout) itself stretches against the force of its gravity and towards the force of the Sun's gravity. This causes the wobbling phenomenon called the Chandler Wobble.

And whatever point the north pole faces, becomes the point where all the stars you see from the Earth, orbit around (only from Earth's POV). This shift, over the course of a century, accounts for 10 meters (on the earth's surface). And if, for every 26,000 years, a 360° rotation happens, then for every century, an approximate shift of 1.3° takes place. The north pole currently points towards the star Polaris, which is also called the North Star. And since the pole is directly facing it, it neither rises nor sets, when seen from the Northern Hemisphere. Little Dipper, the asterism, is directly connected to Polaris which makes it go around, with Polaris being in the centre.

Understanding the Zodiacs

This means when the axis point towards a different star, the Earth's ecliptic is bound to change. When the Earth's ecliptic changes and the constellations that fall on it will change too. The oldest undisputed timeline for the use of the Zodiac dates back to 1950 BCE, to the Mesopotamian Dynasty. 1950 BCE can be calculated to be about 4000 years or 40 centuries back. If for each century, a 1.3° shift takes place, then, 40 centuries ago, the north pole must have been facing 52° ($1.3^\circ \times 40$ centuries) away from its current point. By running a simple simulation on an app, we can see that about 4000 years ago, the North Star was Kochab, from Little Dipper, while Polaris is orbiting it.



(Image credit: Britannica.com)

If 40 centuries ago, the Zodiac signs came about with their respective month, then the sign associated with the month in the current times, must be inaccurate due to this precession movement. And you can see that too if you are interested in looking at the stars' movement. During the period 22nd March – 21st April, which is supposed to be the month of Aries, the Sun sits right in the constellation of Pisces, the sign before it. Running another simulation on the same program, it can be seen that the sun shifts to the next constellation every 100 years. This means, that just one century ago, the sun was in the exact position as it was during the Mesopotamian period. Being born after the 19th century, we are all off by what we think of our Zodiac Sign is, by one sign. If you think you're a Taurus, you are an Aries. And in 12,000 years, when Vega becomes the North Star, your zodiac will be off by 4 signs.

Conclusion

All this just goes to show that Science is always evolving, and it's up to us to keep ourselves updated. Associating something so spiritual as Astrology to some outdated Science because of the perception that Science is the answer to everything, diminishes its value. They are both unique and beneficial to people in different ways, and so should be embraced accordingly.

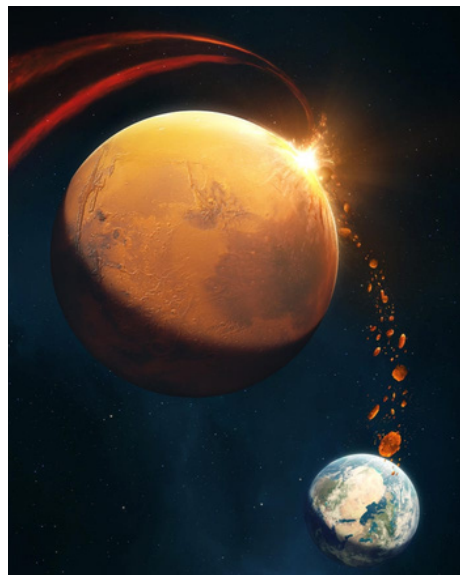
Panspermia

Anisha Patil

iAstronomer member.

Introduction

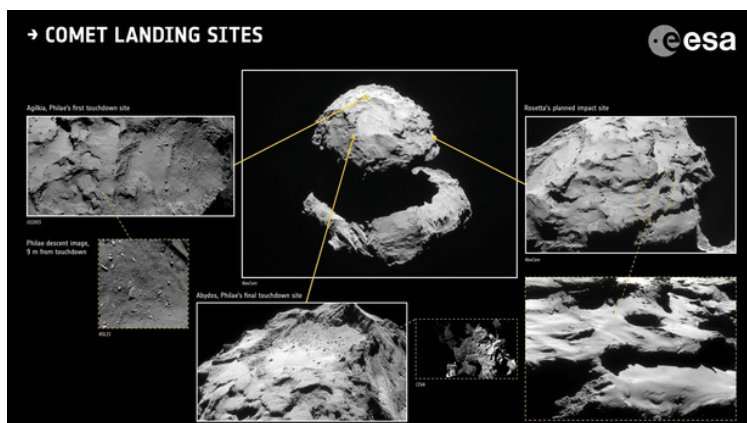
Mankind has been trying to seek the answers to the questions. 'Who are we?' 'From where we have originated?' How life first came on Earth? 'Is there life somewhere else in the Universe?', and many more...! We are still trying to figure out that how we came into existence. We really don't know where this journey is going to take us, but the quest that has started since time immemorial won't stop. The quest must go on...



The Panspermia Theory

Quest has been going on to find out our own origin and search for blooming life somewhere else in the universe. Though we have developed a lot still we are unaware of the answers about who's over the next hill. Till now, we have explored less than 5% of the universe, the remaining 95% is still arcane! When scientists approach the question of how life began on Earth, or elsewhere, their efforts generally involve attempts to understand how non-biological molecules bonded, became increasingly complex, and eventually reached the point where they could replicate or could use sources of energy to make things happen. Ultimately, of course, life needed both. Way time back famous scientists Urey and Miller performed an experiment where they tried to create primitive earth conditions in the laboratory. They figured it out, that somehow, small organic molecules along with the lightning and solar energy paved the way for the emergence of primitive lifeforms on earth's surface which leads to the complex diversity that we have today!

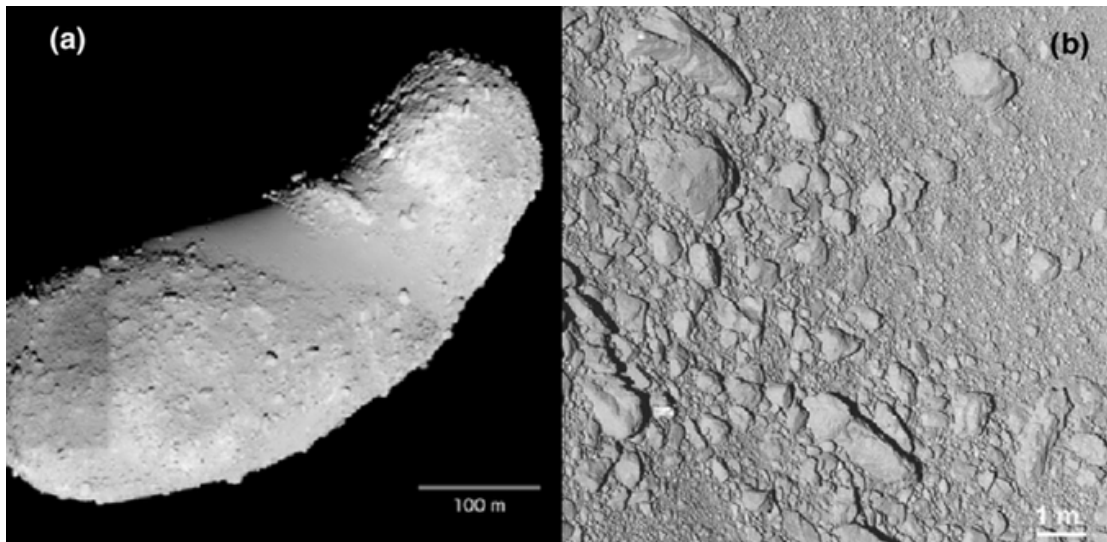
WAIT!!! But from where these organics came? Were they already present on the earth's surface? Or, whether they were brought to earth from somewhere else through an external source? Hmm! Worth asking, right? To put some light on this topic let us discuss THE PANSPERMIA THEORY. This very famous theory was put forth by noble laureate Scientist. Svants Arrhenius. He believed that "life on earth was not the part for it originally, rather it was brought to earth via meteorites. Since then many space missions were conducted to encounter comets and asteroids to collect samples for unfolding the mysteries of life. Take for example, the famous 'ROSETTA MISSION', which was the first one to catch a comet. It figured out traces of amino acids on the comet which played a crucial role in building different life compounds especially, DNA!



(Image credit: ESA)

Panspermia

Similarly, JAXA had announced their sample collection mission to asteroid 'HAYABUSA' which was orbiting between earth and mars. Comets and rocks have been found to harbor the organic molecules essential to sustain life. Also, it's been stated that there has been rock exchange between Venus, Earth & Mars backing then and still going on. If there has been a rock exchange taking place, the question arises, are we truly Venusians, Earthians, or Martians? If comets or celestial objects were potent enough to plant the spores of life on our planet might be it has done the same somewhere else in the universe. That's why there might be a possibility that it had seeded life somewhere out in the universe.



General (a), and detailed (b) view of asteroid Itokawa from the Japanese ISAS-JAXA Hayabusa spacecraft during encounter and landing in September–November 2005. A few thousands of grains (<10 m) from this asteroid were brought back to Earth in June 2010.

It's been estimated that our earth started evolving somewhere around 4.5 billion years ago. At that time it was one of the hostile places for life to actually go ahead and emerge. Earth was flooded with hot lava, massive volcanic eruptions, and immense temperature jeopardizing enough life. As time went on earth's atmospheric temperature became more and more humble and served as a fertile site for smaller molecules to coalesce and gave rise to simple, innocuous life forms which after a long span became more complex lifeforms.



Conclusion

We are still trying to figure out how we came to existence. We really don't know where this journey is going to take us, but a quest that has started since the time that's immemorial and won't stop. The quest must go on.

Cosmic Collisions

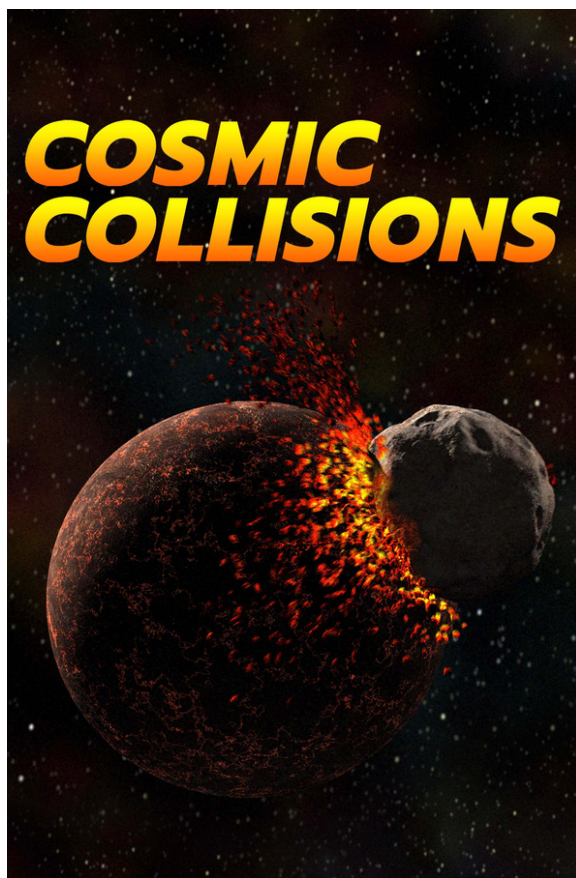
Jhanvi Singh

iAstronomer member.

Cosmic Collisions are the most significant phenomenon happening in space. It has an equal significance role in providing life to us human beings as well and thus we shall get into more depth about this topic and its importance and how if any of the cosmic collisions have not had happened, we would not even have existed. Cosmic collisions are one of the most important celestial occurrences which happen in our solar system or beyond. We shouldn't agonize much about it at the present time because none of the asteroids or comets is going to hit earth any time soon, but they come closer due to earth's gravitation and pass by very closely but don't collide with the earth's surface. (For Instance, asteroids are the huge chunks of rocks that were left behind after the formation of our solar system).

As the comet passes by, some chunks of rocks and dust fall from the tail of the comet and come towards the earth and form meteorites which we infer as a meteor shower.

The rays of the sun are known as Solar flares, they are extremely dangerous and impactful. However, we won't be affected by it due to the earth's magnetic field. As the solar flares comes rushing towards that earth, the earth's tilted magnetic field prevents it and forms auroras on top of both of the magnetic fields of the earth.



Millions of years later, when dinosaurs used to dominate our planet, one asteroid actually came closer and aimed towards the earth, and hit it. The asteroid hit our planet in the place which we today call Mexico. The impact was compelling and many living creatures and dinosaurs, died.

Huge fireballs from the asteroid covered the entire planet and affected every plant and creature. But some microorganisms and creatures still survived and evolved and from the huge ancestors of apes, we became humans.

Cosmic collisions can be very dangerous but beautiful and spectacular when viewed. They play a huge part in our existence. If the asteroid hadn't collided with earth, the impact hadn't been that big, the earth wouldn't have tilted and we wouldn't get our seasons and probably not even us.

There is a different theory as to how was our universe or solar system formed but many scientists believe that, Thousands of Billions of Years ago, when our earth was very young, it was just a big ball of fire. They believe that an asteroid hit the earth and flew away very big parts of it. The big chunks of rock parts roamed near the earth and eventually in a month's time, came together due to the gravity of the earth and formed another big ball which we call today our moon.

Four billion years later, the Milky Way and Andromeda galaxy will come closer and eventually collide with countless stars and planets present inside. Some scientists believe that it's their tail of dust that will collide thus it won't be affected much. Our own galaxy Milky Way formed from the very process. It was also formed from the collision of two galaxies. The collisions of two stars are also very common in outer space.

We know for sure that asteroids can't affect the earth in the present or the near future but we must be prepared. Scientists at NASA have thought of a way to prevent asteroids coming towards the earth. We can launch a very strong satellite in space, which can change the course of the asteroid which will head towards the earth. The gravitation pull of the satellite can help change the course of the asteroid from its orbit and thus helping the earth to prevent the damages caused by it. Of course, the gravitation won't be that big, but big enough to change the course of the asteroid.



(Image credit: Science.org)

ASTRONOMY'S GREATEST CONTRIBUTORS

Abhay Dhanush Sadhu

iAstronomer member.

In the history of astronomy, there have been many astronomers who have contributed to astronomy so that other generations of people will benefit from their contribution but the contributions of the most famous and intelligent people in astronomy have not only made a small contribution but in turn, changed a bit of the concepts of Astronomy itself.

So, here are some of the famous people who made the greatest contribution.

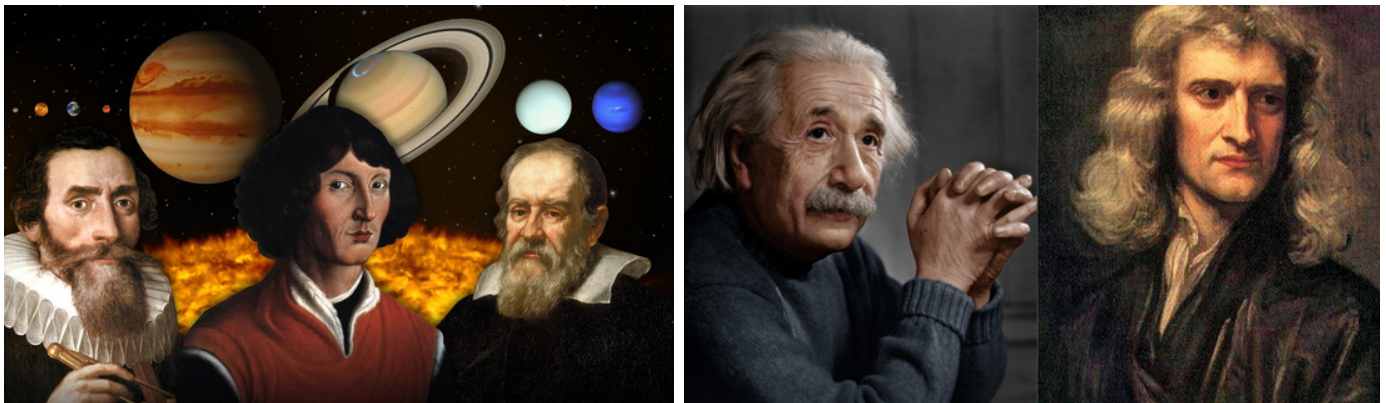
Nicolaus Copernicus: Nicolaus Copernicus who was born in 1473, was the first to suggest the sun was the center of the solar system and all planets orbited it. This was known as the heliocentric view of the Universe. Before Copernicus suggested the heliocentric view, everyone thought that Earth was the center of the universe and everything orbited it. This was known as the geocentric view. Though not everyone believed Copernicus, many scientific and logical pieces of evidence came from future astronomers.

Hans Lippershay: Hans Lippershay who was born in 1570 was known to invent the first telescope. He was a spectacle maker in the United Netherlands. In 1608, he created the first telescope which can see only near objects on land clearly. Many astronomers like Galileo inspired the idea and worked the same to look beyond the Earth.

Galileo Galilei: Galileo was born in 1564 and was a great Italian mathematician, astronomer, engineer and scientific philosopher. He made his own telescopes to look into the night sky and watch the planets. While observing Jupiter's moons and Venus' phases, he came to believe in the Copernican theory of heliocentric view. He showed the evidences to the catholic church but they denied it and kept Galileo under house arrest until he died. In 1992, the catholic church admitted it had been wrong and apologized for its treatment of Galileo.

Johannes Kepler: Johannes Kepler discovered the basic rules that govern the way in which the planets move. Kepler's first law was that the shape of the orbit a planet revolves around a star is always elliptical. Kepler's second law is that the speed of a planet depends upon the distance from its star. Kepler's third law is that the time a planet takes to revolve around the star also depends upon the distance between the star and the planet. He also believed that the sun is not always at the center of the solar system but near the center. This means the sun will be at one focus and the secondary focus is just opposite to the sun. This rule is followed by every star which has planets orbiting it.

Sir Isaac Newton: Sir Isaac Newton was born in 1642 and discovered the laws that govern the force of gravity and motion. His main contribution discovered the natural force called gravity and shows why planets orbit the sun. He realised that the planets orbit depends on its mass and distance from the sun. The farther apart and lighter two objects are, the weaker the pull of gravity is between them. He even discovered that sunlight can be split into a spectrum, the seven colours of rainbow -Red, orange yellow, green, blue, Indigo and violet. In 1669, Newton was made the Lucasian professor of mathematics at Cambridge University.



(From left, Johann Kepler, Nicolaus Copernicus, Galileo Galilei, Albert Einstein & Isaac Newton)

Edmund Halley: Edmund Halley was one of the leading scientists and explorers of his day, and made many discoveries. Halley also made advances in mechanics, motion, gravity and mathematics. In 1705, after noticing visits by a comet in 1456, 1531, 1607 and 1682, Halley predicted its return in 1758 which was accurate. The comet was named as Halley's comet.

Albert Einstein: Albert Einstein is known for discovering two theories of relativity. Special relativity shows that all measurements are relative, including time, space and speed. In other words, time, space and speed depend upon each other. He suggested that light will always travel at the same speed. Special relativity also shows that as things go faster, they seem to become shorter and heavier. There is another theory called the theory of general relativity which contains a lot of special relativity but also explains how gravity works.

Edwin Hubble: Edwin Hubble discovered the first galaxies which were first thought as nebulae. He even discovered the term 'Red Shift'. This happens when distant galaxies go farther away from Earth causing them to become red because the light rays must travel so much distance that their wavelength becomes red. This red shift term has helped him discover that the Universe is constantly expanding.

Carl Sagan: Carl Sagan was born in 1934 and wrote many books regarding space, his most famous one being the TV series Cosmos which was co-written by him and was presented in more than 100 countries.

Stephen Hawking: Stephen Hawking was a famous scientist who did groundbreaking work on black holes and discovered the laws of the Universe. His theories even explain us about the space time inside a black hole and near to it. He even discovered radiation emitted from a black hole which was named as Hawking's radiation. He even found out the origin of the Universe which was known as the big bang. He explained that before the big bang was a very small point full of energy squeezed into it. Then the ball exploded into a Universe. Hawking was appointed the Lucasian professor of mathematics in 1979 which was once held by sir Isaac Newton.



LIFE ON MARS

Daksh Rathi

iAstronomer member.

Mars is the fourth planet from the sun and also, it is the second smallest planet in our solar system. The possibility of life on Mars has aroused the interest of scientists for many years. A major reason for this interest is the similarity and proximity of the planet to Earth. Mars certainly gives some indications of the possibility of life.

Possibilities of Life on Mars

In the past, Mars used to look quite similar to Earth. Billions of years ago, there were certainly similarities between Mars and Earth. Furthermore, scientists believe that Mars once had a huge ocean. This ocean, experts believe, covered more of the planet's surface than Earth's own oceans do so currently.

Moreover, Mars was much warmer in the past than it is currently. Most noteworthy, warm temperature and water are two major requirements for life to exist. So, there is a high probability that previously there was life on Mars. There are some ingredients for life that already exist on Mars.

Bio signatures refer to current and past life markers. Furthermore, scientists are scouring the surface for them. Moreover, there has been an emergence of a few promising leads. One notable example is the presence of methane in Mars's atmosphere. Most noteworthy, scientists have no idea where the methane is coming from. Therefore, a possibility arises that methane presence is due to microbes existing deep below the planet's surface.

One important point to note is that no scratching of Mars's surface has taken place. Furthermore, a couple of inches of scratching has taken place until now. Scientists have undertaken an analysis of small pinches of soil. There may also have been a failure to detect signs of life due to the use of faulty techniques. Most noteworthy, there may be "refugee life" deep below the planet's surface.



Challenges to Life on Mars

First of all, almost all plants and animals cannot survive the conditions on the surface of Mars. This is due to the extremely harsh conditions on the surface of Mars.

Another major problem is the gravity of Mars. Most noteworthy, the gravity on Mars is 38% to that of Earth. Furthermore, low gravity can cause health problems like muscle loss and bone demineralization. The climate of Mars poses another significant problem. The temperature on Mars is much colder than on Earth. Most noteworthy, the mean surface temperatures of Mars range between -87 and -5 °C. Also, the coldest temperature on Earth has been -89.2 °C in Antarctica.

Mars suffers from a great scarcity of water. Most noteworthy, water discovered on Mars is less than that on Earth's driest desert. Other problems include the high penetration of harmful solar radiation due to the lack of the ozone layer. Furthermore, global dust storms are common throughout Mars. Also, the soil of Mars is toxic due to the high concentration of chlorine.

To sum it up, life on Mars is a topic that has generated a lot of curiosity among scientists and experts. Furthermore, establishing life on Mars involves a lot of challenges. However, the hope and ambition for this purpose are well alive and present. Most noteworthy, humanity must make serious efforts for establishing life on Mars.

Dyson sphere

Sourajit Mandal
iAstronomer member.



We humans, consume a lot of energy. We use coal, petrol, diesel, hydroelectricity, windmills, etc. to produce electricity. But these sources are not stable. They do not produce enough energy and have many drawbacks. Humans need a lot more energy to go to different stars and become an interstellar species. A Dyson Sphere is a good idea. The sun would provide us with enough energy to become an interstellar species. Also, it would be a stable source of energy with no known drawbacks.

The Dyson Sphere

A Dyson sphere is a hypothetical megastructure that completely encompasses a star and captures a large percentage of the energy from a star. It is a giant superstructure, which surrounds a star to capture all the energy produced by its light. Although first proposed by Freeman Dyson, a mathematician and physicist, in 1960, in his paper Search for Artificial Stellar Sources of Infrared Radiation, he was inspired by the 1937 novel "Star Maker" by Olaf Stapledon.

In his paper, Freeman Dyson mainly focused on energy consumption but not construction. His idea was to make a solid sphere around a star. However, this structure is very inconvenient as it requires a lot of material. Also, any tiny gravitational shift or any space rock may push the sphere into the star.

A better idea is a Dyson swarm. It would consist of many independent constructions orbiting the star. The independent structures would be either giant reflectors that would reflect light to some central collecting station or they would be independent solar panels. This would be useful as we would need less materials to make it and it would be less dangerous. Any kind of space rock or gravitational shift would push only some independent structures into the star. If that happens the other structures would provide enough energy to rebuild them.

Still, this would require a lot of material. Mercury which is closest to the sun and extremely rich in minerals would be completely diminished by this project. It could be used as our space mine.

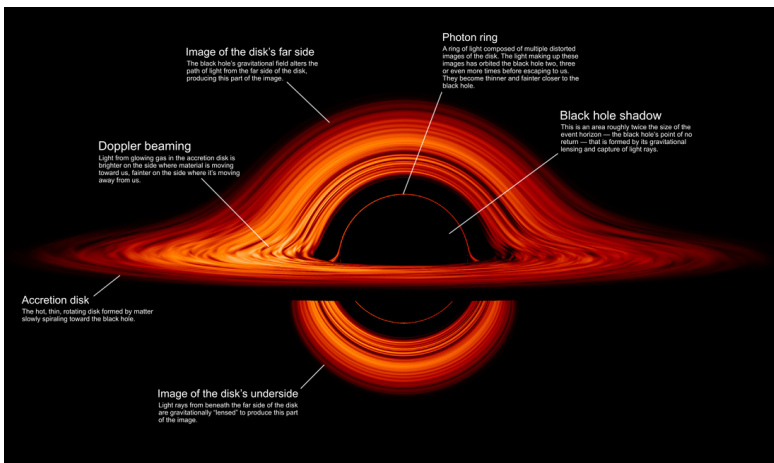
Electromagnetic launchers could be used to launch the independent constructions. They would launch our structures easily.



The Dyson swarm would speed its own construction. The first structure launch would provide energy and speed up the formation of the second. The first two structures would give enough energy for the next two and so on. Also, the Dyson swarm would give the energy to build more Dyson swarms around other stars.

The Dyson swarm would be a great achievement for current day humanity, just like fire for the ancient humans. It would make humans an interstellar species and give us enough energy for space travel outside the solar system. We would have enough energy for converting any solid celestial object into habitable. Just, anything would be possible with this.

"It would end up all our physical limitations to just our imagination."



The Dark Eaters

Jasraj Singh

iAstronomer member.

A black hole is a celestial body that has really strong gravity, so strong that even light can't escape from it. Black holes are capable of sucking in the fabric of time and space. Imagine a really strong and flexible water bed with something really heavy in the middle, and then put a light but smooth ball on the water bed. The ball will roll over into the pit caused by the really heavy thing on the water bed. In this example, the water bed is the fabric of space-time, the heavy thing is a massive object, and the light ball is a less massive object.

The bend caused in space-time is not a major one for a star, but a black hole would make a really big one as its density is a lot more than any star that can exist. If an object is turned into a black hole by compressing it enough (you can imagine it being done by some fictional aliens), its size would reduce by a lot. Imagine the sun being replaced by a black hole of equal mass, the black hole's size will be 2.94 kilometers while if the same were done to the moon, it would be as small as a penny.

A black hole has a total of 6 known parts here's a slight description of some of them:

- i. Accretion disk** - This is disk formed by matter slowly falling inside the black hole in a spiral-y way.
- ii. The ark on the top and bottom** - This isn't actually a separate part, it's a part of the disk in the far side of the black hole, but is visible to us due to gravitational lensing (path of light being redirected by gravity [this can take place with anything that has weight including us humans but is only easily noticed in black holes as they have the strongest known gravity])
- iii. Event horizon** - This is the point of no return. If you (somehow) get to a black hole and cross this boundary, you can't escape unless you have a way to go faster than the speed of light.
- iv. Singularity** - This is the middle of the black hole. It has no breadth, no length, and no height. It's basically 0 dimensional. According to many hypothesizes there's also a singularity, which has a length and breadth and explains rotating black holes.

Black holes are divided into 4 categories- supermassive (100000 to 10000000000 suns), intermediate (100 to 100000 suns), stellar (3 to 10 suns), and miniature (it's in kilograms).

At the end, a black hole is just a celestial body that is misunderstood to be destructive and dangerous. A lot of people think that black holes disobey the laws of physics, but they follow them like everything else, they are just very extreme places in the universe. They are just as beautiful as any other natural phenomena. They might even be the reason the big bang happened, as the point of infinite mass that exploded and created the universe as we know it could have been a singularity and the universe in a constant loop of death and life, dying and being reborn for who knows how long. All these universes could be different. But this is the only one that matters to us. We won't be around in the next time the loop repeats. So, we should try to remove all the things that make this world worse, like pollution, discrimination and the list goes on, and on and on.

A Diamond Planet in Space

Lakshana Kumar

iAstronomer member.

Except the eight basic planets in our solar system that we know of, could there be yet another planet made of diamonds in space?

Well, the answer is Yes! NASA has discovered a planet made of diamonds named 55 Cancri e in 2004.

Scientists said that the planet was two times larger than Earth and its inside core is completely made of diamonds. It is a kind of alien planet.

55 Cancri e was turned into a diamond planet due to the pressure of heat for millions of years. It is 40 light years from our Earth.



Its surface is boiling hot since its positioned near its host star. The planet is also referred to as Super Earth.

NASA scientists have led to the conclusion that it was made from diamonds after an in-depth estimation of the planet's radius, mass and host star composition.

It is the first ever diamond planet discovered and NASA has been trying to find even more.

No wonder the universe is such a treasure to us. It gave us the planet Earth to survive and we have also now found out a diamond planet. How spectacularly splendid!

The King of Anti Cyclonic Storm 'Jupiter'

Peyali chanda

iAstronomer member.

Jupiter is the biggest planet in the solar system and gets its name from the king of the ancient Roman gods 'Namesake'.

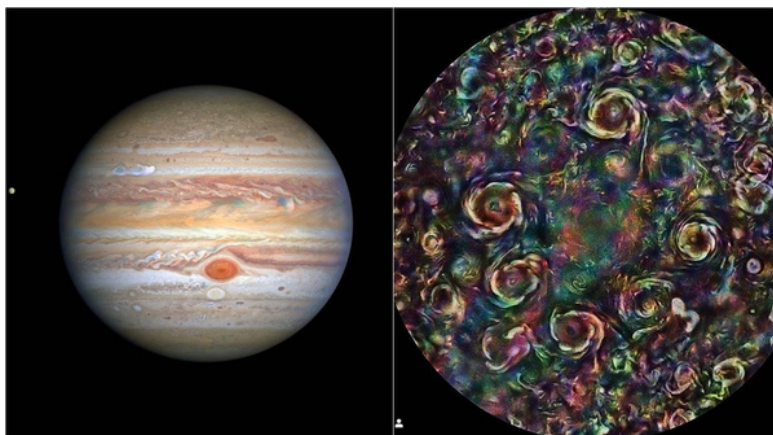
- Jupiter Is the Fastest Spinning Planet in The Solar System.
- The Clouds on Jupiter Are 15 km Thick.
- Jupiter Has Rings.
- Jupiter's Magnetic Field Is 14 Times Stronger Than Earth's.

Jupiter is called a gas giant planet. Its atmosphere is made up of mostly hydrogen gas and helium gas.

Jupiter's Storms

The bands on Jupiter are storms that have been going on for many years as it rotates very fast.

The microwave observations show these storms on Jupiter, called vortices, extend below the cloud deck of the planet. In the case of the Great Red Spot, it extends at least 200 miles into the clouds of Jupiter, beyond the depths of where clouds form and water condense. The red spot is a storm going on for centuries it is bigger than our very own planet. The Great Red Spot is a high-pressure, anticyclonic storm, and the largest in the entire Solar System. The storm causes its clouds to spin counterclockwise at a speed of more than 400 miles per hour. In comparison, a category four hurricane on Earth has winds reaching up to only 150 mph.



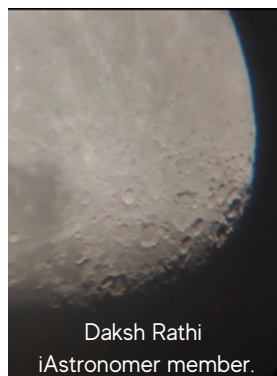
Astrophotographs by students



Milkyway Arm by Yash Dabholkar
iAstronomer member.



Jyotirmay Routray
iAstronomer member.



Daksh Rathi
iAstronomer member.



Abhineet Bansal
iAstronomer member.



Vanshika sehrawat
iAstronomer member.



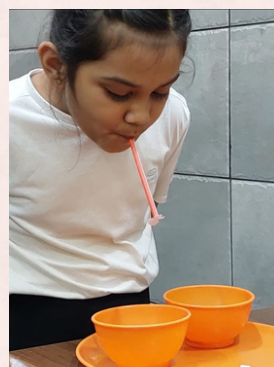
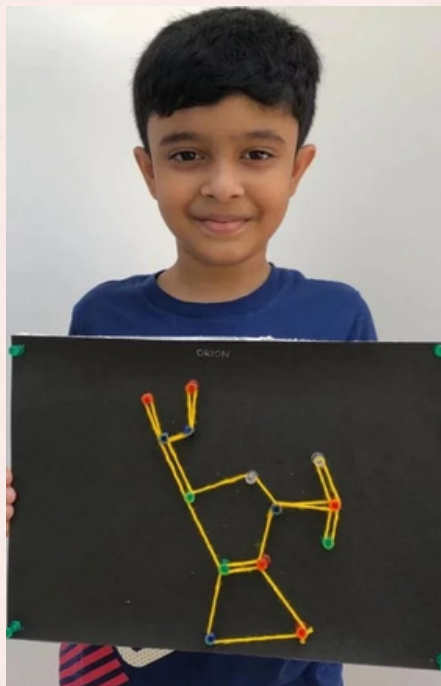
Sajan Saravanan
iAstronomer member.



Thiru Arasu
iAstronomer member.

SPACE Online "Astronomy Summer Camp"

Space conducted a ten days online Astronomy workshop for school students of different age groups. It includes 10 days of interactive sessions where the kid learnt various concepts of Astronomy and Space science. To understand the concepts better kids have done different activities and models. some of the works done by our young Astrokids are,



HISTORICAL EVENTS THAT HAPPENED IN JUNE

Pioneering women in space : Valentina Tereshkova - the first woman to travel in space.



The first woman in space

In June 1963, the first woman rocketed into space. Her name was Valentina Tereshkova and she bravely went where no woman had gone before.

Before she was a cosmonaut, Tereshkova was a textile worker. The first woman to fly in space had no experience as a pilot. Tereshkova volunteered to join the Soviet space program in 1961 due to her hobby, skydiving.

This experience proved to be of value in the selection process, as cosmonauts were required to parachute from their capsules upon returning to the Earth. Having completed 126 parachute jumps, Tereshkova made an impressive candidate.

In February 1962, Tereshkova and four other women (Tatyana Kuznetsova, Irina Solovyova, Zhanna Yorkina and Valentina Ponomaryova) were selected from a pool of over 400 applicants.

According to the European Space Agency (ESA), the original plan was for a joint mission to take place, putting two women in space with solo missions aboard Vostok 5 and 6 sometime in March or April of 1963. Tereshkova was to crew Vostok 5 with Ponomaryova aboard Vostok 6. However, plans changed.

It was decided that cosmonaut Valeri Bykovsky would fly aboard Vostok 5, and Tereshkova would take flight aboard Vostok 6.

After 18 months of training, Tereshkova launched into space on June 16, 1963, aboard her Vostok 6 spacecraft, just two days after Bykovsky lifted off inside his Vostok 5 capsule.

It marked just the second time two crewed spacecraft were in orbit at the same time. The two capsules came within three miles of each other and communications were established between the two spacecraft.

At just 26, Tereshkova had become the first woman to fly in space.

During her three-day mission, she orbited the Earth 48 times. Her spaceflight was broadcast on television and watched by citizens in the Soviet Union and Europe.

Her flight almost ended in disaster due to an error in the spacecraft's navigation software, but luckily, Tereshkova took notice, made adjustments, and returned safely home.

Following Tereshkova's flight, the first program for women cosmonauts was scrapped. It would be nearly two decades before the next woman, cosmonaut Svetlana Savitskaya, would fly in space with her Soyuz T-7 mission in 1982.



SALLY RIDE : THE FIRST AMERICAN WOMAN IN SPACE.

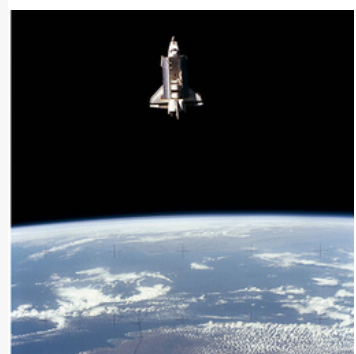
Sally Ride was the third woman to fly in space but was the first American woman to rocket into orbit aboard Challenger for the STS-7 mission on June 18, 1983.

Ride joined NASA in 1978. She was selected out of a pool of 8,000 applicants and became part of the first astronaut class to include women. The class, referred to as the “Thirty-Five New Guys,” consisted of 29 men and six women. Ride trained for five years before she was assigned to her first mission, STS-7.

The flight of the first American woman in space lasted six days, during which time the crew conducted experiments and deployed two communications satellites.

In a NASA interview for the 25th anniversary of her flight in 2008, Ride said of being the first woman in space, “I didn’t really think about it that much at the time – but I came to appreciate what an honor it was to be selected to be the first to get a chance to go into space.”

Following her historic flight, Ride traveled into space one last time, a year later, again aboard Challenger for STS-41G. She was assigned to a third mission, but it was scrubbed following the tragic Challenger accident in 1986.



She is the only person to have served on both investigation boards following the Challenger and Columbia accidents. Ride left NASA in 1989 and joined the faculty at the University of California, San Diego as a professor of physics and became director of the California Space Institute. She started her own company in 2001, Sally Ride Science, to encourage girls and women to pursue careers in science, technology, engineering, and math (STEM).

In 1988, Ride was added to the National Women’s Hall of Fame, and in 2003, she was inducted into the Astronaut Hall of Fame.

Sally Ride passed away in 2012, but her legacy lives on. She was an outspoken advocate for women in STEM and her passion and accomplishments still serve as inspiration for the next generation of female explorers, to continue reaching for the stars.

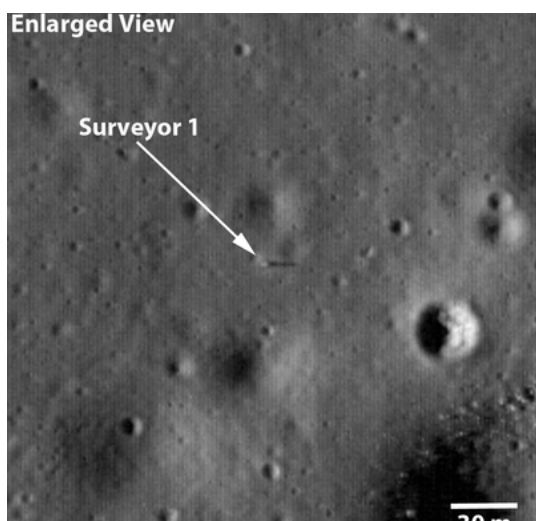


SURVEYOR 1 - AMERICA'S FIRST SOFT LUNAR LANDING



Image of Surveyor 1's shadow against the lunar surface, collected by the on-board imaging system [NASA]

Surveyor 1 was the first in a series of seven US missions to the Moon that preceded Apollo; five of the seven missions were successful. Surveyor 1 was launched on May 30, 1966 and landed on June 2, 1966. The mission's objectives were to soft land on the Moon and to collect information on the lunar regolith. This first Surveyor spacecraft carried only a television camera system (later missions carried additional instruments). The spacecraft landed on a relatively smooth mare surface in Oceanus Procellarum (the Ocean of Storms). The Surveyor 1 landing site is also one of the areas identified by Project Constellation as a high-priority target for future human lunar exploration.



(Image credit: NASA)

About the mission

Surveyor 1, the first of a series of seven robotic spacecraft sent to the moon to gather data in preparation for NASA's Apollo missions, was the first spacecraft to make a true soft landing on the moon. As such, it was one of the great successes of NASA's early lunar and interplanetary program.

The soft landing was achieved using a retrorocket and a bank of three thrusters to slow the lander's speed from almost 6,000 miles per hour to just 3 miles per hour and safely touch down on the lunar surface. Over a period of about 30 days, Surveyor 1 transmitted more than 11,000 photographs as well as data on the moon's surface and temperature.

EVENTS BY SPACE

VENUS AND JUPITER CONJUNCTION

A celestial spectacle was waiting for the early risers who wished to gaze out at the pre dawn skies. It was the apparent alignment of two planets - Jupiter and Venus. The predawn hours of May 1, 2022 were no excuse for stargazers to show up to glimpse a rare celestial event.

The much awaited conjunction of Venus and Jupiter was observed through virtual observation on May 1st, 2022, at between 4.30 am and 5.45 am.

Space India hosted a live telecast for the people of this eye-catching event. We showed a good view of the close encounter of the hottest planet Venus and the giant planet Jupiter using a Meade-10-inch telescope.

A conjunction is a celestial event in which two planets, or a planet and the moon or a planet and a star, appear close together in the night sky. The planetary meet up brings Venus and Jupiter within just one half degree of each other, which is equal to the apparent width of the Moon. The planets appear to line up from our vantage point on Earth, but in reality they are very far from each other.

Space snap photo of the close encounter of two planets. The two closely-spaced planets were joined by the slender crescent Moon for a spectacular three way conjunction. The three brightest objects in the night sky gathered so tightly together that you can hide them all behind your thumb held at arm's length.

Following are some of the photographs from the event,



JUPITER AND MARS CONJUNCTION

On 29th May 2022, SPACE India in its endeavor to popularize Astronomy and Space Science has organized a photo walk for the members of the iAstronomer Space Astronomy Club. The objective of this event was to organize the first physical meet of the iAstronomers as well as to observe the beautiful conjunction of the red planet- Mars with the giant planet Jupiter.

For the better understanding of our readers, conjunction is an event where 2 celestial objects come in close proximity to each other if observed from the Earth and technically share the same RA in the sky. This time planets Mars and Jupiter were just 0.7 degrees apart from each other which is little more than Full Moon.

The iAstronomer is a club with no geographical boundaries and has members from pan India, thus the event was observed and photographed by multiple groups from different locations across India.

Majorly it was observed from Chennai and Delhi where members of the club did the observation along with the SPACE Team.

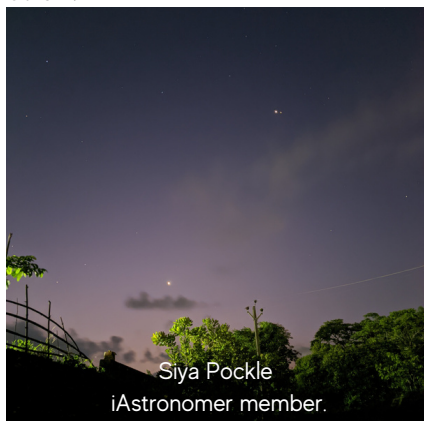
At Delhi, Space team conducted the event at Talkatora Garden which is a mughal era garden near the President Estate. Nearly 28 people attended the event live on the site where at first they observed the planets Jupiter, Mars and Saturn through the telescope and then moved on to photograph the conjunction of Mars and Jupiter and alongside the planet parade of Mars, Jupiter, Saturn and Venus.

At the same time, the SPACE team along with the members of the iAstronomer observed the live view of the planets and the conjunction from Chennai.

Alongside the live observation of iAstronomers, SPACE team also conducted a live webinar for everyone on Youtube and live view of the conjunction along with the close up view of the planets Mars, Jupiter and Saturn was shown to the audience.

This conjunction was special as it will be next visible in August 2024 and thus an amazing learning experience as well as photography opportunity for all.

Following are some of the images from the event at Delhi and Chennai and the photographs of the conjunction.



Siya Pockle
iAstronomer member.



JUPITER AND MARS CONJUNCTION



ALL INDIA ASTEROID SEARCH CAMPAIGN

All India Asteroid Search Campaign, a unique and exclusive International platform created by SPACE for Indian students and amateur astronomers across India since 2010.

SPACE conducts this campaign across India, in association with International Astronomical Search Collaboration (IASC) conducted by Dr. Patrick Miller of Hardin Simmons University, the USA as an educational outreach program.

The students will be specially trained to search asteroids in the Main Belt Asteroid through advanced data analysis and specially designed software.

In AIASC 2022, students will access the real-time data from the 'Pan Starrs' (The Panoramic Survey Telescope and Rapid Response System) Telescope, located at Hawaii, USA. They use a 1.8 m (60 inch) telescope to survey the sky to look for asteroids, comets and Near-Earth Objects (NEO).

The Campaign enables the students and amateurs to get exclusive access to astronomy images, which are otherwise not accessible till the postgraduate level, and they get training in advanced data analysis and software as well as interact with international scientists, all of which builds up to an invaluable real-time research experience. Through this campaign, students have made confirmed discoveries of Main Belt Asteroids and important observations that contribute to the NASA Near-Earth Object (NEO) Program at the Jet Propulsion Laboratory (Pasadena, CA).

SPACE
An Opportunity To **DISCOVER ASTEROIDS**

ALL INDIA ASTEROID SEARCH CAMPAIGN - 2022

Most Prestigious Project for Students

Phase I - May 27th to June 20th 2022
Phase II - June 24th to July 18th 2022

A Citizen Science Project By NASA

Online Training
15 May 2022, 4:00 pm - 6: 00 pm

Last Date of Registration 10th May 2022

for details, Email us at outreach@space-india.com

Scan to Register
@ No Cost or Hidden Charges

Logos: NASA, IASC, Catalina, Pan STARRS

CONGRATULATIONS

to
The citizen scientists of SPACE India for
discovering the Main Belt ASTEROIDS under
All India Asteroid Search Campaign (AIASC) 2021

 Ananya Ghoshal	 Vrinda Shankar	 Shubd Srivastava	 Kritik Raj	 Arnav Chalotra	 Uday Mottan
Team Saket Designation: 2021 NU59		Team DPS VNS Designation: 2021 NH54		Team Sainik School Jammu Designation: 2021 NK55	
 Anirban Kopty	 Saptarshi Sarkar	 Shaurya Singh	 Krishna Agarwa	 Aanandi Burande	
Team Asteroid Seekers Designation: 2021 NL55		Team Amity G46 Designation: 2021 NY54		Team The Swaminarayan School Nagpur, Designation: 2021 NA55	

Logos: SPACE, NASA, IASC, Catalina, Pan STARRS

Email: getintouch@space-india.com
Website: <https://linktr.ee/Space-India>

In the past 12 years of its successful conduction, following are the achievements of AIASC.

2 Numbered Asteroid Discovery, 76 Provisional Discoveries of Asteroids, 2 Special Discoveries, 11,325 Preliminary Discoveries of Asteroids, 62 Near-Earth Object Confirmations and 1636 Near-Earth Object Observations.

This year's campaign is running in two phases in which 500 teams having 1000 participants will take part and contribute in finding the asteroids.

For each phase, SPACE conducts the training session for the participants to train them in finding asteroids using the Astrometrica Software.

First phase of the campaign is from 27th May 2022 to 20th June 2022 and second phase of the campaign is from 24th June 2022 to 18th July 2022.

For the first phase, SPACE India has conducted the training session on 14th May 2022 and now the participants are ready to start their hunt for the asteroids.

If you all wish to be the part of this campaign in future then follow SPACE India on various social media platforms and stay updated regarding events.

LCO WORKSHOP "100 HOURS FOR 100 SCHOOLS"

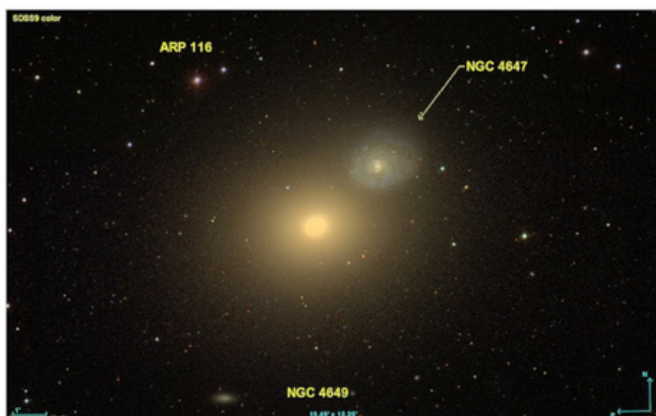
SPACE Students Team Captures a Supernova Explosion in a Galaxy in Virgo

SPACE students team participating in the "100 Hours for 100 School" workshop on 14th May 2022 have successfully captured an explosion of a bright star in a Galaxy, NGC 4647 in the Virgo Constellation. The galaxy is located 63 million light-years away from earth. The supernova is officially named "Supernova 2022hrs" and was discovered by an amateur astronomer, Koichi Itagaki. SPACE team robotically gave the command to capture the supernova, using the 0.4 Meter telescope at Las Cumbres Observatory (LCO). Supernovas are among the most powerful explosions ever seen in the universe. Dying massive stars end their life in gigantic blasts known as supernovas. Supernovas can be so bright that they can outshine their entire galaxies, that is exactly what is seen in the image captured by the students participating in the SPACE LCO workshop. The supernova seen is confirmed by comparing the image taken by students to the archival image of the NGC 4647 taken by professional astronomers. (See attached image)

About 100 Hours for 100 Schools

"100 Hours for 100 School" workshop was held for students in India by SPACE in collaboration with the International Astronomical Search Collaboration (IASC) and the Las Cumbres Observatory (LCO) with an aim to increase the interest of students in astronomy and gives them the opportunity to robotically use a power telescope located across the world and take amazing pictures of the universe. SPACE team was awarded 90 minutes of telescope time under this program which allows students to capture 7-9 images of the cosmos.

Supernova 2022hrs Captured by SPACE Students



NGC 4647 Archival Image by Sloan Digital Sky Survey (No Supernova Seen)



NGC 4647 image taken during SPACE LCO Workshop. A supernova is seen. Image taken on 20th May 2022

ASTROPHOTOGRAPHS BY SPACE TEAM



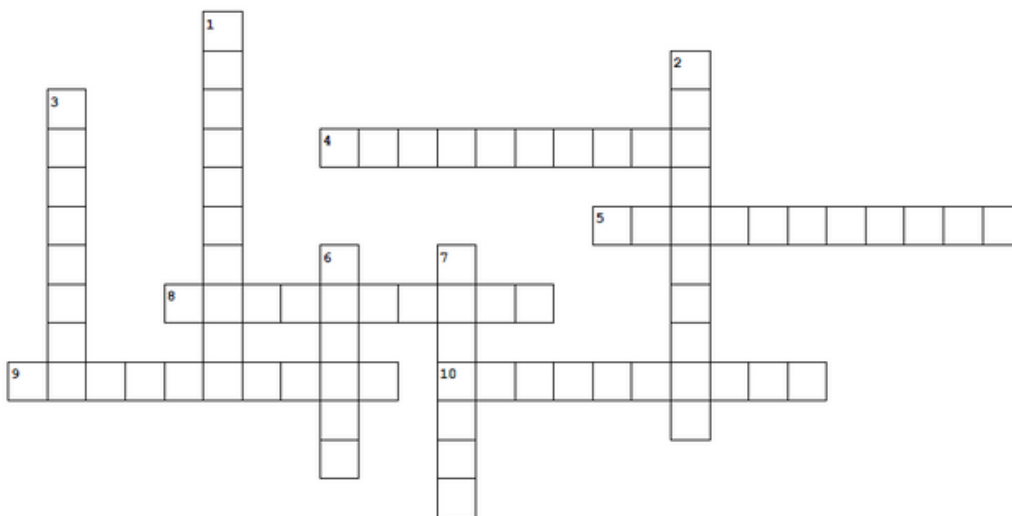
Captured by SPACE Educator Mr. Ranjith Kumar.



Captured by Mr. Neeraj Ladia, CEO, Gnomon Astrotech Pvt Ltd.

TRAIN YOUR BRAIN

CROSSWORD



Down

1. What are Chinese astronauts called?
2. What are the Indian astronauts called?
3. Name of the space shuttle that took Kalpana Chawla to space
6. The name of world's first space station
7. Name of the mission which planned to take first woman to the Moon

Across

4. Who Was the First Tourist in Space?
5. Who left a photo on the Moon?
8. The second person to land on the Moon
9. The first woman to walk in space
10. What was the first manned mission to the ISS?

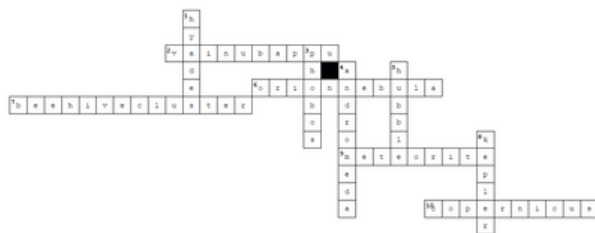
ASTRONOMY WORD PUZZLE

Meteor Showers

D	C	I	D	R	A	C	O	N	I	D	S	O	P
O	E	S	S	P	H	O	E	N	I	C	I	D	S
M	N	I	D	A	L	S	A	O	S	R	O	C	R
O	T	P	I	H	E	R	C	U	L	I	D	S	C
N	A	C	T	S	I	T	U	E	S	N	P	I	C
O	U	D	N	R	A	Q	U	A	R	I	I	D	S
C	R	I	A	R	N	Y	L	Y	R	I	D	S	T
E	I	I	R	P	E	R	S	E	I	D	S	O	O
R	D	C	D	C	Y	G	N	I	D	S	S	S	S
O	S	A	A	E	I	G	E	M	I	N	I	D	S
T	E	S	U	S	D	I	C	I	N	E	R	E	B
I	C	D	Q	I	D	O	R	I	O	N	I	D	S
D	U	D	I	R	L	R	S	D	A	I	C	O	I
S	C	A	P	R	I	C	O	R	N	I	D	S	R

- MONOCEROTIDS
- ORIONIDS
- CAPRICORNIDS
- PERSEIDS
- QUADRANTIDS
- CENTAURIDS
- DRACONIDS
- BERENICIDS
- AQUARIIDS
- LYRIDS
- GEMINIDS
- HERCULIDS
- CYGNIDS
- PHOENICIDS

Answers for last month puzzles.



S	I	J	H	E	R	C	U	L	E	S	O	O	I
C	S	U	H	C	U	I	H	P	O	R	G	A	P
O	I	A	S	C	U	R	A	H	P	D	R	R	C
R	G	I	S	V	E	U	A	P	E	S	I	S	A
P	G	N	C	Q	I	U	R	I	E	A	V	A	N
I	S	E	C	A	S	S	I	O	P	E	I	A	I
U	A	R	P	S	I	R	I	L	I	C	R	U	S
S	A	Q	U	A	R	I	U	S	A	U	S	R	M
P	R	A	D	A	D	E	M	O	R	D	N	A	A
A	T	T	D	S	C	A	R	A	O	I	R	G	J
H	A	U	R	I	G	A	S	R	U	A	U	H	O
U	S	A	G	I	T	T	A	R	I	U	S	U	R
C	H	I	U	L	Y	R	A	S	U	R	U	A	T
P	E	R	S	E	U	S	L	C	S	R	R	R	S

**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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SPACE LAUNCHER 60MM
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MOUNT: ALT-AZ
APERTURE: 60MM
FOCAL LENGTH: 700MM

CELESTRON POWERSEEKER 60EQ
TYPE: REFRACTOR
MOUNT: EQ
APERTURE: 60MM
FOCAL LENGTH: 900MM

SPACE PROBE 80EQ
TYPE: REFRACTOR
MOUNT: EQ
APERTURE: 80MM
FOCAL LENGTH: 400MM

ASTRO BINOCULARS



CELESTRON SKYMASTER 15X70
PRISM SYSTEM: PORRO PRISM
PRISM GLASS: BAK-4
APERTURE: 70MM
EXIT PUPIL: 4.7MM
MAGNIFICATION: 15X
ANGULAR FOV: 6.4 Deg

CELESTRON SKYMASTER 20X80
PRISM SYSTEM: PORRO PRISM
PRISM GLASS: BAK-4
APERTURE: 80MM
EXIT PUPIL: 4MM
MAGNIFICATION: 20X
ANGULAR FOV: 3.7 Deg

CELESTRON SKYMASTER 25X100
PRISM SYSTEM: PORRO PRISM
PRISM GLASS: BAK-4
APERTURE: 100MM
EXIT PUPIL: 4MM
MAGNIFICATION: 25X
ANGULAR FOV: 3 Deg

REFLECTOR TELESCOPES



SPACE LAUNCHER 76MM
TYPE: REFLECTOR
MOUNT: ALT-AZ
APERTURE: 76MM
FOCAL LENGTH: 700MM

KSON 80MM NEWTONIAN
TYPE: REFLECTOR
MOUNT: ALT-AZ
APERTURE: 80MM
FOCAL LENGTH: 900MM

BRESSER 127EQ NEWTONIAN
TYPE: REFLECTOR
MOUNT: EQ3
APERTURE: 127MM
FOCAL LENGTH: 650MM

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Brands







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