

Galactica

Astronomy and Space Science Magazine

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SPACE Insights

Highlights From January

Moon Phases And Planet Visibility

What's Awaiting in February

Student's Corner

Historical Events Happened In February

February Born Legends

Train Your Brain

Galactica is a monthly magazine about astronomy & space science published by SPACE India 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 the general audience, and the article about historical missions & events of astronomy and more. All of this comes in an easy-to-understand user-friendly style that's perfect for astronomers at any level.

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ABOUT SPACE



Legacy of
22 years



Pioneer
Organization



10000+
Activities
Developed



1000+
Schools
Associated



1M+
Students
Engaged



10k+
Outreach Events



10+
Cities
Presence

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

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

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

CMD'S MESSAGE:



Mr. Sachin Bahmba
CMD, Space.

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

SPACE INSIGHTS

"SPACE" RECEIVED 'SPECIAL AWARD' FROM "BWEDUCATION" FOR EDUCATIONAL INNOVATION

Space Technology and Education Pvt. Ltd. was honoured with a special award at the 4th Edition of the Leadership Summit, followed by the Top Education Brands Awards in January 2023. The prize was awarded in the category of Innovative Technology Solutions Provider for Schools for Edu Tech Innovation of the Year. Space India's persistence and innovative efforts to give hands-on learning about Space and Astronomy to foster a scientific temperament in young minds have helped it earn this accolade and a name for itself in the field of ed tech innovation. The CMD of Space Technology & Education Pvt. Ltd., Mr. Sachin Bhamba, accepted the honor on behalf of Space India.

"We feel a tremendous sense of pride and humility to witness our efforts coming to fruition and getting acknowledged. We have envisaged ourselves as a potent venture for developing the general public's scientific temperament. Thus, along these lines, we intend to make our pursuits bigger in the near future to ensure that a maximum of young minds get to explore the real world of science and technology.



Our educational initiatives are cutting-edge, ambitious, and carried out in association with organizations from across the world. These age-appropriate courses complement the NEP 2020 and use an interdisciplinary approach that aids the holistic development of the students by preparing them for the future. Our schools' initiatives include Universe In The School (UITS) Program, Astronomy Club and Workshops, while the online initiatives include iAstronomer club, Voyager, and Astronomy Camp.

We are on verge of incorporating Augmented Reality (AR) and Virtual Reality (VR) in our Programs to make them more engaging and immersive. As far as innovation is concerned, we have re-used more than 40,000 plastic bottles to carry out rocketry sessions in various schools. By innovatively delivering education in the specialized and vital field of Astronomy and Space Science and ensuring our presence on online platforms as well, we aim to transform Indian institutions into providers of better learning opportunities through experiential and hands-on learning. This recognition is evidence of our team's unwavering dedication to delivering exceptional results to transform astronomy and space education since 22 years", expressed Mr. Sachin Bhamba, CMD, Space Technology, and Education Pvt. Ltd.



The Park in New Delhi hosted the top Education Brands Awards (TEB) in December 2022, on January 18, 2023. The leadership summit and award ceremony was an initiative of BWEducation. A range of school and higher education companies gathered to communicate their journey to the global education community.

By bringing them together to discuss how they may mutually benefit from technology, strategies, and management tools, the event primarily focused on recognizing and appreciating the quality of education in India. Power speakers, including Mr. Tarun Anand, Dr. Kaushal Prasad, Prof. Dr. Vikas Singh, and Vishal Khurana, participated in high-level discussions and strategies at the event, which also acknowledged and celebrated the greatest education brands in the nation.

About SPACE: SPACE is a pioneering organization with a 22-years legacy of delivering STEM education and experiences at the grassroots level. It is the largest non-governmental organization in the world, with its headquarters in Dwarka, New Delhi, promoting astronomy and space sciences throughout schools, hotels, and the tourism sector. Through its products and services, Space has inspired 1,000+ Schools and engaged more than 1 million students pan India.

About BW Education: BW Education is an umbrella community for the entire education sector including K-12, Higher Education, Skill Education, Professional Education and Education for Social Responsibility. It aims to engage students, parents, educators, leaders, policy makers, service providers and every person associated with the education industry. The situation today calls for a complete synthesis of the industry to build an innovative, disruptive and quality India. BW Education highly promotes successful case studies, researches and ideas that have been practiced and can be learnt by others to replicate.

AN EVE WITH THE PLANETS

On January 3rd, the planets were about to align in a straight line. Alignments occasionally occur because the planets buzz around the Solar System at vastly distinct speeds. The planets are not actually aligned. It's merely a line-of-sight phenomenon. We can also call it an optical illusion. The planets are many millions of miles apart from each other and Earth. It was the start of 2023, and SPACE India planned to organize a public observation. We wanted everyone to witness this rare phenomenon.

At 2 pm on January 3rd, all the members gathered at the education centre. We were expecting more than 1500 people, but the weather started to act up. The sky was supposed to be clear that day, but it began to get hazy. The temperature dropped to 14 Degrees. We ignored the weather and did everything that we could do. The telescopes were aligned at their respective positions. The event was supposed to start at 5:30 in the evening, but, to our surprise, people began gathering at the ground at 5 pm. We quickly grabbed our refreshments and started our work.

I was a part of the science communication team. We pointed the telescope toward the Moon though it was covered in clouds. When I tried to look through the eye-piece, it seemed like the Moon was peeking from the clouds. A long queue was already waiting as we aligned the telescope. I saw a vast crowd of people, all of them eager to look through the telescope. I let the first kid look at the Moon. He paused for a moment, looked again, and then looked at his mom in awe. His Mom was next, and she was stunned by the view. Soon, all the telescopes had long queues behind them. There were two large screens for the live feed of the planets, filmed through the Meade telescope. Surprisingly, the crowd was quiet, and everyone waited patiently for their turn.



As the sun began to set, it got darker, and Jupiter was already there in the sky. We pointed the telescope toward Jupiter, and everyone observed the planet along with its three Moons. It was my first experience with Public Observation. We educated the people about the features of the Moon and the visible planets. I could see how amazed they were. The look on their faces was priceless. No one cared about the cold anymore; at that moment, we all were one, admiring the beauty of our universe.

MONTHLY TELESCOPIC OBSERVATION

SPACE ARCADE team conducted their 1st Monthly Telescopic Experience session on 3rd of January at two different places which are Delhi and Chennai respectively. People from various places joined the observation with their own telescopes, binoculars and other astronomical equipment to learn and experience the breathtaking view of the Moon! and planets such as Jupiter, Saturn and Mars. They also learnt about different types of telescopes and cleared all their queries on the Alignment of various telescopes then did basic Astrophotography. Everyone had their hands-on telescopic experience and enjoyed the view of the moon and its craters through the 8" Dobsonian telescope setup by Space team.



ASTRO NIGHT SKY TOURISM- A SKY GAZING EVENT

Realizing the importance of the 'awe-inspiring impact of astronomy on human minds' and its ability to generate a novel pathway for employment and revenue, the Ministry to Culture, Govt. of India decided to promote the concept of Astro-tourism and spread awareness about this immense discipline that is essentially the oldest form of science on our planet. This idea was imparted an elegant shape by a collaboration between National Science Center, Nehru Planetarium, and Space India through a mega public observation event at India Gate, New Delhi. The event named "Astro Night Sky Tourism" was inaugurated by Shri Arjun Ram Meghwal, Hon'ble Minister of State for Culture, Govt. of India. It was also enthralling to honour the presence of IAS Shri Govind Mohan, Secretary, Ministry of Culture, Govt. of India and IAS Megdha Sinha, Joint Secretary, Ministry of Culture, Govt. of India.



GALACTICA

Space Group Highlights

We, at Space India, played a central role in the event by setting up seven telescopes at the venue for public observation. There were six 200mm Dobsonian Telescopes that were set up for the public to observe Moon, Venus, Mars, Jupiter, and Saturn at different magnifications. While two of them were at the event venue, the other four were placed right below the India Gate to attract and cater to a larger number of audience. Apart from this, an automated 10-inch Meade Telescope was also put up and the moon and the planets seen through this was projected on a huge screen for public viewing in greater detail.



People were mesmerized to see the celestial bodies live as they often go unrecognized in our modern busy lives. While our sister planet Venus could be witnessed by a few of the audience because of its short window of visibility, the craters on the moon, the Galilean moons and bands on Jupiter, the mighty red Mars, and the rings of Saturn were experienced in full glory. And to add a cherry on top, we also conducted fun astronomy activities such as Weigh Yourself on Different Planets and Comet-Making Demonstration. The smile of joy on the face of the people while experiencing 1/6th weight on the moon turned into a frown of self-consciousness when Jupiter showed 2.4 times their weights. In order to let people enjoy this experience, even further, we had set up a wide variety of telescopes for demonstration and sale along with our marketing team who enlightened the visitors with the various educational programmes and tourism activities that we conduct in educational institutions.

The entire experience enhanced with a vibe of some astronomical music and visuals was simply a treat for the people who had visited the national heritage that evening. Witnessing the immense magnitude of the event, a footfall of more than 6000, and the exciting and optimistic feedback from the public, we successfully established the sense of astronomical thought within the minds of the people. It was vivid that astronomy and space science created a lasting impact at an individual level and as such, stood as firm evidence for the development of Astro-tourism, as a new source of revenue and employment for the country. Complementing this, it has the potential to develop awareness and education about this everlasting domain, thus instilling a sense of oneness and gratitude within every individual and eventually, the whole of humanity.

REPUBLIC DAY CELEBRATIONS



Republic Day marks the adoption of India's constitution and the country's transition to a republic on January 26, 1950. Every year, the celebrations marking the day feature spectacular military and cultural pageantry. Here is the Glimpse of the 74th Republic Day celebration where we pledged to uphold the fundamental duty of developing and celebrating scientific temper and humanity. Like our 22 years of celebration, we 'Spacians' did Flag hoisting & all paid their respect to our incredible nation, India.



HIGHLIGHTS OF FEBRUARY 2023

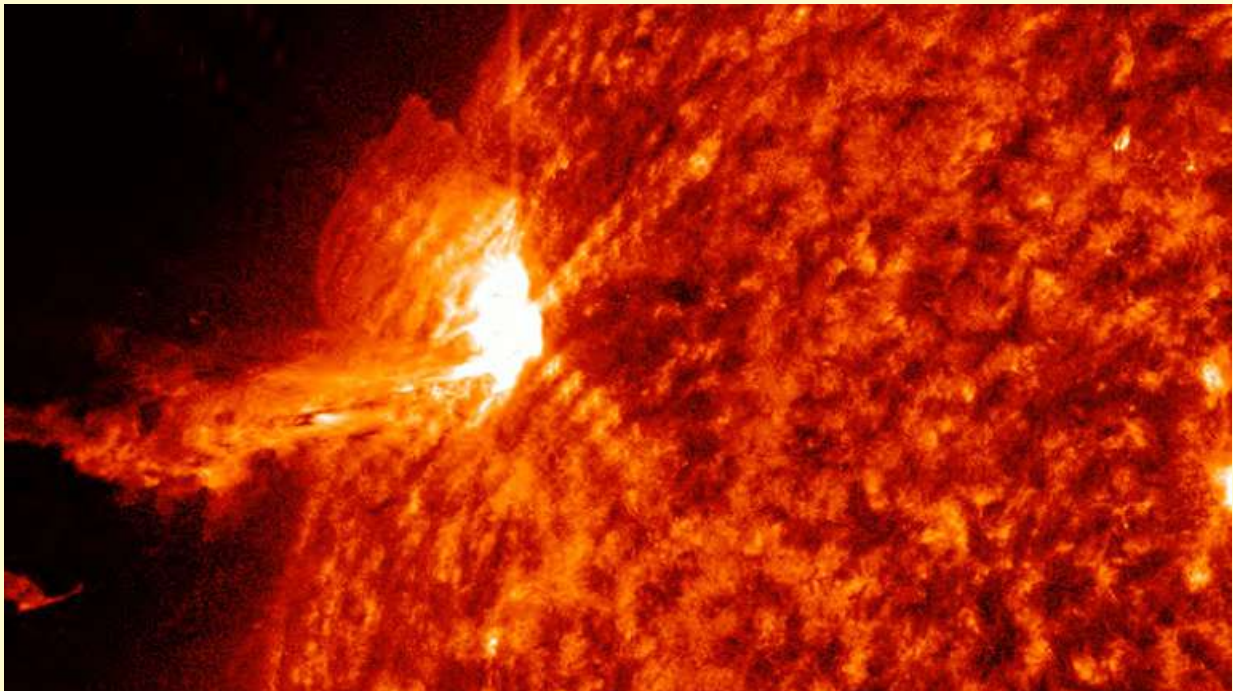
INCREASED SOLAR ACTIVITY- THE SUN SUDDENLY STARTED SPITTING 'X-CLASS' FLARES TOWARDS US

"Solar activity doesn't look like it's slowing down anytime soon".

The Sun has woken up. The beginning of 2023 has seen our star crackle with activity, with observers seeing black sunspots all over its surface as it waxes towards possibly one of its strongest periods on record.

The resulting "X-class" solar flares can affect Earth's magnetic field with the potential to damage satellites and communications equipment as well as causing power grids to overload. Solar flares are also a threat to orbiting astronauts.

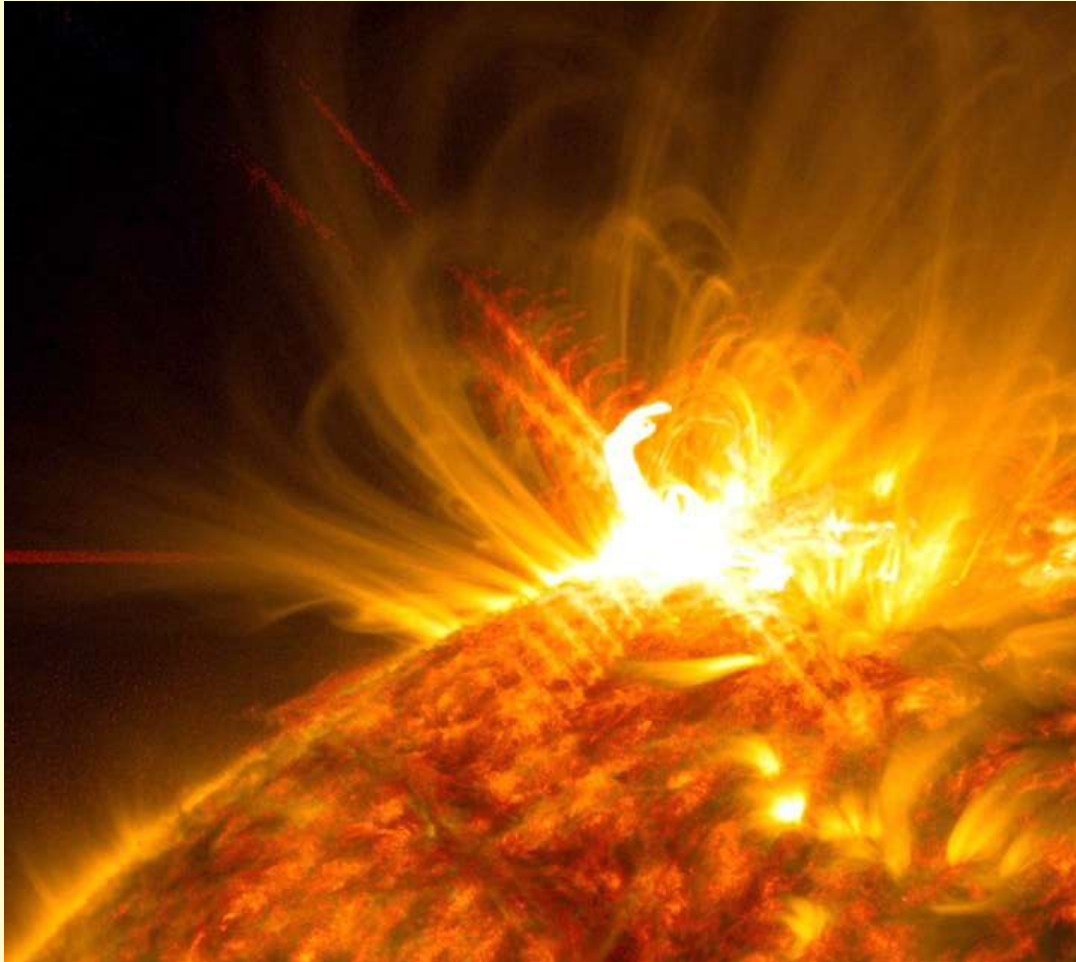
A ball of hydrogen and helium plasma about 93 million miles from Earth, the Sun has a roughly 11 year solar cycle. During that time it moves from a period of "solar minimum" to a "solar maximum." The latter—the peak of the current Solar Cycle 25—is expected to occur in 2024 or 2025, making this year theoretically one of the most powerful periods for the Sun for almost a decade.



NASA's Solar Dynamics Observatory recorded the X1.09 solar flare on Jan. 10, 2023, at 5:47 p.m. EST (2247 GMT) (Image credit: NASA/SDO/Heliviewer.org)

The evidence is suddenly everywhere as "space weather" increases. After more sunspots appeared on its surface last week our star issued three solar flares of the strongest type possible, so-called X-flares. That was on the back of one of its most active days for years in December 2022. On January 5, 9 and 10, respectively, X1-class solar flares erupted from sunspots, sending pulses of x-rays and extreme ultraviolet radiation out into the solar system traveling at light-speed, some of it in the direction of Earth.

Solar flares—which can cause radio blackouts on Earth minutes after occurring—are eruptions of electromagnetic radiation in the Sun's atmosphere. They're caused by twisted magnetic fields, typically above sunspots—cooler, darker regions of the Sun's surface that form when clumps of its magnetic field well up from deep within the Sun. Sunspots appear in solar telescopes as tiny specks on the Sun's surface, but they can be colossal in size. Their frequency is the main clue solar physicists have in gauging how intense (or otherwise) solar activity is and, right now, they're everywhere. In fact, if sunspot production continues at this rate for the rest of January the monthly sunspot number will reach a 20-year high.



So far Solar Cycle 25 has been known for producing sunspots on the Sun's far side, but the Jan. 9 event's extreme ultraviolet flash was captured by NASA's Solar Dynamics Observatory (SDO) (main image, above). It caused a shortwave radio blackout in the Pacific Ocean.

While the effects of solar flares on Earth can be sudden, it's what can often happen next that are more noticeable. From sunspots and solar flares can come coronal mass ejections (CMEs), large expulsions of plasma and magnetic field from the Sun's corona that can take 15-18 hours to reach Earth (although they can be aimed anywhere in the solar system). When a CME arrives at Earth it can cause geomagnetic storms, a significant disturbances in Earth's magnetic field.

Forecasters at the NOAA (National Oceanic and Atmospheric Administration) Space Weather Prediction Center predict that an M-class solar flare and CME on Jan. 14 could cause a geomagnetic storm on Jan. 19. That means intense Northern Lights could be on the way.

One result could be more intense and frequent aurora. When a CME comes our way, Earth's magnetosphere accelerates the charged particles down its field lines to the poles. The result is brighter and more frequent are the displays of the Northern Lights and the Southern Lights.

While the Arctic and Antarctic Circles are typically the best places to view aurora, during an intense geomagnetic storm the "auroral oval" increases in size so people who live in areas that normally don't experience aurora—such as the USA and Western Europe—sometimes get to see them. And it's right now, as we approach solar maximum, that aurora are at their most frequent and spectacular.



(Northern lights. Credit: 50 degrees North.com)

IS EARTH'S CORE SPINNING IN REVERSE?

A new study out of Peking University asks whether the ground beneath our feet has shifted.

Three thousand, one hundred miles below the soil of the Earth, through thick layers of solid granite and liquid iron, our planet's inner core rotates furiously, locked in a sort of harmonious spin with the rest of the world in concert.

But the patterns of its rotational dance remain a mystery to scientists—who have many theories, but have yet to agree on just how the inner core behaves. Some believe it spins faster than the outer layers, at a rate of so-called super-rotation. Others believe it has slowed over the past decades: first, down to a rhythm in step with the outer core, mantle, and crust and now, to a pace that lags behind the rest of the planet.

That's the finding of a recent study published in *Nature Geoscience*. According to researchers from Peking University's seismology department, who examined the way in which seismic waves from earthquakes travel through the Earth's core, it's possible that the inner core may even have reversed its motion and may now be spinning in the opposite direction from the humans who walk its surface.



"We show surprising observations that indicate the inner core has nearly ceased its rotation in the recent decade and may be experiencing a turning-back," Yi Yang, associate research scientist at Peking University, and Xiaodong Song, Peking University chair professor, wrote in the study.

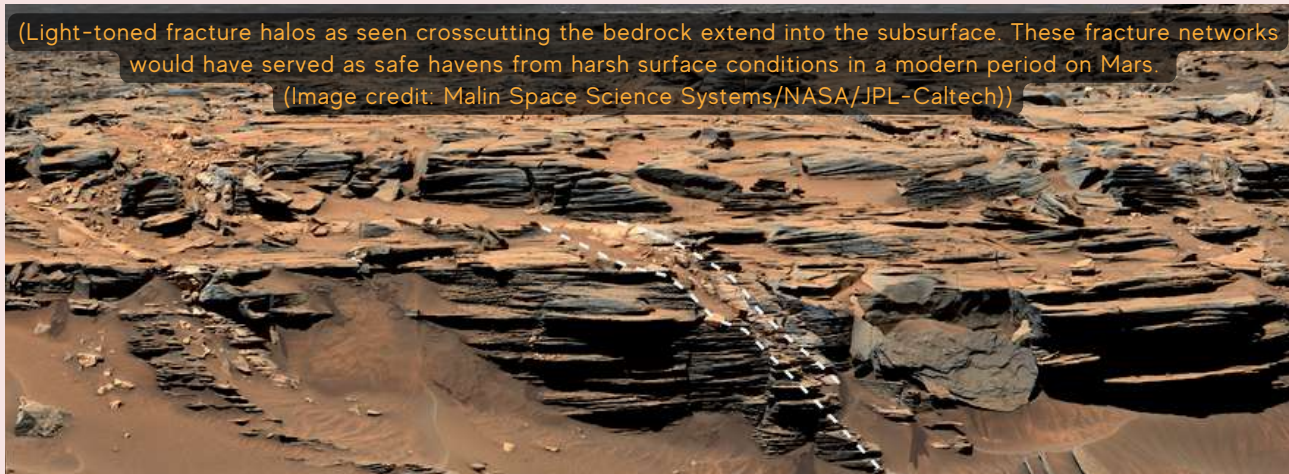
The team studied earthquake data from between 1995 and 2021. When an earthquake is generated on the Earth's surface, seismic waves ripple beneath the crust toward the other side of the globe, passing through the inner core in the process. When they reach the opposite surface, seismologists can measure how much the wave has shifted, if at all—which, in turn, offers insight into what machinations are churning at the center of all things.

And according to the graphs, seismic records have shown less of a shift lately. "When you look at the decade between 1980 and 1990, you see clear change," Song said in a statement. "But when you see 2010 to 2020, you don't see much change"—suggesting that there's less activity now at the Earth's inner core, or even that its rotation has paused entirely.

If that were the case, the delicate suspension of the inner core—which is roughly the size of the dwarf planet Pluto—could be easily disturbed by imbalances between electromagnetic or gravitational forces, which are perpetually playing tug-of-war with the planet's spin, the study authors say. According to their calculations, this overpowering of forces—which leads first to asynchronization, and then to a reverse in the direction of rotation is cyclic, occurring once every 35 years.

CURIOSITY ROVER DISCOVERS OPAL GEMS ON MARS WITH CLUES TO WATERY PAST

Martian water ice is abundant at the poles but not so much at the equator (where Gale Crater is located). NASA's Curiosity Mars rover, which is currently exploring the crater, had previously beamed back data from its DAN (Dynamic Albedo of Neutrons) spectrometer, which was then analyzed by a team of researchers. In both older and newer Curiosity images, they noticed fracture halos, rings of light-colored sediment, that stood out because of their color; further tests proved that the light rock was actually opal. Because opal is predominately composed of water and silica, the presence of this mineral could mean that there was once enough water there to possibly make the depths of these cracks habitable. Furthermore, the opal currently on Mars may one day be able to be harvested for the water stored inside, offering a source of water for any crewed missions to the Red Planet.



Mars is a barren and sun-blasted planet. The amount of radiation on the planet's surface makes it inhospitable to life as we know it. However, inside subsurface fractures, there is a much darker environment better protected from the intense radiation that is constantly bombarding Gale Crater on the outside. Water-rich opals inside these fractures makes their discovery even more exciting.

"Seeing that these fracture networks were so widespread and likely chock-full of opal was incredible, research physicist Travis Gabriel, formerly of the University of Arizona, said in a statement. "Given the widespread fracture networks discovered in Gale Crater, it's reasonable to expect that these potentially habitable subsurface conditions extended to many other regions of Gale Crater as well, and perhaps in other regions of Mars. These environments would have formed long after the ancient lakes in Gale Crater dried up."

Gabriel and his colleagues think evidence of opal possibly means that the fracture halos on Mars were some of the last places that had an abundance of liquid water, and that Mars may have dried up after they formed.

Opals form from a solution of water and silica. On Earth, solutions like this occur in geysers and hot springs as well as at the bottom of bodies of oceans and other bodies of water. When particles of silica settle at the bottom of the solution, they begin to create an opal. It is possible to harvest water from opals because while they may sparkle, they are not actually minerals.

Minerals have a tightly bound crystalline structure, but the structure of an opal is more loosely bound, meaning water can be extracted from it. Astronauts who explore Mars in the future might have a significant water source in fracture halos if more opal can be found. According to the statement, a fracture halo 1 meter in diameter "could house roughly one to 1.5 gallons of water in the top foot of the surface."



(Region on Mars where opal has been discovered.

Credit: NASA/JPL)

This find has now given the Perseverance rover a new focus. If fracture halos containing opal exist on Gale Crater, they may also be somewhere in Jezero Crater, where Perseverance is searching for signs of past life. Jezero Crater is already confirmed to have once been a lake, so there may be more Martian opal waiting to be unearthed.

FROM THE EYES OF WEBB - JANUARY 2023

JWST'S NEW DATA PROVIDES INSIGHTS INTO AN EARLY ERA OF STAR FORMATION

By peering into a well-known star cluster within the Small Magellanic Cloud, Webb's NIRCam instrument has revealed many new pockets of star formation that have never been seen. Further, new structures appear in this image that provide a window into the stars feeding within.

NGC 346, one of the most dynamic star-forming regions in nearby galaxies, is full of mystery. Now, it is less mysterious with new findings from NASA's James Webb Space Telescope.

NGC 346 is located in the Small Magellanic Cloud (SMC), a dwarf galaxy close to our Milky Way. The SMC contains lower concentrations of elements heavier than hydrogen or helium, which astronomers call metals, compared to the Milky Way. Since dust grains in space are composed mostly of metals, scientists expected there would be low amounts of dust, and that it would be hard to detect. New data from Webb reveals the opposite.

Astronomers probed this region because the conditions and amount of metals within the SMC resemble those seen in galaxies billions of years ago, during an era in the universe known as "cosmic noon," when star formation was at its peak. Some 2 to 3 billion years after the big bang, galaxies were forming stars at a furious rate. The fireworks of star formation happening then still shape the galaxies we see around us today.



NGC 346 (NIRCam Image)

Image credit: NASA, ESA, CSA, STScI.

"A galaxy during cosmic noon wouldn't have one NGC 346 like the Small Magellanic Cloud does; it would have thousands" of star-forming regions like this one, said Margaret Meixner, an astronomer at the Universities Space Research Association and principal investigator of the research team.

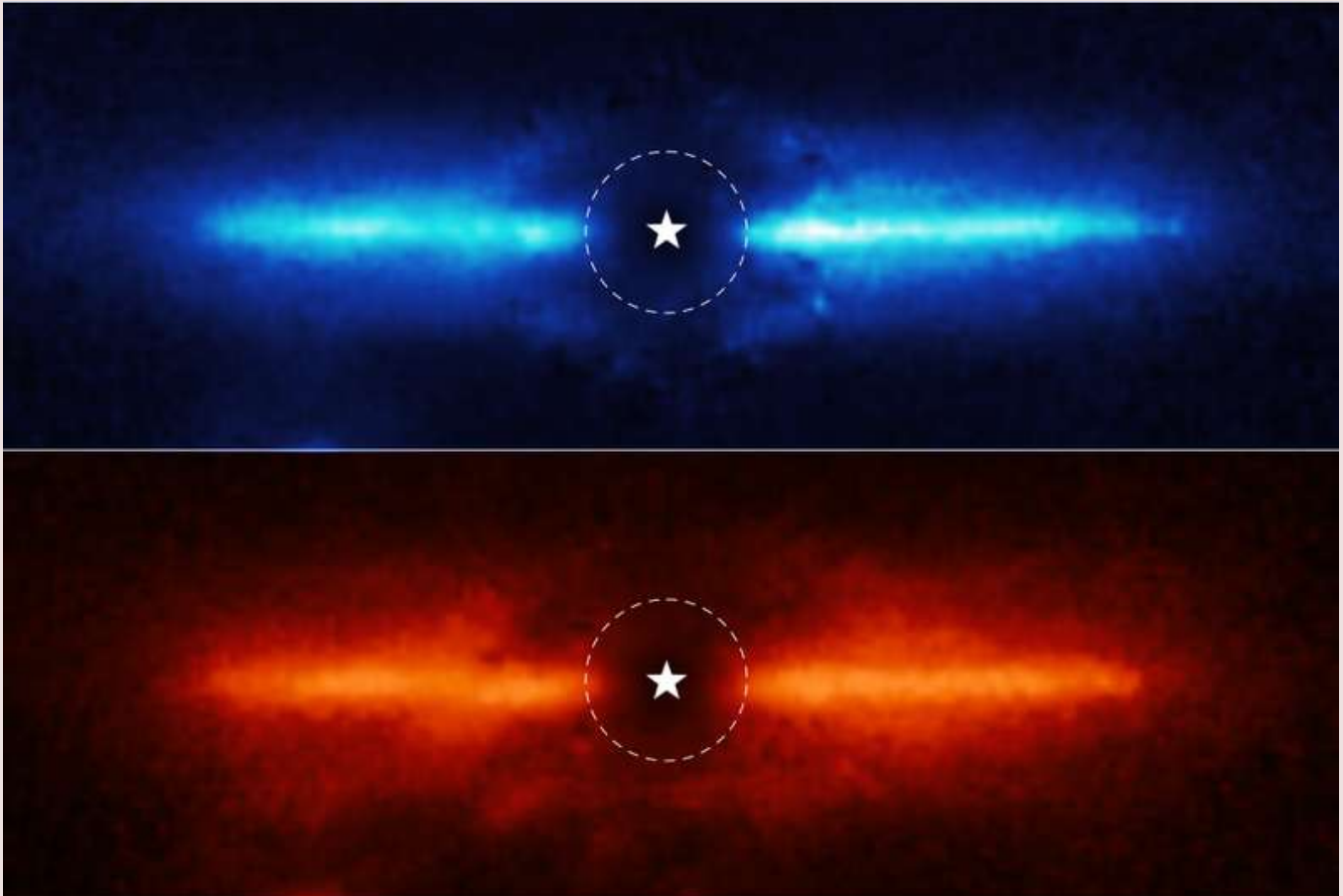
By observing protostars still in the process of forming, researchers can learn if the star formation process in the SMC is different from what we observe in our own Milky Way. Previous infrared studies of NGC 346 have focused on protostars heavier than about 5 to 8 times the mass of our Sun. "With Webb, we can probe down to lighter-weight protostars, as small as one tenth of our Sun, to see if their formation process is affected by the lower metal content," said Olivia Jones of the United Kingdom Astronomy Technology Centre, Royal Observatory Edinburgh, a co-investigator on the program.

As stars form, they gather gas and dust, which can look like ribbons in Webb imagery, from the surrounding molecular cloud. The material collects into an accretion disk that feeds the central protostar. Astronomers have detected gas around protostars within NGC 346, but Webb's near-infrared observations mark the first time they have also detected dust in these disks.

NEW WEBB IMAGE REVEALS DUSTY DISK LIKE NEVER SEEN BEFORE

"The observations are the first time that the debris disc has been imaged in infrared frequencies".

The James Webb Space Telescope has imaged the debris disc around the young star AU Microscopii (AU Mic). The observations contain clues on the composition of the disc, and is the first time that the previously known disc has been imaged in infrared frequencies. The observations were conducted with an aim of discovering exoplanets at large distances from the host star. The disc is made up of a number of small objects called planetesimals that have collided with each other. A coronagraph on the telescope has been used to obstruct the light from the host star, with the disc being imaged from approximately the distance Jupiter is from the Sun.



The debris disc around AU Mic imaged by the James Webb Space Telescope in two different frequencies.

(Image credit: NASA, ESA, CSA, and K Lawson, Goddard Space Flight Center, A Pagan, STScI).

The process of planet formation, which usually takes place for around 10 million years after the formation of the star, has apparently ended as the star is around 23 million years old, which is about one per cent the age of the Sun. The observations were conducted in two wavelengths, with the debris being brighter in the bluer frequency, indicating that there is more dust that can scatter the shorter wavelengths. The findings are consistent with previous observations that found the radiation pressure from the host star being too little to eject the finer grains of dust from the disc. There are two known exoplanets in orbit around the host star, which were discovered by other telescopes.

The host star is a red dwarf star with a radius of about 75 per cent that of the Sun. Principle investigator for the observing programme, Joshua Schlieder says, "This system is one of the very few examples of a young star, with known exoplanets, and a debris disc that is near enough and bright enough to study holistically using Webbs uniquely powerful instruments." The debris disc has previously been imaged with the number of astronomical instruments, including the Hubble Space Telescope.

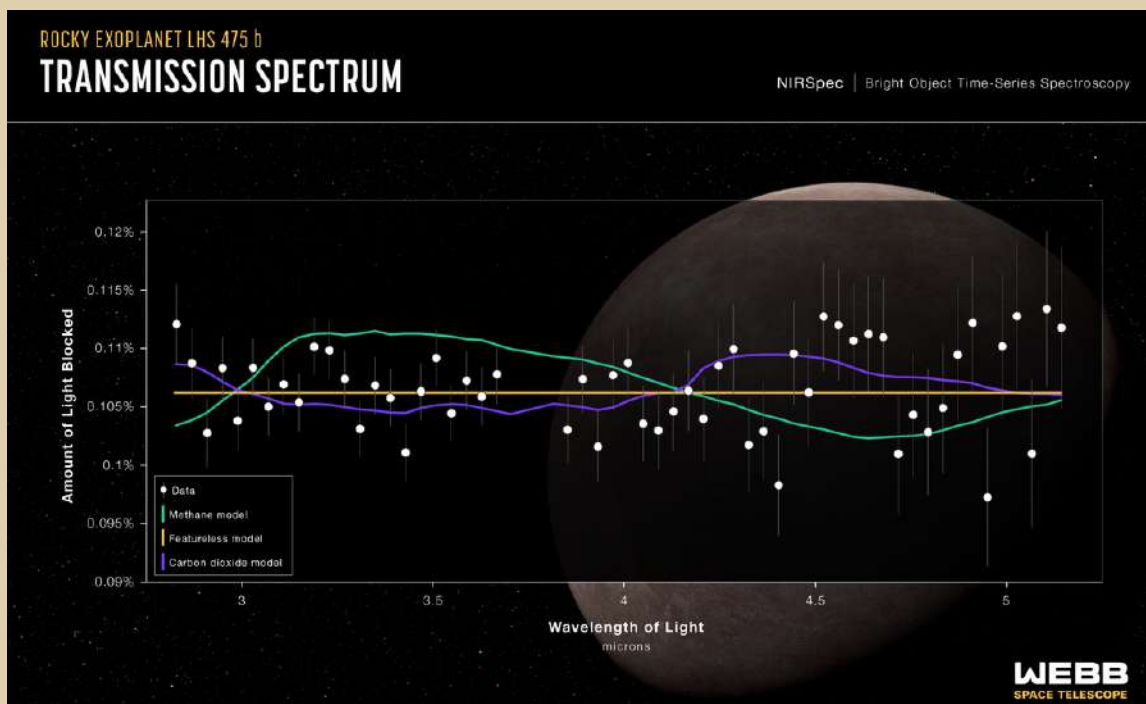
NASA'S WEBB CONFIRMS ITS FIRST EXOPLANET

"The planet is rocky and almost precisely the same size as Earth, but whips around its star in only two days".

Researchers confirmed an exoplanet, a planet that orbits another star, using NASA's James Webb Space Telescope for the first time. Formally classified as LHS 475 b, the planet is almost exactly the same size as our own, clocking in at 99% of Earth's diameter. The research team is led by Kevin Stevenson and Jacob Lustig-Yaeger, both of the Johns Hopkins University Applied Physics Laboratory in Laurel, Maryland.

The team chose to observe this target with Webb after carefully reviewing targets of interest from NASA's Transiting Exoplanet Survey Satellite (TESS), which hinted at the planet's existence. Webb's Near-Infrared Spectrograph (NIRSpec) captured the planet easily and clearly with only two transit observations. "There is no question that the planet is there. Webb's pristine data validate it," said Lustig-Yaeger. "The fact that it is also a small, rocky planet is impressive for the observatory," Stevenson added.

"These first observational results from an Earth-size, rocky planet open the door to many future possibilities for studying rocky planet atmospheres with Webb," agreed Mark Clampin, Astrophysics Division director at NASA Headquarters in Washington. "Webb is bringing us closer and closer to a new understanding of Earth-like worlds outside our solar system, and the mission is only just getting started."



Among all operating telescopes, only Webb is capable of characterizing the atmospheres of Earth-sized exoplanets. The team attempted to assess what is in the planet's atmosphere by analyzing its transmission spectrum. Although the data show that this is an Earth-sized terrestrial planet, they do not yet know if it has an atmosphere. "The observatory's data are beautiful," said Erin May, also of the Johns Hopkins University Applied Physics Laboratory. "The telescope is so sensitive that it can easily detect a range of molecules, but we can't yet make any definitive conclusions about the planet's atmosphere."

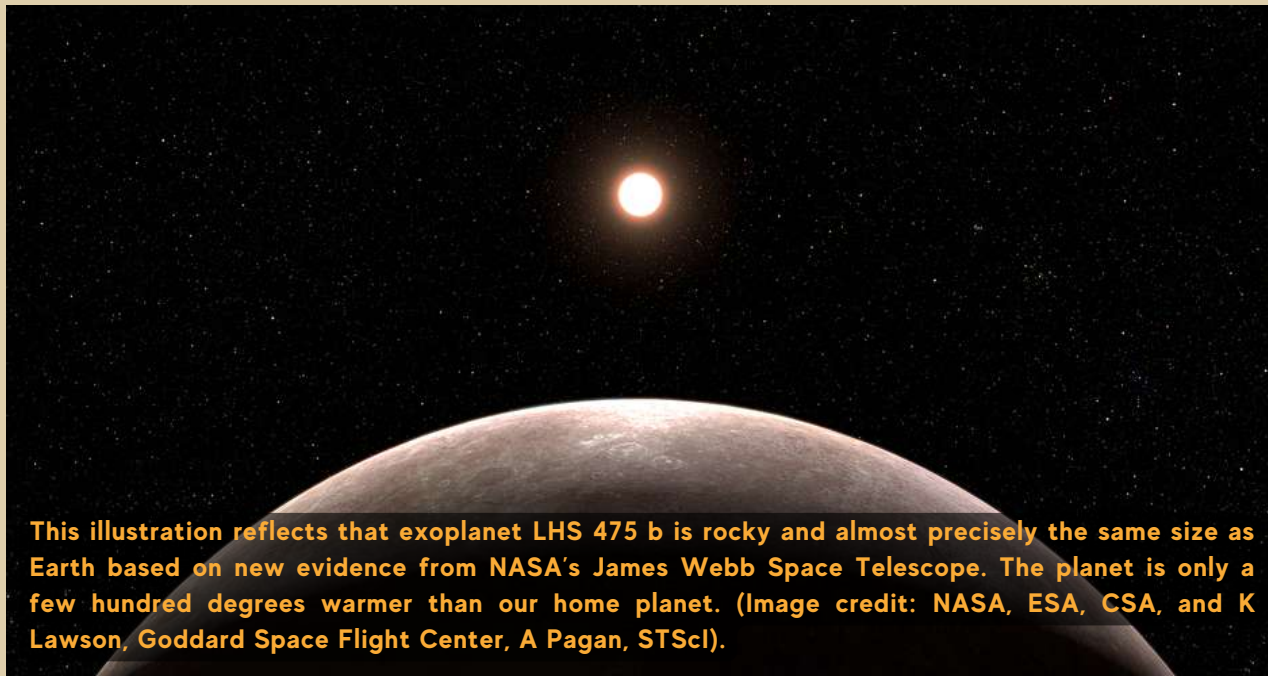
Although the team can't conclude what is present, they can definitely say what is not present. "There are some terrestrial-type atmospheres that we can rule out," explained Lustig-Yaeger. "It can't have a thick methane-dominated atmosphere, similar to that of Saturn's moon Titan."

The team also noted that while it's possible the planet has no atmosphere, there are some atmospheric compositions that have not been ruled out, such as a pure carbon dioxide atmosphere. "Counterintuitively, a 100% carbon dioxide atmosphere is so much more compact that it becomes very challenging to detect," said Lustig-Yaeger.

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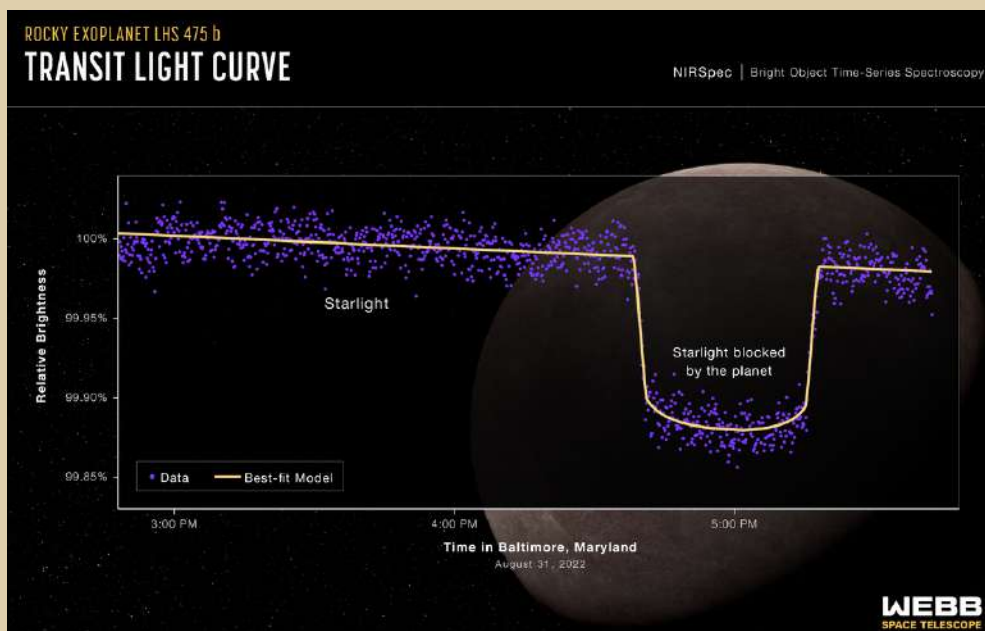
Even more precise measurements are required for the team to distinguish a pure carbon dioxide atmosphere from no atmosphere at all. The researchers are scheduled to obtain additional spectra with upcoming observations this summer.

Webb also revealed that the planet is a few hundred degrees warmer than Earth, so if clouds are detected, it may lead the researchers to conclude that the planet is more like Venus, which has a carbon dioxide atmosphere and is perpetually shrouded in thick clouds. "We're at the forefront of studying small, rocky exoplanets," Lustig-Yaeger said. "We have barely begun scratching the surface of what their atmospheres might be like."



This illustration reflects that exoplanet LHS 475 b is rocky and almost precisely the same size as Earth based on new evidence from NASA's James Webb Space Telescope. The planet is only a few hundred degrees warmer than our home planet. (Image credit: NASA, ESA, CSA, and K Lawson, Goddard Space Flight Center, A Pagan, STScI).

The researchers also confirmed that the planet completes an orbit in just two days, information that was almost instantaneously revealed by Webb's precise light curve. Although LHS 475 b is closer to its star than any planet in our solar system, its red dwarf star is less than half the temperature of the Sun, so the researchers project it still could have an atmosphere.



The researchers' findings have opened the possibilities of pinpointing Earth-sized planets orbiting smaller red dwarf stars. "This rocky planet confirmation highlights the precision of the mission's instruments," Stevenson said. "And it is only the first of many discoveries that it will make." Lustig-Yaeger agreed. "With this telescope, rocky exoplanets are the new frontier." LHS 475 b is relatively close, at only 41 light-years away, in the constellation Octans.

NASA'S WEBB TELESCOPE REVEALS LINKS BETWEEN GALAXIES NEAR AND FAR

A new analysis of distant galaxies imaged by NASA's James Webb Space Telescope shows that they are extremely young and share some remarkable similarities to "green peas," a rare class of small galaxies in our cosmic backyard.

Green pea galaxies were discovered and named in 2009 by volunteers taking part in Galaxy Zoo, a project where citizen scientists help classify galaxies in images, starting with those from the Sloan Digital Sky Survey. Peas stood out as small, round, unresolved dots with a distinctly green shade, a consequence of both the colors assigned to different filters in the survey's composite images and a property of the galaxies themselves.

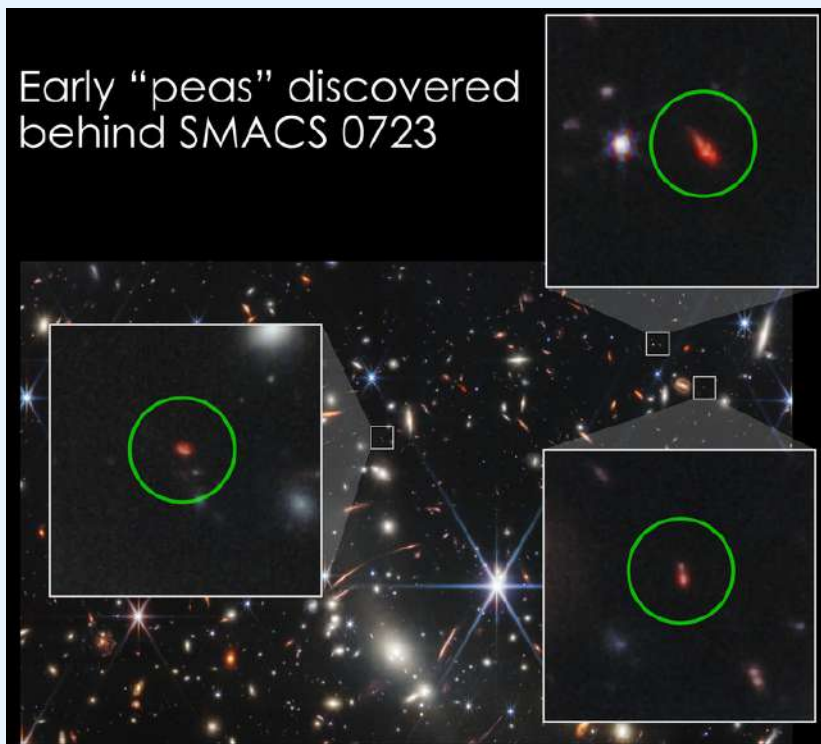
Green pea galaxy colors are unusual because a sizable fraction of their light comes from brightly glowing gas clouds. The gases emit light at specific wavelengths unlike stars, which produce a rainbow-like spectrum of continuous color.

Peas are also quite compact, typically only about 5,000 light-years across or about 5% the size of our Milky Way galaxy.

"Peas may be small, but their star-formation activity is unusually intense for their size, so they produce bright ultraviolet light," said Keunho Kim, a postdoctoral researcher at the University of Cincinnati and a member of the analysis team. "Thanks to ultraviolet images of green peas from Hubble and ground-based research on early star-forming galaxies, it's clear that they both share this property."

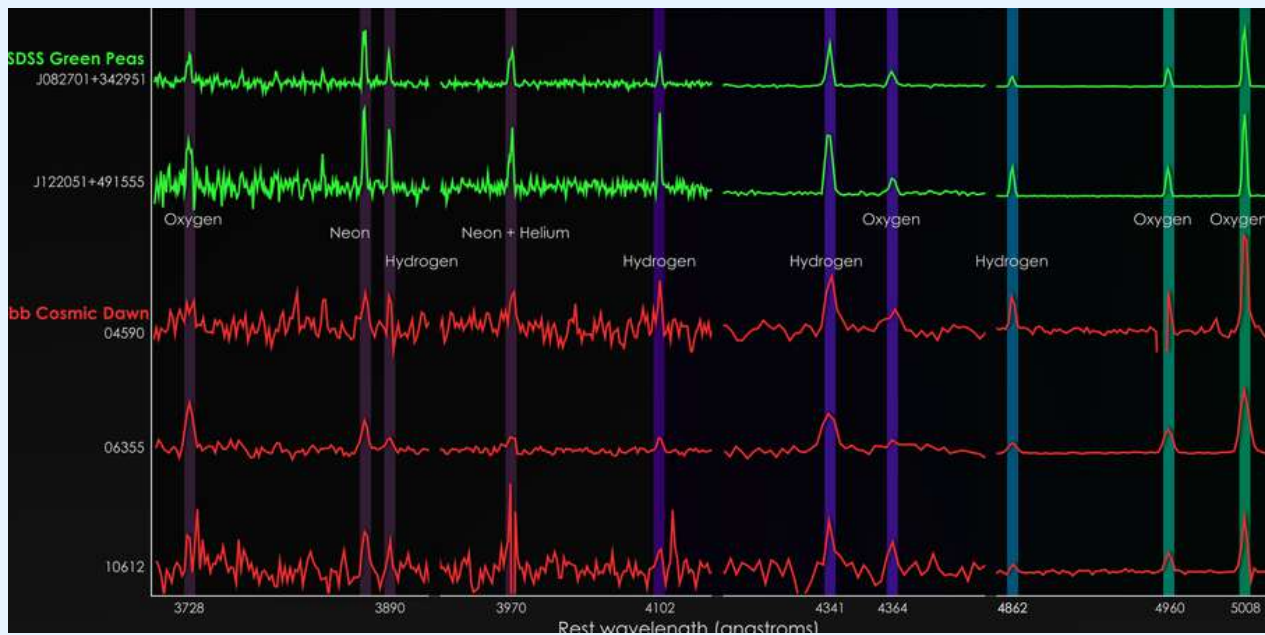
In July 2022, NASA and its partners in the Webb mission released the deepest and sharpest infrared image of the distant universe yet seen, capturing thousands of galaxies in and behind a cluster known as SMACS 0723. The cluster's mass makes it a gravitational lens, which both magnifies and distorts the appearance of background galaxies. Among the faintest galaxies behind the cluster were a trio of compact infrared objects that looked like they could be distant relatives of green peas. The most distant of these three galaxies was magnified by about 10 times, providing a significant assist from nature on top of the telescope's unprecedented capabilities.

Webb did more than image the cluster - its Near-Infrared Spectrograph (NIRSpec) instrument also captured the spectra of selected galaxies in the scene. When Rhoads and his colleagues examined these measurements and corrected them for the wavelength stretch resulting from the expansion of space, they saw characteristic features emitted by oxygen, hydrogen, and neon line up in a stunning resemblance to those seen from nearby green peas.



(A trio of faint objects (circled) captured in the James Webb Space Telescope's deep image of the galaxy cluster SMACS 0723 exhibit properties remarkably similar to rare, small galaxies called "green peas" found much closer to home. The cluster's mass makes it a gravitational lens, which both magnifies and distorts the appearance of background galaxies. We view these early peas as they existed when the universe was about 5% its current age of 13.8 billion years. The farthest pea, at left, contains just 2% the oxygen abundance of a galaxy like our own and might be the most chemically primitive galaxy yet identified.)

GALACTICA



The James Webb Space Telescope’s Near-Infrared Spectrograph captured the chemical fingerprints of selected galaxies behind SMACS 0723, including three faint, distant objects. When corrected for the wavelength stretch caused by the expansion of space over billions of years, the spectra of these galaxies (shown in red) exhibit features emitted by oxygen, hydrogen, and neon that show a stunning resemblance to those seen from so-called green pea galaxies found nearby (in green). Additionally, the Webb observations made it possible to measure the amount of oxygen in these cosmic dawn galaxies for the first time. The spectral lines have been stretched vertically in order to clarify these relationships.

Additionally, the Webb spectra made it possible to measure the amount of oxygen in these cosmic dawn galaxies for the first time.

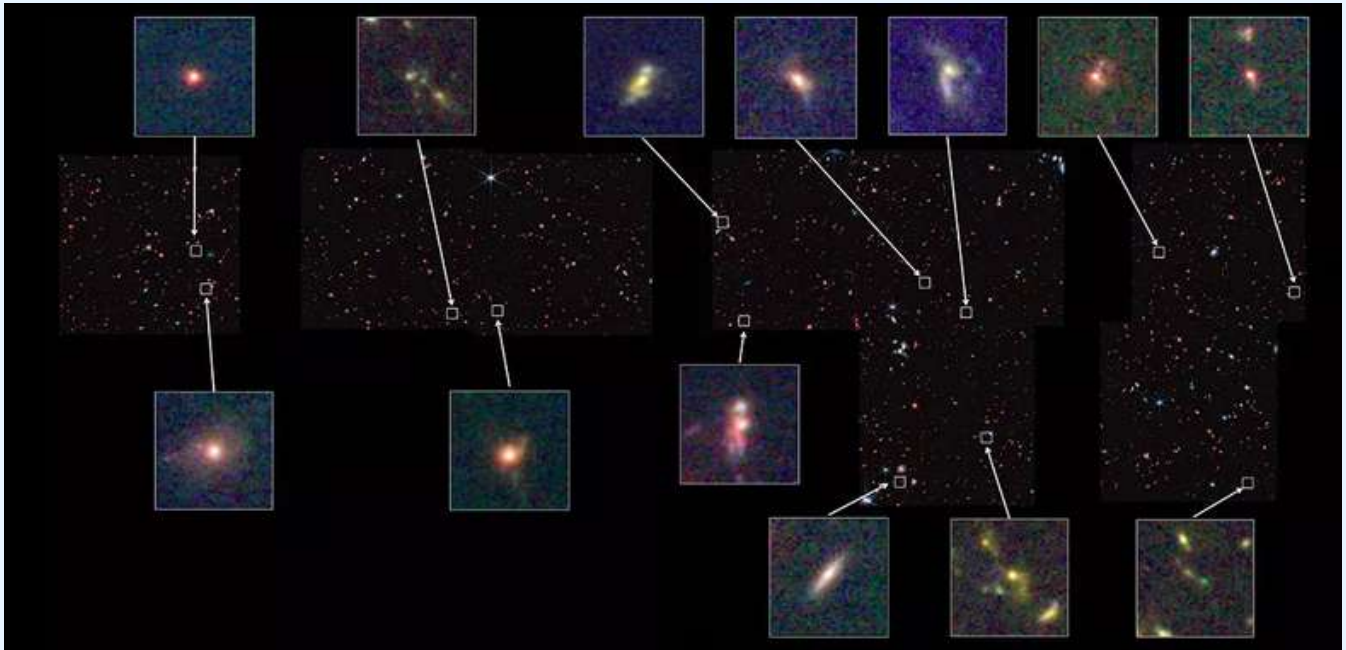
As stars produce energy, they transmute lighter elements like hydrogen and helium into heavier ones. When stars explode or lose their outer layers at the ends of their lives, these heavier elements become incorporated into the gas that forms the next stellar generations, and the process continues. Over cosmic history, stars have steadily enriched the universe.

Two of the Webb galaxies contain oxygen at about 20% of the level in our Milky Way. They resemble typical green peas, which nevertheless make up less than 0.1% of the nearby galaxies observed by the Sloan survey. The third galaxy studied is even more unusual.

“We’re seeing these objects as they existed up to 13.1 billion years ago, when the universe was about 5% its current age,” said Goddard researcher Sangeeta Malhotra. “And we see that they are young galaxies in every sense – full of young stars and glowing gas that contains few chemical products recycled from earlier stars. Indeed, one of them contains just 2% the oxygen of a galaxy like our own and might be the most chemically primitive galaxy yet identified.”



(A green pea galaxy imaged by the Sloan Digital Sky Survey is shown alongside an infrared picture of an early pea captured by NASA’s James Webb Space Telescope. At left is J122051+491255, a green pea about 170 million light-years away that’s about 4,000 light-years across, a typical size. At right is an early pea known as 04590, whose light has taken 13.1 billion years to reach us. Compensating for the cluster’s gravitational lensing effect and the galaxy’s greater distance to us, 04590 is even more compact, comparable to the smallest nearby green peas. Credit: SDSS and NASA, ESA, CSA, and STScI)



The above image – a mosaic of 690 individual frames taken with the Near Infrared Camera on the James Webb Space Telescope – covers an area of sky about eight times as large as Webb's First Deep Field Image released on July 12, 2022. It's from a patch of sky near the handle of the Big Dipper. This is one of the first images obtained by the Cosmic Evolution Early Release Science Survey collaboration. It contains several examples of high-redshift galaxies with various morphologies. (Image credit: NASA/STScI/CEERS/TACC/S. Finkelstein/M. Bagley/Z. Levay.)

The James Webb Space Telescope is changing our understanding of the cosmos.

Galaxies in the early days of the universe were much more varied and mature than previously thought, according to a new study of observations of hundreds of galaxies by NASA's James Webb Space Telescope (JWST).

The Cosmic Evolution Early Release Science (CEERS) Survey has been using JWST to look far back in time, studying galaxies as they were around 11 to 13 billion years ago.

"Even early on, 'galaxies were already fairly evolved and had a wide range of structures."

"Galaxies in early universe were surprisingly diverse, JWST finds"

These new images have revealed the presence of mature features such as disks and spheroidal components, Jeyhan Kartaltepe, an associate professor in the Rochester Institute of Technology's School of Physics and Astronomy, said in a statement.

"This means that, even at these high redshifts, galaxies were already fairly evolved and had a wide range of structures," said Kartaltepe, lead author of the new paper and a CEERS co-investigator.

These early galaxies were therefore much more like the galaxies of the present than previously known.

"This tells us that we don't yet know when the earliest galaxy structures formed," said Kartaltepe.

"We're not yet seeing the very first galaxies with disks. We'll have to examine a lot more galaxies at even higher redshifts to really quantify at what point in time features like disks were able to form."

The results of the study, which used an early JWST data set from June last year, have been accepted for publication in *The Astrophysical Journal* and posted on the online preprint site ArXiv.

Since then, the CEERS survey has racked up another 60 observing hours with JWST, meaning there may be many thousands of high redshift galaxies to further explore and advance our understanding of how the early universe evolved.

NASA'S JWST DISCOVERED THE INGREDIENTS **FOR LIFE IN A COLD & DARK CLOUD**

A few hundred light-years away from Earth (which is exceptionally close, cosmically speaking) lies a mysterious, foggy expanse called the Chamaeleon I molecular cloud. In an already cold and dark universe, this misty stellar nursery is considered one of the coldest, and darkest, districts known to date. And it is often in space's most shadowed corners where we find the brightest embers of our universe's evolution and history.

On 23rd Jan in the journal *Nature*, scientists working with the James Webb Space Telescope announced that pointing this machine toward Chamaeleon I has revealed a stunning menagerie of icy molecules hidden within the cloud. But these aren't just plain old molecules. They're the kind of interstellar bricks that'll one day fuse into the next generation of stars, planets and potentially even lead to the inception of life as we know it.

Sure enough, on top of structural icy bits such as frozen carbon dioxide, ammonia and water, the JWST also managed to detect evidence of what're known as "prebiotic molecules" in the cloud, according to a press release on the find. That simply refers to specific chemicals known to foster the right conditions for precursors of life.



(This image by NASA's James Webb Space Telescope's Near-Infrared Camera (NIRCam) features the central region of the Chamaeleon I dark molecular cloud, which resides 630 light years away.)

"Our identification of complex organic molecules, like methanol and potentially ethanol, also suggests that the many star and planet systems developing in this particular cloud will inherit molecules in a fairly advanced chemical state," Will Rocha, an astronomer at Leiden Observatory who contributed to the discovery, said in a statement. "This could mean that the presence of prebiotic molecules in planetary systems is a common result of star formation, rather than a unique feature of our own Solar System."

In other words, maybe humans, flowers and Earthling microbes aren't so special. Maybe we're not alone in the universe because the ingredients that made us are extraordinarily common byproducts of baby stars growing up into big, bad suns.

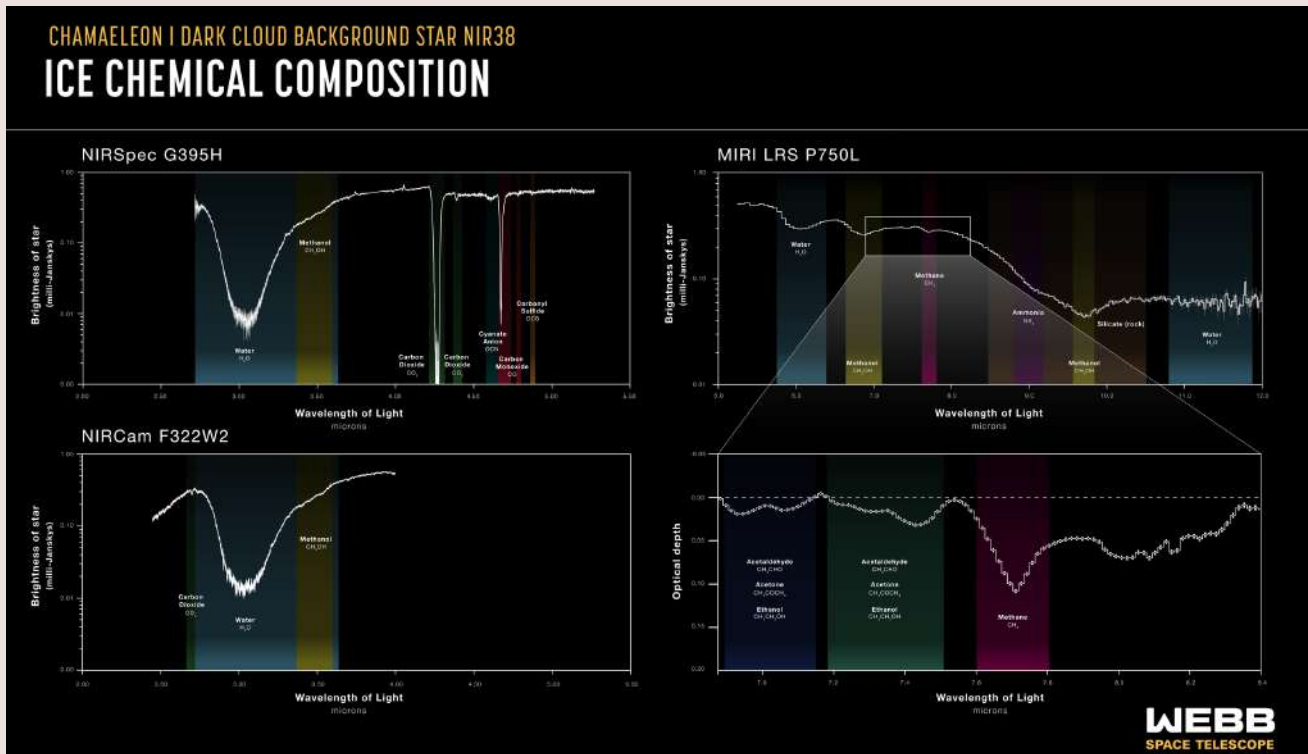
OK, to be clear, this doesn't mean we've found proof of alien life or anything drastic like that. I mean, we don't exactly know what's going to happen to these cloud-borne molecules over time as mini-solar systems doppelgangers actually start to form.

"These observations open a new window on the formation pathways for the simple and complex molecules that are needed to make the building blocks of life," Melissa McClure, an astronomer at Leiden Observatory and lead author of the paper, said in a statement.

GALACTICA

Tracking a chameleonic cloud

In a nutshell, the JWST works by using its gold-plated mirrors and high-tech instruments to detect specific wavelengths of light that fall within the infrared region of the electromagnetic spectrum. Infrared light is super different from the regular light we're used to seeing with our naked eye. Unlike the latter, known as visible light, infrared wavelengths are essentially invisible to us. Yet a lot of light emanating from different areas of the universe particularly from inside star-forming clouds arrives at our vantage point on Earth as invisible, infrared light. That's why the JWST is such a big deal. This machine is literally constructed to decode all of that deep space infrared light and turn it into something understandable by our minds and technology elucidating a wealth of cosmic secrets otherwise shielded from our sight.



(These graphs show spectral data from three of the James Webb Space Telescope's instruments. In addition to simple ices like that from water, the science team was able to identify frozen forms of a wide range of molecules, from carbon dioxide, ammonia and methane to the simplest complex organic molecule, methanol.) And, you guessed it, while the JWST was observing Chamaeleon I, it caught a bunch of infrared wavelengths associated with the icy molecules hidden inside the haze, and turned it into information digestible by the team of scientists operating the scope.

Basically, light emitted by a star in the background of the cloud kind of touched everything in its path on the way to the JWST's lenses, located a million miles away from our planet. More specifically, as the wavelengths passed through the cloud itself, they came into contact with all those icy molecules floating inside.

Thus, some of the starlight was absorbed by those icy molecules, leaving a sort of fingerprint in its wake. Such fingerprints are called absorption lines -- and once analyzed, can help deduce whatever stuff created them. In this case, the fingerprints led scientists to learn about, of course, the icy molecules.

"We simply couldn't have observed these ices without Webb," Klaus Pontoppidan, Webb project scientist at the Space Telescope Science Institute, who was involved in this research, said in a statement. "In regions that are this cold and dense, much of the light from the background star is blocked and Webb's exquisite sensitivity was necessary to detect the starlight and therefore identify the ices in the molecular cloud."

Going forward, the team intends to see how these ices and prebiotic components evolve over time in Chamaeleon I as planet-forming disks start to arise in the region. As McClure explained, "this will tell us which mixture of ices and therefore which elements can eventually be delivered to the surfaces of terrestrial exoplanets or incorporated into the atmospheres of giant gas or ice planets."

ASTRONOMERS WEIGHED OUR MILKY WAY, AND IT'S LIGHTER THAN EXPECTED

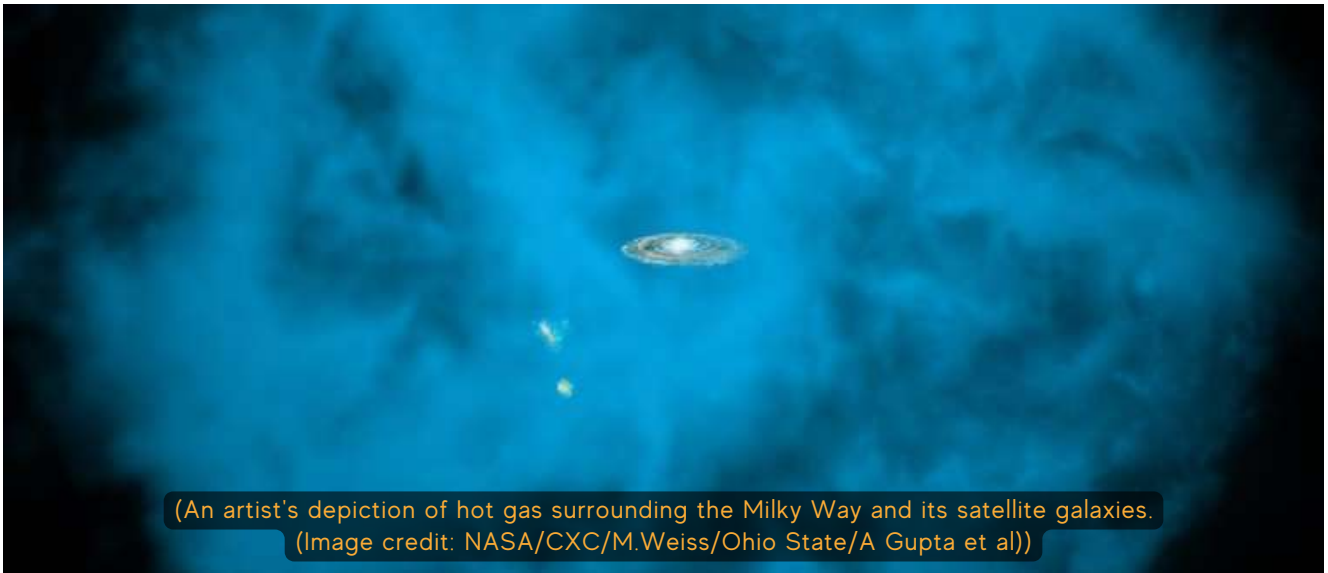
Mysterious fast radio bursts (FRBs) helped astronomers weigh our galaxy.

For over a decade now, so-called fast radio bursts (FRBs) have been puzzling scientists. These ultra-short-lived, bright flashes of radio waves across the sky happen all day, but no one yet knows what causes them.

Although FRBs are still a mystery, new observations of this strange phenomenon may actually help astronomers learn more about our own galactic neighborhood. In new research presented in a press conference at the 241st American Astronomical Society meeting, a team of astronomers from Caltech reported measuring our Milky Way's mass using an FRB – and it turns out our galaxy is lighter than expected.

Caltech astronomers built an observatory called the Deep Synoptic Array (DSA), a collection of 110 radio antennas nestled in the Owens Valley of Central California on the ancestral lands of the Big Pine Paiute Tribe, to make more precise measurements of FRBs.

At the same time, the array must survey a large chunk of the sky to have any hope of spotting the extremely short bursts. Surveying a large amount of sky means processing a lot of data, so the array's computers are processing 24 gigabytes per second. This is far beyond the capabilities of most computers we interact with" It would be like streaming 28,000 Netflix movies all at the same time.



(An artist's depiction of hot gas surrounding the Milky Way and its satellite galaxies.
(Image credit: NASA/CXC/M.Weiss/Ohio State/A Gupta et al))

In the long run, astronomers hope to build an even more advanced FRB observatory, nicknamed DSA-2000 – yes, that's an array of two thousand radio dishes. in the Nevada desert. But even the initial DSA is a powerful instrument for observing FRBs.

And not only are these observations giving astronomers clues into the mystery of FRBs, they also reveal invisible matter all around us. "As it turns out, more than 80% of baryonic matter – not dark matter, but actually matter like you and me – is invisible in the nearby universe," said Vikram Ravi, astronomer at Caltech, during the press conference. This hidden matter is really spread out, making it hard for our telescopes to see. (Dark matter is the mysterious substance that astronomers can't see directly, but have observed through its gravitational signature on galaxies.)

As the radio waves travel from distant galaxies to our antennas on Earth, certain frequencies of the waves will be delayed – an indicator of how much stuff there is between the observer and the FRB. Data from the DSA revealed that our Milky Way has far less regular matter than astronomers expected. Whereas most of the universe is made of around 16% regular matter and 84% dark matter, our Milky Way is less than 10% regular matter and over 90% dark matter.

This unexpected lightness could hint at blowouts in our galaxy's past. "These results strongly support scenarios predicted by galaxy-formation simulations where feedback processes expel matter from the halos of galaxies," Ravi said in a statement from Caltech. These processes are "fundamental to galaxy formation, whereby matter is funneled in and blown out of galaxies in cycles," he added.

NASA ASTRONAUT AND 2 COSMONAUTS MAY STAY ON SPACE STATION FOR A FULL YEAR AFTER SOYUZ LEAK



An apparent micrometeoroid strike on a Russian Soyuz spacecraft will keep three astronauts aloft for longer than planned.

Three astronauts are apparently going to be away from their home planet for twice as long as originally planned.

NASA's Frank Rubio and cosmonauts Sergey Prokopyev and Dmitry Petelin launched toward the International Space Station (ISS) aboard a Russian Soyuz spacecraft on Sept. 21, 2022. The trio was supposed to come home in March on that same Soyuz. But the vehicle, known as MS-22, lost all of its coolant after an apparent micrometeoroid strike last month, rendering it unfit to carry astronauts except in the event of an emergency. So Russia's federal space agency Roscosmos has decided to launch an uncrewed Soyuz to the orbiting lab on Feb. 20 to bring Rubio, Prokopyev and Petelin back to Earth.

However, that next Soyuz will stay docked at the ISS until its successor – a vehicle that will carry crew is ready to go. That will likely be a while, so Rubio, Prokopyev and Petelin are getting a hefty mission extension.

"The plan is for Frank, Dimitri and Sergey to stay on board for several more months until they come home, probably [in] late September," Dina Contella, NASA's ISS operations integration manager, said during a press conference on Tuesday (Jan. 17).

"We're looking at the exact timing of that, but at this point, that would be when the vehicle would be planned to come home," she said.

If "late September" means sometime after Sept. 21, then the MS-22 crew will end up staying aloft for a full year – something no NASA astronaut has ever done.

A few have come close. For example, Mark Vande Hei lived aboard the station for 355 days between April 2021 and April 2022. Scott Kelly and cosmonaut Mikhail Kornienko logged 340 days in space between March 2015 and March 2016, and Christina Koch was away from Earth for almost 329 days, from April 2019 to February 2020.

Of these missions, only that of Kelly and Kornienko was supposed to last so long. Their highly publicized "year in space" was designed to gather data about the effects of long-duration spaceflight on the human body, to aid planning for future crewed missions to Mars.

Vande Hei and Koch lived aboard the ISS longer than planned due to scheduling issues. Vande Hei's extension, for example, was necessitated by Russia's decision to launch filmmakers on the next Soyuz in line rather than a replacement astronaut crew.

But NASA biomedical personnel and mission planners are doubtless using the extra data generated during those unexpectedly long past flights and they'll probably study Rubio, Prokopyev and Petelin with the same outlook and intensity.

Cosmonauts have lived off Earth for a full year continuously, by the way. Valery Polyakov holds the duration record for a single spaceflight, racking up 437 consecutive days aboard Russia's old Mir space station in 1994 and 1995.



(From left - Frank Rubio, Sergey Prokopyev and Dmitri Petelin.)

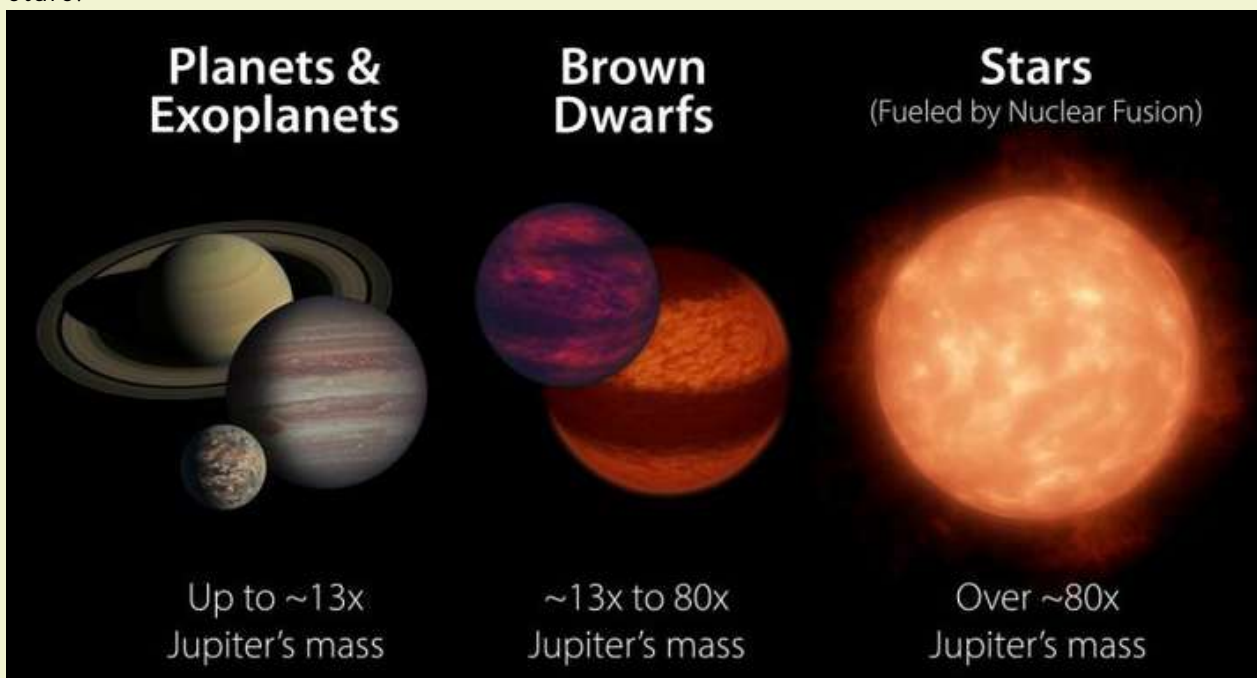
A NEWLY FOUND ALIEN PLANET HAS NUCLEAR FUSION GOING IN ITS CORE

"HD 206893 c is on the boundary between a planet and a brown dwarf, or failed star."

An international team of scientists has found a new exoplanet that's the first to be directly imaged thanks to Europe's Gaia spacecraft – and it appears to have nuclear fusion ongoing in its core.

The team, led by Professor Sasha Hinkley at the University of Exeter in England, discovered the exoplanet orbiting roughly 300 million miles (483 million kilometers) away from the star HD 206893, which is located about 130 light-years from Earth and is about 30% larger than our sun.

The star has a known debris disk around it and was considered a good candidate for finding new extrasolar planets. The European Space Agency's Gaia mission makes extremely precise measurements of the location of stars as they move across the sky, and the astrometric data it provides also means the presence of exoplanets can be inferred by measuring the wobble of stars.



Following up on Gaia data, the team used the GRAVITY instrument on the Very Large Telescope in the Atacama Desert of northern Chile to directly confirm the presence of the newfound planet, known as HD 206893 c.

What's more, the observation also allowed the researchers to analyze the light spectrum from the planet's atmosphere. The apparent brightening of the object suggests that the core of this giant planet is undergoing nuclear fusion using deuterium, an isotope of hydrogen carrying a neutron.

The newly discovered exoplanet is likely about 13 times more massive than Jupiter. That enormous size and the evidence of fusion mean it is on the boundary between being a planet and a brown dwarf, a curious cosmic object that forms in the same way as normal stars but does not quite have the mass required to sustain nuclear fusion. The discovery could provide new insight for scientists to distinguish between massive planets and brown dwarfs, study team members said.

"The discovery of HD 206893 c is a really important moment for the study of exoplanets, as ours may be the first direct detection of a 'Gaia exoplanet,'" Hinkley said in a statement.

The discovery shows that Gaia can point the way to potential exoplanets, which can then be directly detected by follow up observations, either on the ground or by a space-based observatory such as NASA's James Webb Space Telescope.



"LUNAR NEW YEAR 2023"

You may have thought that New Year's was only celebrated on January 1, but you couldn't be more wrong. In other cultures, New Year's actually doesn't take place until much later. It's referred to as Lunar New Year and is one of the most important Asian holidays of each year.

What is Lunar New Year?

Did you know that more than 1.5 billion people celebrate the Lunar New Year every year? It's true! The holiday marks the first new moon of the lunisolar calendar, which is a calendar used in countries like Singapore, China, South Korea, Vietnam and other Asian countries.

Each Lunar New Year is extra special because it corresponds with an animal from the Chinese zodiac, which consists of 12 different animals and cycles through over 12 years. This upcoming year, 2023, is the Year of the Rabbit.

Lunar New Year 2023

Unlike the Jan. 1 celebration most of us are used to, the date of the Lunar New Year changes every year. Americans and many other cultures around the world use the Gregorian calendar to keep track of the days of the year. However, this calendar doesn't keep track of the moon and sun's different phases, like the lunisolar calendar does. This lunisolar calendar is used by many ancient cultures and religions and it's the calendar used to determine the Lunar New Year—that's why the holiday falls on different dates each year. Typically, it is celebrated between January 20 and February 21 of the Gregorian calendar. In 2021, it was on February 23. In 2022, Lunar New Year was Tuesday, February 1, 2022. This year, Lunar New Year is on Sunday, January 22, 2023.

How do people celebrate the Lunar New Year?

While most holidays are only typically celebrated for one day, The Lunar New Year can be celebrated for multiple days. In fact, depending on what culture is celebrating it, the holiday can be celebrated for up to 15 days. During that time, extravagant events like firework displays, parades and lion and dragon dances can occur. And while celebratory customs vary between Asian cultures, one of the most popular traditions of the Lunar New Year is to give children money. Besides giving the tradition of money, the Lunar New Year can be celebrated in other ways too. One of those ways is by decorating with the color red because it is associated with happiness and good fortune and has a history of warding off evil spirits.

People also celebrate the holiday by having a family dinner that includes traditional dishes, like fish, longevity noodles, tangyuan, spring rolls and dumplings. Foods like oranges and tangerines are also traditionally gifted during this holiday because they represent luck and wealth and people also do things like sweeping their homes to drive out any bad luck that's there. The end of the holiday is usually marked by a beautiful lantern festival, which symbolizes love and hope.

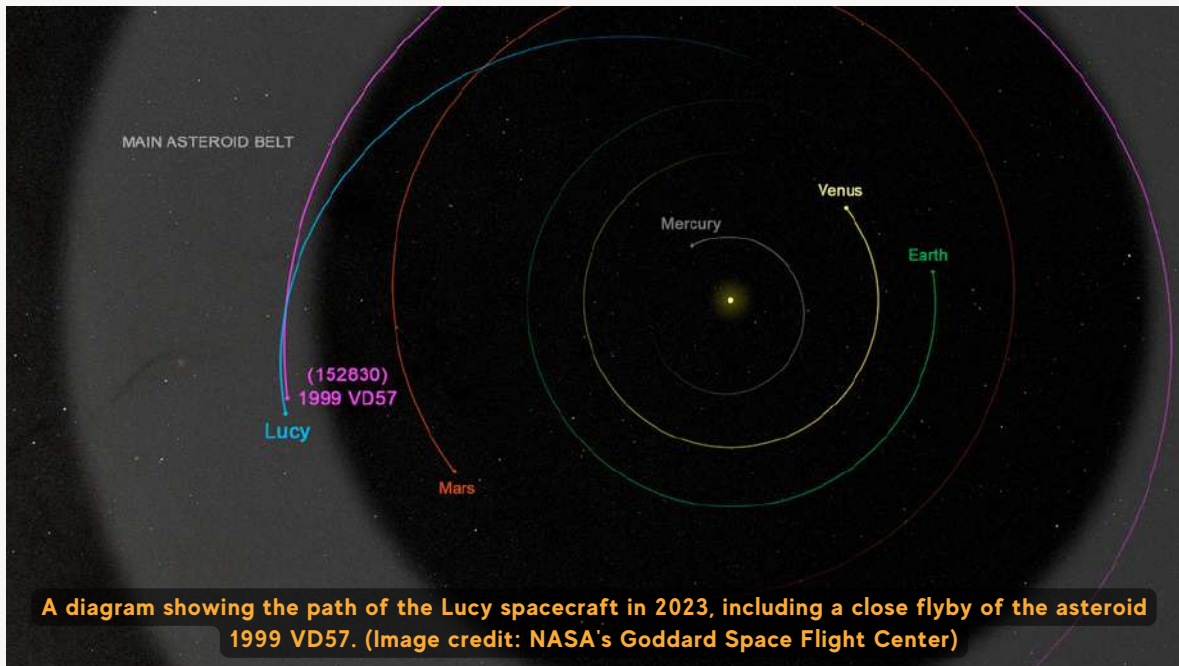
NASA'S LUCY ASTEROID MISSION ADDED ITS 10TH SPACE ROCK TARGET

Lucy will fly by the small main belt asteroid 1999 VD57 on 1st of November 2023.

NASA's Jupiter Trojan asteroid-scouting mission has been given an additional space rock to visit, bringing the journey's total to 10 asteroids.

The Lucy mission team officially added main-belt asteroid 1999 VD57 to Lucy's list of targets on Jan. 24. The addition will allow the spacecraft to test its innovative target tracking system and introduce us to another small world years before Lucy reaches its primary science targets in the outer solar system.

"There are millions of asteroids in the main asteroid belt," Raphael Marschall, a Lucy collaborator at the Nice Observatory in France, who identified asteroid 1999 VD57 as an object of special interest for Lucy, said in a statement. "This asteroid really stood out. Lucy's trajectory as originally designed will take it within 40,000 miles of the asteroid, at least three times closer than the next closest asteroid."



Asteroid 1999 VD57 is an S-type, or stony, asteroid was not identified as a target earlier because it is extremely small, according to the team, but its presence now offers the mission a useful opportunity to conduct an extra dress rehearsal for its Trojan tour.

Lucy's original trajectory would have taken it within 40,000 miles (64,400 kilometers) of the 2,300-foot (700 meters) diameter asteroid, but a series of small maneuvers beginning in May will allow the spacecraft to make a much closer approach, coming within approximately 280 miles (450 km) on Nov. 1.

The flyby will give the team an early opportunity to test its twin Terminal Tracking Cameras (T2CAM), which the spacecraft will mainly use to automatically lock onto and track asteroids during flybys and make sure Lucy's other instruments are pointed in the right direction, which has traditionally been tricky.

"In the past, most flyby missions have accounted for this uncertainty by taking a lot of images of the region where the asteroid might be, meaning low efficiency and lots of images of blank space," Levison said in a statement.

"Lucy will be the first flyby mission to employ this innovative and complex system to automatically track the asteroid during the encounter," he said. "This novel system will allow the team to take many more images of the target."

The mission's first encounter with a space rock was previously slated to be its 2025 flyby of the main belt asteroid 52246 Donaldjohanson, named for the paleontologist who discovered the fossil Lucy, which in turn inspired the name of the NASA mission.

GALACTICA

The Hubble Space Telescope captured a stunning image of a small region of Westerhout 5, also known as the Soul Nebula, glowing red. The suffusion of red light is caused by H-alpha emission, which happens when very energetic electrons within hydrogen atoms lose energy, causing the release of this distinctive red light.

This red light also reveals a range of fascinating features, such as a so-called free-floating evaporating gaseous globule (frEGG). Seen as a dark, tadpole-shaped region in the upper center left of the image, this frEGG is officially named KAG2008 globule 13 and J025838.6+604259.



"HUBBLE CAPTURES A STUNNING RED VIEW OF THE SOUL NEBULA"

This and other frEGGs belong to a special class of evaporating gaseous globules (EGGs), which occur in nebulas when energetic radiation from young, hot stars ionizes surrounding gas by stripping away electrons. This causes the gas to disperse away from those bright stars in a process called photoevaporation, which may help to halt star formation in nebulas.

In EGGs, the gas is so dense that this photoevaporation process happens much more slowly than it does in surrounding regions of gas. This slower photoevaporation and the protection of gas from dispersal allow gas to remain dense enough to collapse and form protostars, which eventually go on to become full-fledged stars. This means astronomers are interested in frEGGs and EGGs because they are the areas of nebulas where star birth may have once taken place.

Astronomers discovered the existence of EGGs only recently. A prominent example of these structures is located at the tips of the Pillars of Creation in a 1995 Hubble image of the nebula. frEGGs are an even newer find; they are distinct from EGGs because they are detached from surrounding gas, giving them a distinct tadpole-like shape.

The Soul Nebula is the partner of another nebula that will have its image widely shared as Valentine's Day approaches: the Heart Nebula. Officially known as IC 1805, the massive cloud of gas and dust is so named because the glowing hydrogen content makes it resemble a pink heart. At 7,500 light-years away, the Heart Nebula can be snapped by amateur astrophotographers, making it one of the most commonly shared space images around Feb. 14.

The "Heart and Soul" nebula complex forms a vast star-forming region that spans 300 light-years, with the two nebulas joined by a bridge of gas. Both nebulas are packed with bright stars that are just a few million years old, veritable infants compared with our nearly 5 billion-year-old sun.



Hubble Space Telescope (Image credit: Hubblesite.org)

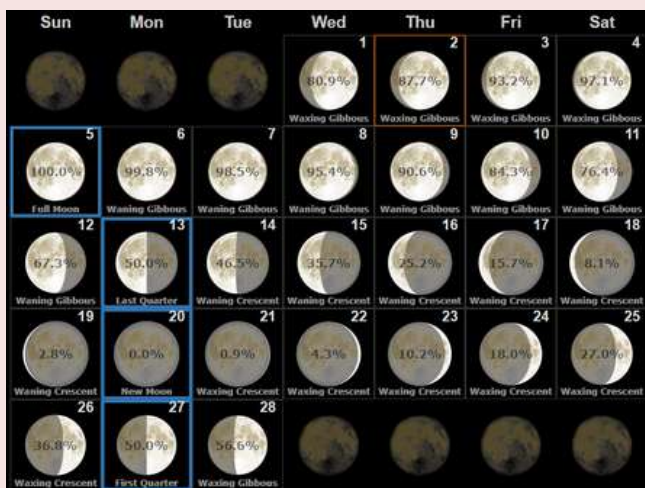
WHAT'S UP IN THE SKY - FEBRUARY 2023

LUNAR CALENDAR

IMPORTANCE OF MOON PHASES FOR STARGAZERS

One might wonder why it is important to refer to moon phases for star gazing. The reason is that the phases of the Moon reflect 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

Mercury much tougher to spot in morning twilight. By mid-month, it will not be visible.



Venus

Venus, the brightest planet, is climbing higher in the west after sunset each night



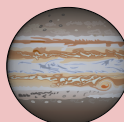
Mars

Mars is high in the evening sky, noticeably red in color, setting several hours after midnight.



Jupiter

Jupiter is now descending into the sunset glare. It will be in conjunction with Crescent Moon and Mars on 27th February.



Saturn

It's too close to the sun to be visible this month. Its conjunction with the sun will come on February 16.



Uranus

Uranus is an easy binocular target all month, located in the region of southern Aries.



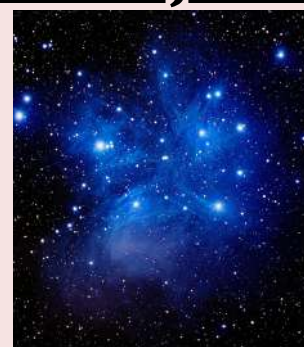
Neptune

Dim Planet at magnitude 7.8 and it has great conjunction with Venus on 15th Feb.



BRIGHT DEEP SKY OBJECTS

The Messier 45 (M45), also known as the Pleiades or Seven Sisters, is a bright open star cluster located in the constellation Taurus, the Bull. The Pleiades cluster has an apparent magnitude of 1.6 and lies at an average distance of 444 light years from Earth. Finding M45 is easy, the cluster is positioned about 14 degrees northwest of orange giant star Aldebaran (mag. +0.9), the brightest star in Taurus.



Messier 35 (M35) is a large open star cluster located in the northern constellation Gemini. The cluster consists of several hundred stars. The beautiful open cluster M35 reaches its highest position in the sky, due south, around 20:00 UT. The cluster is just visible to the naked eye, and a real treat through binoculars or a small scope.



M37 is an open cluster in the constellation Auriga. It has the designation NGC 2099 in the New General Catalogue. M37 is the brightest, richest and largest of the three open clusters in this constellation that were catalogued by Messier. It has an apparent magnitude of 6.2 and lies at a distance of 4,511 light years from Earth.



The Orion Nebula, designated as Messier 42, is a diffuse nebula situated south of Orion's Belt in the constellation of Orion. It is one of the brightest nebulae visible to the naked eye in the night sky with an apparent magnitude of 4.0. It is 1,344 light-years away and is the closest region of massive star formation to Earth.



ROCKET LAUNCHES IN FEBRUARY 2023

SOYUZ | PROGRESS MS 22 | 83P

"Russian Federal Space Agency (ROSCOSMOS) is scheduled to launch a Soyuz 2.1a rocket as part of the Progress MS-22 (83P) mission. The launch is scheduled on 02/09/2023 at 06:15 UTC for the Resupply mission launching from Baikonur Cosmodrome, Republic of Kazakhstan. Don't miss this exciting rocket launch!"

The Russian space agency, Roscosmos, will launch another Soyuz rocket to bring back three astronauts to Earth after their original capsule was damaged and began leaking coolant into the vacuum of space. The Soyuz spacecraft will return two Russian cosmonauts and an American astronaut from the International Space Station. 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.



About 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.

About the Progress Spacecraft:

The Progress is a Russian expendable cargo spacecraft. Its purpose is to deliver the supplies needed to sustain a human presence in orbit. While it does not carry a crew, it can be boarded by astronauts when docked to a space station, hence it is classified as crewed by its manufacturer. Progress is derived from the crewed Soyuz spacecraft and launches on the same launch vehicle, a Soyuz rocket.

Progress has supported space stations as early as Salyut 6 and as recently as the International Space Station (ISS). Each year there are between three and four Progress flights to the ISS. A Progress remains docked until shortly before being replaced with a new one or a Soyuz (which will use the same docking port). Then it is filled with waste, disconnected, and de-orbited, at which point it burns up in the atmosphere.

Progress was developed because of the need for a constant source of supplies to make long-duration space missions possible. It was determined that cosmonauts needed an inflow of consumables (food, water, air, etc.), plus there was a need for maintenance items and scientific payloads that necessitated a dedicated cargo carrier. Such payloads were impractical to launch with passengers in the restricted space of a Soyuz.

SSLV-D2/EOS-07 MISSION: SECOND DEVELOPMENTAL FLIGHT OF SSLV

The ISRO New Rocket Launch: Satellite No Longer Usable, Will Soon Be Back With SSLV-D2, Says Space Agency

Failure Analysis of SSLV-D1 Mission & Recommendations for SSLV-D2

The Small Satellite Launch Vehicle (SSLV) of ISRO is designed to be affordable and amenable to industry production and will function as a launch-on-demand platform for Mini, Micro or Nanosatellites. It is a three-stage vehicle with all solid propulsion stages and a liquid propulsion-based Velocity Trimming Module (VTM) as the terminal stage. The launcher also targets many novel features including low turn-around time, flexibility in accommodating multiple satellites, launch-on-demand, minimal launch infrastructure requirements, etc.

The first developmental flight of a Small Satellite Launch Vehicle (SSLV) lifted off from Satish Dhawan Space Centre (SDSC) on 7th August 2022 at 09.18 Hrs IST. The objective of the mission (SSLV-D1/EOS-02) was to inject the EOS-02 satellite of ISRO into a circular orbit of 356.2 km with an inclination of 37.21°. Azaadisat, a student satellite was also accommodated in the mission, authorized by IN-SPACe.

However, the spacecraft were injected into a highly elliptical unstable orbit due to a shortfall in velocity, leading to their decay and deorbiting immediately, in spite of normal performance of all solid propulsion stages. The orbit achieved was 360.56 km x 75.66 km with an inclination of 36.56°. Initial investigations with the flight data indicated that the lift-off of SSLV D1 was normal along with normal performance of all solid propulsion stages. However, the mission could not be achieved due to an anomaly during the second stage (SS2) separation, which triggered a mission salvage mode (which is a procedure adopted to attempt minimum stabilized orbital conditions for the Spacecraft in case of an anomaly in the vehicle system).



Getting ready for SSLV-D2:

The SSLV-D1 was the first developmental mission of this new launch vehicle. The objective of development missions is to prove the launch vehicle design and architecture and to bring out any residual unknowns not identified in the qualifications tests and analysis during its development journey. SSLV-D1 mission demonstrated the satisfactory integrated performance of SSLV in all its systems including its flight through the aerodynamic regime, which is an accomplishment by itself.

Considering the clear identification of the cause of the flight anomaly and suggested corrective actions, the next development flight (SSLV-D2) is planned to be executed complying to the recommendations, its satisfactory implementation, review and approval by the authorized committees.

The second developmental flight of SSLV (SSLV-D2/EOS-07 Mission) is scheduled in the first quarter of 2023 and will launch a total payload mass of about 334 kg including EOS-07 satellite and two co-passenger satellites.

SOYUZ MS 23 TO BRING BACK ASTRONAUTS



Expedition 68 crew members Dmitri Petelin of Roscosmos, top, Frank Rubio of NASA, and Sergey Prokopyev of Roscosmos, bottom, wave farewell prior to boarding the Soyuz MS-22 spacecraft for launch, Wednesday, Sept. 21, 2022, at the Baikonur Cosmodrome in Kazakhstan. (Photo Credit - NASA/Bill Ingalls)

Soyuz MS-23 is a planned Russian uncrewed Soyuz spaceflight to launch from Baikonur on 20 February 2023 to the International Space Station, in order to replace the Soyuz MS spacecraft for landing that the three Soyuz MS-22 crew members launched onboard, with a new spacecraft.

The Russian space agency, Roscosmos, will launch another Soyuz rocket to bring back three astronauts to Earth after their original capsule was damaged and began leaking coolant into the vacuum of space. The Soyuz spacecraft will return two Russian cosmonauts and an American astronaut from the International Space Station. 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.

"The expedition of Sergey Prokopyev, Dmitry Petelin, and Francisco Rubio to the ISS is being extended. They will return to Earth on Soyuz MS-23," Roscosmos said, indicating that a new spacecraft will be launched to the flying laboratory. The MS-23 launch had earlier been planned for mid-March. Soyuz MS-22 will descend to Earth without a crew, it said.

Found a leak in the capsule!

An investigation of the leak has revealed that it stemmed from a tiny puncture in the external radiator of the Soyuz MS-22 capsule which is currently docked to the ISS and had been due to bring the three crew members back to Earth in March. The leak from the Soyuz MS-22 was spotted in December when the Russians were about to venture outside the station on a planned spacewalk and ground specialists saw a stream of fluid and particles emanating from the Soyuz on a live video feed from space.

Roscosmos chief Yuri Borisov told reporters on Wednesday that the analysis confirmed a micrometeoroid caused the leak.

Roscosmos and NASA have said the incident hadn't posed any danger to the station's crew. Along with Prokopyev, Petelin, and Rubio, four other crew members are currently on the space outpost: NASA astronauts Nicole Mann and Josh Cassada; the Japan Aerospace Exploration Agency's Koichi Wakata; and Anna Kikina of Roscosmos.

SpaceX Launches - February 2023

SPACEX FALCON 9 / AMAZONAS NEXUS-6

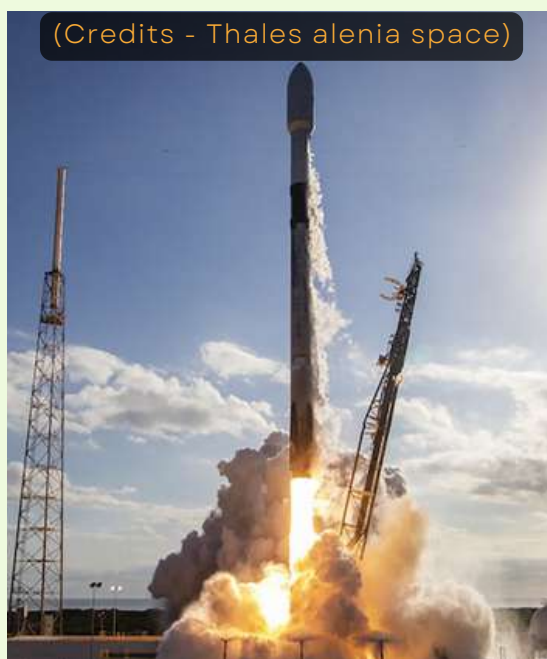
SpaceX is scheduled to launch a Falcon 9 rocket as part of the Amazonas Nexus mission. The launch is scheduled on 02/05/2023 at 22:32 UTC for the Communications mission launching from Cape Canaveral, FL, USA.

A SpaceX Falcon 9 rocket will launch the Amazonas Nexus communications satellite for the Spanish company Hispasat. Amazonas Nexus will provide broadband connectivity to airplanes, ships, and other mobile users across the Americas, Greenland, and travel corridors across the Atlantic Ocean. The satellite was built by Thales Alenia Space and is based on the Spacebus NEO platform. The Falcon 9's first-stage booster will land on a drone ship in the Atlantic Ocean. It is a High-throughput geostationary communications satellite built by Thales Alenia Space for Hispasat.



The Falcon 9 Block 5 was manufactured by SpaceX with the first launch on 2018-05-11. Falcon 9 Block 5 has 144 successful launches and 0 failed launches with a total of 144 launches. 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. B1073 will attempt to land on an ASDS after its sixth flight.

Hispasat Chief Executive Miguel Ángel Panduro said Amazonas Nexus will be "the most dynamic and advanced satellite in our fleet." Using broadband and narrowband, Hispasat said the satellite could support a mix of sensor devices for monitoring remote forests, including surveillance cameras.



(Credits - Thales alenia space)

NASA'S SPACEX CREW-6 MISSION

FEBRUARY 26, 2023

A SpaceX Falcon 9 rocket will launch a Crew Dragon spacecraft on the program's ninth flight with astronauts.

SpaceX Crew-6 is planned to be the sixth crewed operational NASA Commercial Crew flight of a Crew Dragon spacecraft, and the tenth overall crewed orbital flight. The mission is scheduled to launch in 26 February 2023. The Crew-6 mission will transport four crew members to the International Space Station (ISS). Two NASA astronauts, a United Arab Emirates astronaut, and a Russian cosmonaut have been assigned to the mission. The two NASA astronauts are Stephen Bowen and Warren Hoburg. The cosmonaut, Andrey Fedyayev, was reassigned from Soyuz MS-23. Sultan Al Neyadi will head the Emirates' mission on the flight.



The four crew members who comprise NASA's SpaceX Crew-6 mission are seated inside the SpaceX Dragon spacecraft during a training session at the company's headquarters in Hawthorne, California. (Photo credit: SpaceX).

Falcon 9 Block 5 - SpaceX

The Falcon 9 Block 5 was manufactured by SpaceX with the first launch on 2018-05-11. Falcon 9 Block 5 has 144 successful launches and 0 failed launches with a total of 144 launches. 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.



The four crew members who comprise the SpaceX Crew-6 mission pose for a photo in their spacesuits during a training session at the company's headquarters in Hawthorne, California. (Photo credit: SpaceX).

Crew-6 will be SpaceX's tenth crewed flight, and the fourth for Dragon Endeavor, which also launched Demo-2, Crew-2, and Axiom Space's Ax-1 mission. They will spend approximately six months on the space station, starting with a short handover with members of Crew-5, who arrived at Station in October for a science expedition at the microgravity laboratory.



Artists' impression of a Crew Dragon approaching the forward port of Harmony on the ISS.

Names: USCV-6.

Mission type : ISS crew transport.

Operator : SpaceX.

Mission duration: 180 days (planned).

STARLINK SATELLITE SERIES

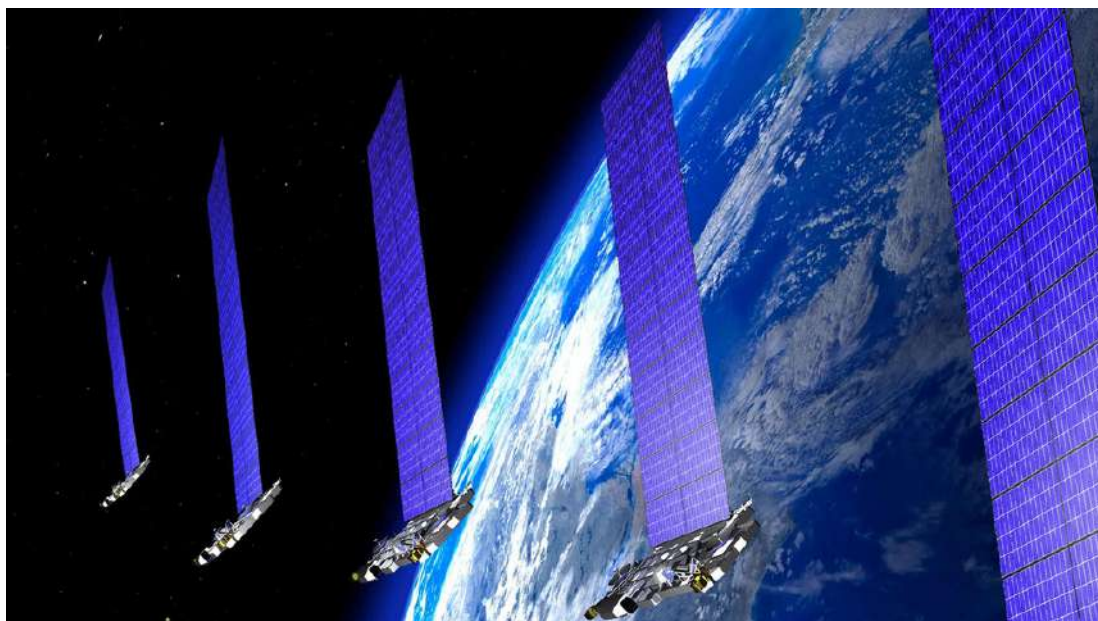
Starlink is a satellite internet constellation operated by SpaceX, providing satellite Internet access coverage to 47 countries. It also aims for global mobile phone service after 2023. SpaceX started launching Starlink satellites in 2019. As of December 2022, Starlink consists of over 3,300 mass-produced small satellites in low Earth orbit (LEO), which communicate with designated ground transceivers. In total, nearly 12,000 satellites are planned to be deployed, with a possible later extension to 42,000. SpaceX announced reaching more than one million subscribers in December 2022.

Astronomers have raised concerns about the effect the constellation can have on ground-based astronomy and how the satellites will add to an already congested orbital environment. SpaceX has attempted to mitigate astronomy concerns by implementing several upgrades to Starlink satellites aimed at reducing their brightness during operation. The satellites are equipped with krypton-fueled Hall thrusters which allow them to de-orbit at the end of their life. Additionally, the satellites are designed to autonomously avoid collisions based on uplinked tracking data.



Starlink Group 2-2 | Group 2-5 | Group 6-1 | Group 5-4

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



PEREGRINE MISSION ONE

Launch is currently scheduled on 25th Feb 2023 from Cape Canaveral, Florida on a United Launch Alliance Vulcan Centaur rocket in the VC2S configuration, with 2 GEM-63XL solid boosters, a standard short faring, and two RL10 engines in the Centaur upper stage.

Peregrine Mission 1 (TO2-AB), or the Peregrine Lunar Lander, carrying scientific and other payloads to the Moon, is tentatively scheduled to touch down on the lunar surface sometime in the first quarter of 2023. This first launch of the lander is designated Peregrine Mission 1. The scientific objectives of the mission are to study the lunar exosphere, thermal properties and hydrogen abundance of the lunar regolith, magnetic fields, and the radiation environment. It will also test advanced solar arrays. Peregrine Mission 1 was selected through NASA's Commercial Lunar Payload Services (CLPS) initiative, in which NASA contracts with a commercial partner, in this case Astrobotic, that provides the launch and lander.



Spacecraft and Subsystems

Peregrine Mission 1 is about 1.9 m high and roughly 2.5 m across. It is a box-shaped main body sitting on 4 landing legs. The main structural landing bus is composed of aluminum isogrid shear panels and aluminum honeycomb mounting surfaces. Propulsion is provided by five ISE-100 667-N thrusters mounted on the bottom of the lander. They use a hypergolic system of Mono-Methyl Hydrazine (MMH) fuel and dinitrogen tetroxide/nitrogen dioxide, 25% Mixed Oxides of Nitrogen (MON-25) oxidizer. Four sets of three 45-N attitude control thrusters maintain orientation. Attitude knowledge is provided by Sun and star trackers, inertial measurement, and Doppler radio and LIDAR. Power (at 28 V) is generated by GaInP/GaAs/Ge triple junction solar cells mounted on the top of the lander and stored in lithium-ion batteries. Communications are via a medium gain, low-gain, and WLAN antenna. Thermal control is achieved by radiators and multi-layer insulation blankets.

The mission will carry 14 payloads of various types, the lander has a payload mass capacity of 90 kg. The scientific payload includes the Laser Retro-Reflector Array (LRA), Navigation Doppler Lidar for Precise Velocity and Range Sensing (NDL), Surface Exosphere Alterations by Landers (SEAL), Photovoltaic Investigation on Lunar Surface (PILS), Linear Energy Transfer Spectrometer (LETS), Near-Infrared Volatile Spectrometer System (NIRVSS), Mass Spectrometer Observing Lunar Operations (MSolo), PROSPECT Ion-Trap Mass Spectrometer (PITMS), Neutron Measurements at the Lunar Surface (NMLS), and Fluxgate Magnetometer (MAG).

ADVANCED LAND OBSERVING SATELLITE-3 “DAICHI-3” (ALOS-3)



A Japanese H3 rocket will launch on its first test flight with the Advanced Land Observing Satellite 3, or ALOS 3, Earth observation satellite for the Japan Aerospace Exploration Agency. ALOS 3, also named Daichi 3, will capture high-resolution, wide-swath images of all of the world’s land surfaces, providing data for applications in disaster management, land use, urban sprawl, scientific research, and coastal and vegetation environmental monitoring. The H3 rocket for Test Flight 1, or TF1, will fly in the H3-22S configuration with two first stage engines, two strap-on solid rocket boosters, and a short payload fairing.

Advanced Land Observing Satellite-3 “DAICHI-3” (ALOS-3) is a successor of the optical mission of Advanced Land Observation Satellite (ALOS). The sensor onboard ALOS-3 is designed for an improved ground resolution (0.8 m) and wide-swath (70 km) simultaneously by expanding the size and upgrading performance compared to that of ALOS. ALOS-3 observations regularly cover all of the land areas of not only Japan but also across the whole world.

ALOS-3 aims to become one of the key tools for disaster managements and countermeasures of the central and local governments; therefore, ALOS-3 is always ready for urgent observation of the affected area wherever disaster strikes. In addition to that, the system for product distribution is also developed in order to deliver images for both before and after the disaster to users swiftly.

The observed data from ALOS-3 is expected to lead to progress in the various fields due to its unique imaging capabilities; it will make a significant contribution to upgrading global geospatial information and research and application for monitoring of the coastal/vegetation environment.



JAXA's ALOS 3 (Advanced Land Observation Satellite 3) is a planned optical Earth observation satellite to be used for cartography, regional observation, disaster monitoring, and resource surveying. It is the follow up to the optical component of ALOS. Japan Aerospace Exploration Agency (JAXA) announces the launch schedule of Advanced Land Observing Satellite-3 “DAICHI-3” (ALOS-3) aboard the first H3 Launch Vehicle (H3 TF1: Test Flight No.1), by February 12, 2023, from Yoshinobu Launch Complex at the JAXA Tanegashima Space Center

ASTRONOMICAL EVENTS - FEBRUARY 2023

A ONCE-IN-A-LIFETIME COMET!

"A comet that last passed by Earth about 50,000 years ago is coming around again and will make its closest pass on 2 February, at which point it may be visible with the naked eye."

A rare green comet is about to make its closest pass by Earth. The comet, called C/2022 E3, spends most of its time on the outermost edges of the solar system, in the Oort cloud, but it will make its closest pass by Earth on 2 February.

The close pass will bring the comet within about 45 million kilometers of Earth, about 120 times the distance between Earth and the moon or about one-fifth the average distance to Mars. It only orbits the sun once every 50,000 years or so, so its last pass by our home planet was in the Stone Age when humans still coexisted with Neanderthals.

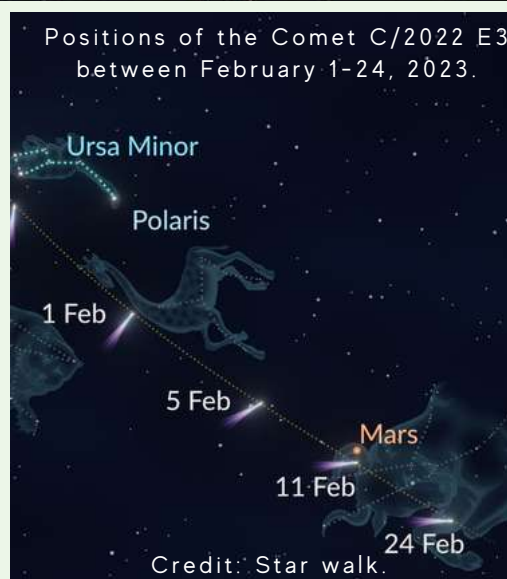
Those early humans may have been able to see C/2022 E3 in the sky, and it is expected to be possible with this pass too, in areas in the northern hemisphere with little light pollution. It is located near the constellation Boötes, just to the east of the Little Dipper, and on 1 and 2 February it might be visible with the naked eye. With a telescope, binoculars, or a camera with the option for extended exposure, it is expected to remain visible through the middle of the month before it slips away back towards the Oort cloud.



(Credit: Chris Schür)

C/2022 E3 was first spotted by astronomers using the Zwicky Transient Facility in California in March 2022, when it came into the solar system past the orbit of Jupiter. Its coma, the cloud of gas surrounding the main body, or nucleus, of the comet, appears green because of carbon gas. It's not just any carbon, though - it is a relatively rare type called diatomic carbon, which consists of two carbon atoms bound together.

Once the strange comet leaves Earth's neighborhood, some observations have hinted that it might be traveling fast enough that it will end up leaving the solar system altogether, or have its orbit bumped around by the gravity of the planets so that it won't pass by again for millions of years. This may be the last chance to spot it.



THE GREAT CONJUNCTION OF VENUS AND NEPTUNE

On February 15, 2023, one of the closest planetary conjunctions of the year will occur. Venus and Neptune will pass within a mere 45" from each other in the constellation Aquarius. Dim Neptune (magnitude 8) can't be seen without optical devices, unlike prominent Venus (magnitude -4). Start your observations in the evening, right after sunset, and watch the planets getting closer to the horizon (they set 1-2 hours after the Sun) Venus lights up the southwestern sky starting soon after sunset. It undergoes a rare close conjunction with Neptune during February's second week when the two worlds appear within the same telescopic field of view.

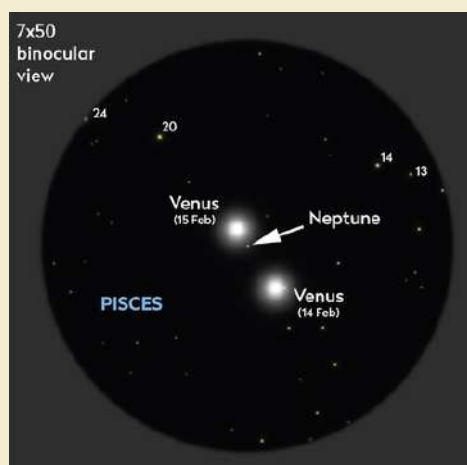


Venus and Neptune will share the same right ascension, with Venus passing 0°00' to the south of Neptune. At around the same time, the two objects will also make a close approach, technically called an appulse.

Object	Right Ascension	Declination	Constellation	Magnitude	Angular Size
Venus	23h38m50s	-03°34'	Aquarius	-4.0	11"6
Neptune	23h38m50s	-03°33'	Aquarius	8.0	2"2



Venus and Neptune will share the same right ascension, with Venus passing 0°00' to the south of Neptune. Venus will be at mag -4.0, and Neptune at mag 8.0, both in the constellation Aquarius in the evening sky. The pair will be close enough to fit within the field of view of a telescope, but will also be visible through a pair of binoculars. Venus and Neptune will become visible around 18:25 (IST), 22° above your western horizon, as dusk fades to darkness. They will then sink towards the horizon, setting 2 hours and 4 minutes after the Sun at 20:14.



Venus and Neptune appears in the same field of view as they share same Right ascension, they are also visible through binoculars.

CONJUNCTIONS FOR THE MONTH

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

The word conjunction comes from Latin, meaning to join together. Maybe you remember the old Conjunction Junction cartoons from the 1970s. In language, conjunctions relate to clauses brought together in sentences with words like and. In astronomy, conjunctions relate to two or more objects brought together in the sky. An astronomical conjunction describes a few different types of meetings. The first two types we're describing here - inferior and superior conjunctions - involve the sun and thus can't be seen.

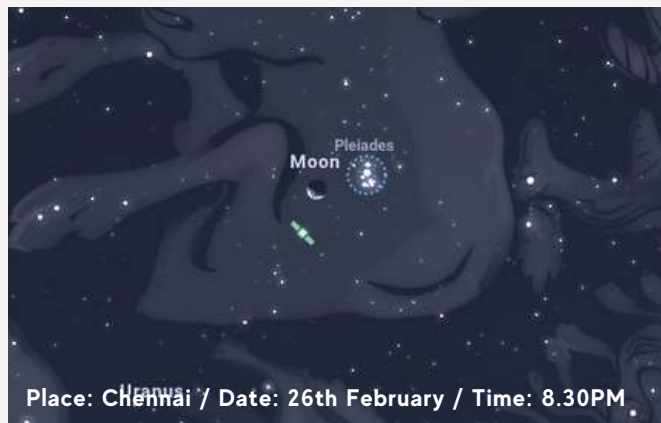
Conjunction of Comet C/2022 with Mars.
 On **Feb 11, 2023**, the green comet will appear very close to the planet Mars. The pair will be close from the early evening. They will be in the western direction. Mars is at a magnitude of 0.02 and the Green Comet has a magnitude of 6.54.

Conjunction of Moon, Jupiter, and Venus.
 On **Feb 22, 2023**, Moon, Jupiter, and Venus appear very close to each other in the early evening. They will be in the southwestern direction. Moon is at a magnitude of -9.85, Jupiter is at a magnitude of -1.96 & Venus is at a magnitude of -3.85.



Conjunction of Moon, and Pleiades.
 On **February 26, 2023**, Moon and Pleiades appear very close to each other in the late evening. They will be in the western direction. Moon is at a magnitude of -11.69, and Pleiades is at a magnitude of 1.59.

Conjunction of Moon and Mars.
 On **February 28, 2023**, Moon and Mars appear very close to each other in the late evening. They will be in the northwestern direction. Moon is at a magnitude of -10.83, Mars will be at a magnitude of 0.4.



STUDENT'S CORNER

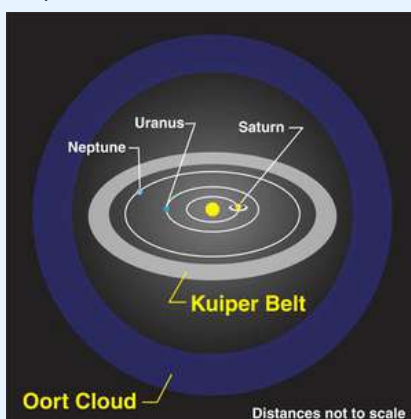
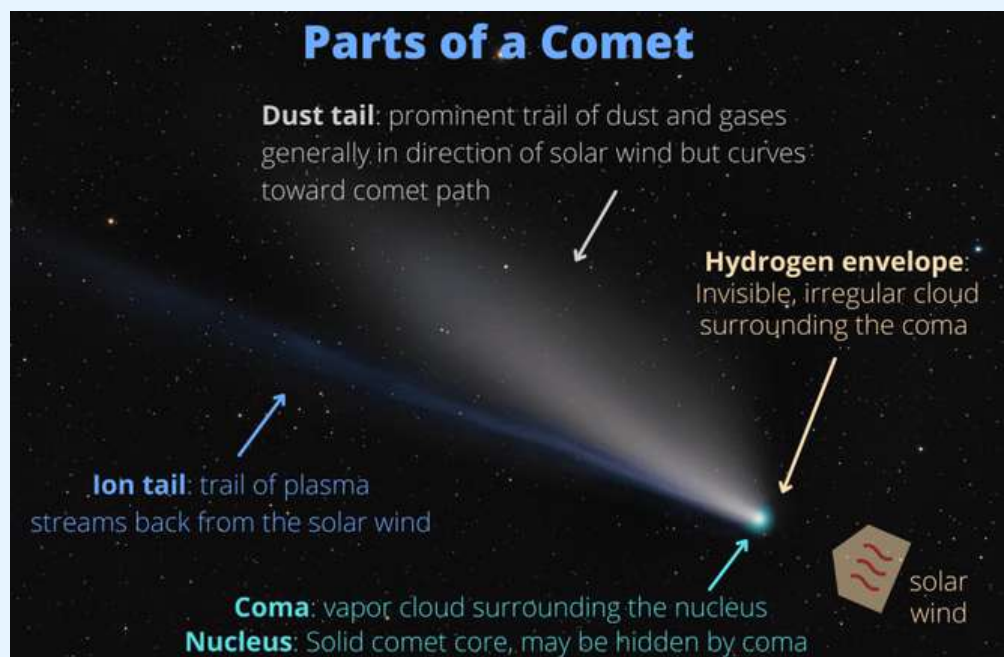
Comets - The Dirty Snow Balls

Jwala Ravisankaranand,
Club Student

People around the world are excited about the green comet which comes closer to our planet this February but what are comets? from where they come from? What it is made up of? these kind of questions may rise. Well, in this article that's what we are going to discuss. Comets are small celestial bodies made up of ice, dust, and rocky material. They orbit around the sun in elliptical paths, and as they get close to the sun, the ice in the comet starts to heat up and vaporize, creating a bright coma, or cloud of gas, around the comet's nucleus. The coma is often accompanied by a bright tail of gas and dust that always points away from the sun. Comets are believed to have formed in the early solar system, in the colder outer region of the solar system, beyond the orbit of Neptune.

They are thought to be leftovers from the formation of the solar system, and have remained relatively unchanged for billions of years. Comets are classified into two main categories: long-period comets and short-period comets. Long-period comets orbit takes hundreds or thousands of years to complete one orbit, and they come from the Oort Cloud, a vast region of space surrounding the solar system. Short-period comets, on the other hand, have orbits that take them less than 200 years to complete, and they come from the Kuiper Belt, a region of the solar system just beyond Neptune.

One of the most famous comets is Halley's Comet, which can be seen from Earth every 76 years. Other notable comets include Comet Hale-Bopp, which was visible from Earth in 1997, and Comet McNaught, which was visible from the Southern Hemisphere in 2007. Comets have been known since ancient times, and have often been viewed as omens or portents of doom.



However, in recent times, comets have been studied in greater detail by astronomers and scientists, using telescopes and spacecraft. The European Space Agency's Rosetta spacecraft orbited Comet 67P/Churyumov-Gerasimenko for over two years, providing valuable data and insights into the nature of comets. Comets continue to fascinate scientists and the general public alike. They are considered as time capsules that have remained unchanged since the formation of the solar system, and studying them can provide us with valuable information about the early history of our solar system.

IMPACTS OF VARIOUS MOTION THAT OUR PLANET EARTH MAKES

Sourajit Mandal

iAstronomer member

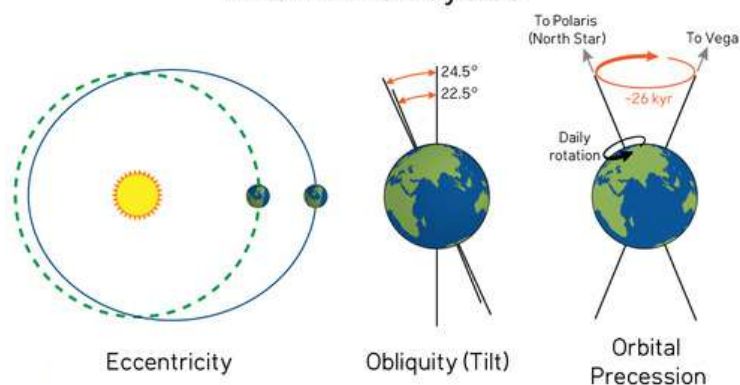
Have you ever pondered about the various motions of our home planet? If you think its just rotation and revolution then you are wrong. Earth has more movements than just rotation and revolution. Even though they are gradual, these motions have a significant impact on the climate of the Earth. They are even known to cause ice ages.

Serbian scientist Milutin Milankovitch studied and found that three types of Earth's orbital movements that have a long-term effect on Earth's climate. These cyclical orbital movements, are also known as the Milankovitch cycles.

So, what are the various orbital movements that Milankovitch studied?

We all know that the Earth rotates on its axis which is 23.5 degrees tilted from the geographical axis. This angle is not fixed. The axis of the Earth changes its angle which is known as Obliquity. It is because of the Obliquity that Earth experiences various seasons. The greater the Earth's tilt angle, the more extreme are its seasons. The lesser the angle, milder are the seasons.

Milankovitch Cycles



Currently Earth's axis is half way between the two extremes, therefore resulting in warmer winters and cooler summers. Milder seasons further result in building up of large ice sheets which do not melt easily.

Seasonal contrasts also depend on the wobbling of Earth upon its axis like a toy top. This "top wobbling" is called the Chandler wobble, named after American astronomer Seth Carlo Chandler who discovered the effect. The trend of this wobble is relative to the fixed position of the stars and is known as axial precession. It is approximately a 23000-year cycle.

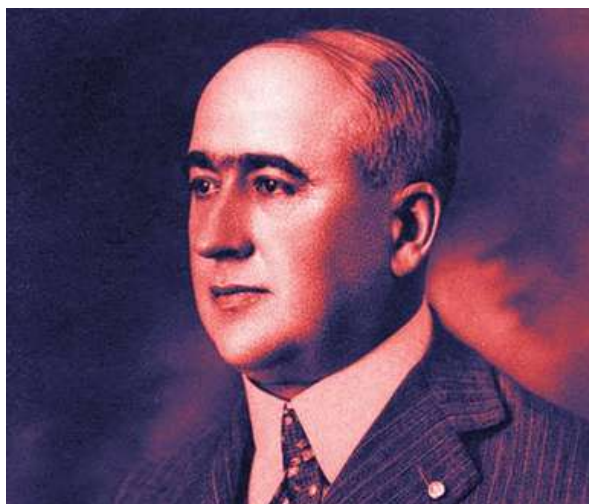
This causes a change in the polestar. For example, about 5000 years ago, our Pole star was Thuban, not Polaris. Polaris will slowly be replaced by the star Vega in about 12 thousand years. As a result of this transition, winter will occur in the southern hemisphere in December and summer in the northern hemisphere.

The Earth also changes its elliptic orbit around the sun. This movement is not static and its time period is also not constant. It ranges between 100000-120000 years. The perihelion of Earth also changes with time. This is due to the gravitational attraction of other planets. It is also one of the primary causes for ice ages.

It has also been discovered that the Earth's plane of orbit is not consistent. Its inclination changes from 2.5 degrees to -2.5 degrees every 100000 years in reference to other planets. If these movements are considered, we will enjoy milder winters and summers in the future. This may also result in another ice age. If the ice that forms in the winter does not melt in the summer, thus marking the start of an ice age.

In 1941, Milankovitch proved that the tilt change of Earth's axis of rotation, combined with its precessional movement, has led to many ice ages on the Earth. This was later proved and now it is believed that from three to one million years ago, the period of ice ages was 40,000 years with an abrupt change from 20,000 years prior to that. These cycles have now been named Milankovitch cycles.

But can these cycles stop global warming? No. These cycles are very slow. If we completely rely on these cycles to cool the Earth down, we will not be able to stop Global Warming. Much before an ice age starts, we will evaporate all the water on Earth with the current rate we are progressing with. We should all try our best to stop this global disaster approaching us.



IMPORTANCE OF ASTRONOMY AND SPACE SCIENCE IN THE CONTEXT OF THE WORLD

Kalyani Desai,
iAstronomer member

By studying the cosmos beyond our own planet, we can understand where we came from, where we are going, and how physics works under conditions that are impossible to recreate on Earth. There are still more things to discover in the field of astronomy. It is a growing science that will continue to produce discoveries in the coming decades, thanks to the growing technology that allows us to construct larger and better telescopes and analyze larger data sets. New topics for research are also emerging, which leads us to a better understanding of our universe.

The need for extremely precise instrumentation in astronomy can often be transferred into the medical field. Beyond pure research, which benefits humanity through various technological applications, some laboratories at the Center for Astrophysics pursue research that's more directly beneficial. High-energy and neutron optics laboratories design mirrors for the next generation of space-based telescopes.



But with a simple modification, these optics can accurately aim high-energy particles for radiation treatment, focusing on destroying tumors while leaving surrounding tissue unharmed. Engineers are working on mirrors that can both focus neutrons from across the Universe, as well as those from a radioactive source sitting in the same room. Work on nuclear magnetic resonance, which can be used to study molecular physics, can also be used to scan the human body. When used for imaging, this is known as magnetic resonance imaging or MRI. Scientists at the CfA are developing an open-access, low-magnetic-field human MRI instrument, that can be used for molecular imaging and the study of traumatic brain injury.

On the other side of the coin, astrophysics sometimes adapts technology from the medical field. The complicated debris left over after a supernova explosion, known as a supernova remnant, can be hard to visualize. We only have our vantage point and cannot travel around the remnant to view the intricacies of its structure. But by measuring how fast the material is traveling, and whether it's traveling towards us or away, we can create a 3D map of the material's motion.

Supernova researchers are putting this data into medical imaging software originally designed for brain scans to get a 3D model that can be viewed in 360 degrees. To take it one step further, the models can then be 3D printed, allowing you to hold a dead star in your hand. The Center for Astrophysics | Harvard & Smithsonian sets the standard for astronomical discovery. By pursuing scientific research, our scientists never know what might be the next big breakthrough. New detector technology means better lighter cameras. Astronomical data analysis software can be reconfigured to make cars safer. Novel techniques in radio astronomy paved the way for wireless internet. We don't know what we are going to find, but we will never know if we don't look.

GALACTICA

Astrophysics is the branch of space science that involves the study of physical laws that explain the origin of stars, planets, and other objects in the universe. NASA describes astrophysics as a goal to observe and explore the universe and its evolution for the search of the existence of life on other planets. Astrophysics allows scientists to deduce theories for explaining the mechanism of radiation emitted by universe objects and extract important information from it. NASA focuses on the Physics of the cosmos, cosmic origins, exoplanet exploration, astrophysics explorer programs, and research in the field of astrophysics.



Future of Space Science

The future space exploration goals involve sending humans and robots beyond Earth's orbit and establishing sustained access to places like Moon, Mars, and asteroids in the universe. The complementary capabilities of humans and robots will immediately benefit back to earth in areas of materials, power generation and energy, storage, recycling and waste management, advanced robotics, health and medicine, transportation, engineering, computing, and software.

Space science proposes a unique and evolving perspective to fulfill people's curiosity by providing fresh data about the solar system. Therefore, international collaborations and partnerships are required not only to prevent Earth from catastrophic events but also to address global challenges. The precise nature of future benefits from space science and its exploration is unpredictable. But the latest trends suggest that considerable benefits would be generated in significant areas of life.

Conclusion

The developed nations have a quite stronghold on astronomy and space science projects in the present and future. These countries have been collaborating with international space platforms like NASA for many years. It is saddening that most developing countries could not focus on astronomy and other projects because they are struggling with their basic issues. Now countries like Brazil, Argentina, and Taiwan, where basic technological and industrial basis exists, have started taking an active part to build space crafts and satellites. These nations have also collaborated with the UN and NASA and other countries like Denmark, France, Italy, and China for various future projects. Arab and other Muslim countries like Lebanon, Jordan, Syria, Libya, and UAE have also taken initiative to build a Gulf observatory, joint observatory, and UAE Center for Astronomy and Space Sciences. India is also going ahead in Astronomy research with the help of ground-based, balloon-borne, and satellite facilities.

The last decade is considered the "Golden Age" for Astronomy and Science with unique and great opportunities for earth people. The availability of existing and future datasets from space by ground-based or space-based observatories has given a global opportunity to make mind-blowing advancements in astronomy, astrophysics, and space science. Only a few space projects can be planned in astronomical sciences near future due to the size, complexity, and budget issues. These surmountable challenges can be tackled by multi-lateral cooperation and international collaboration. Cooperative global action is the only solution to ensure a positive perspective in future space research. So, the negative trend can be corrected, and the "Dark Age" of Astronomy can be avoided. And let's not forget that astronomy offers us a glimpse into our shared future. Will our species be able to spread across the cosmos, colonize other planets, and preserve our heritage and legacy through the ages? If so, it will only be through the study of astronomy.

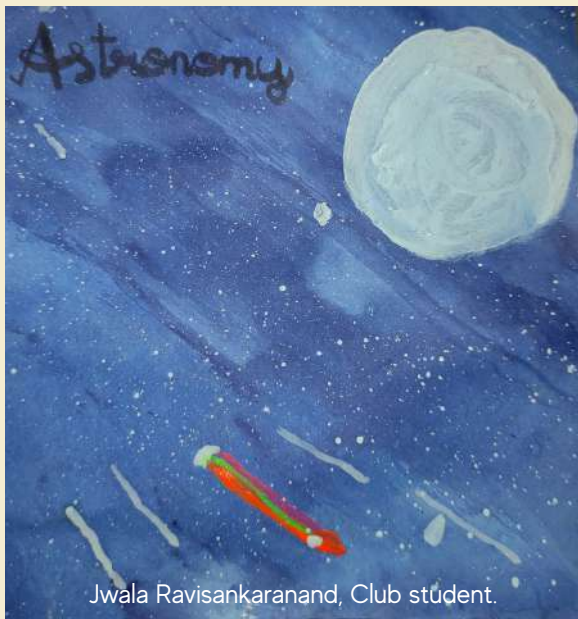
VISUAL ARTS FROM SPACE-ASSOCIATED ASTRONOMERS



Daksh Rathi, Club student.



Ajith Kumar, Summer camp student.



Jwala Ravisankaranand, Club student.



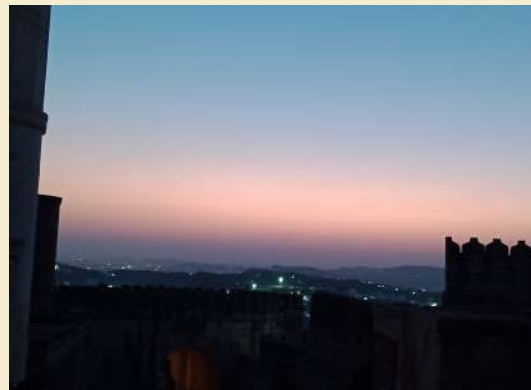
Shree Viswajith, Club student.



Krishna, Club student.



Pleiades star cluster
Daksh Rathi, Club student.



Sunset Captured by Shubh, Club student.

ASTROPHOTOGRAPHS BY SPACE

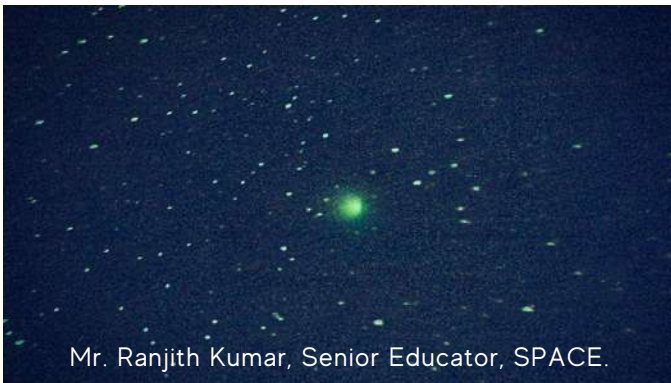
THE GREEN COMET - C/2022 E3



Mr. Deepak Singh, Astroport Educator, SPACE.



Mr. Shiril, Executive, GAPL.



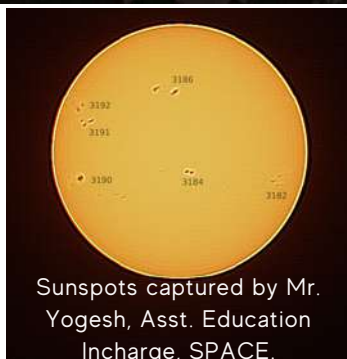
Mr. Ranjith Kumar, Senior Educator, SPACE.



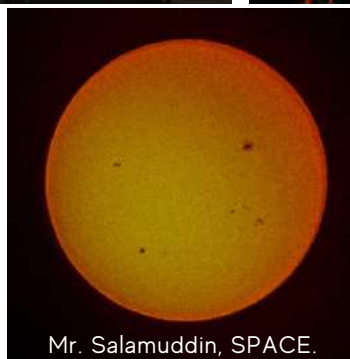
Polar Star Trail Captured by Mr. Shiril, Executive, GAPL.



Polar Star Trail Captured by Mr. Ranjith Kumar, Senior Educator, SPACE.



Sunspots captured by Mr. Yogesh, Asst. Education Incharge, SPACE.



Mr. Salamuddin, SPACE.



Solar Features Captured by Mr. Shiril, Executive, GAPL.



FEBRUARY 15, 1564

Galileo Galilei

Galileo Galilei, (born February 15, 1564, Pisa [Italy] - died January 8, 1642, was an Italian natural philosopher, astronomer, and mathematician who made fundamental contributions to the sciences of motion, astronomy, and strength of materials and to the development of the scientific method. Galileo, though not the first inventor of the refracting telescope, significantly enhanced its power. In 1609, he learned of the spyglass and began to experiment with telescope-making. His telescope allowed him to see with a magnification of eight or nine times, making it possible to see that the Moon had mountains and that Jupiter had satellites. He discovered Craters and mountains on the moon, the Phases of Venus, Jupiter's moons, the Stars of the Milky Way, and the discovery of sunspots.



Nicolaus Copernicus

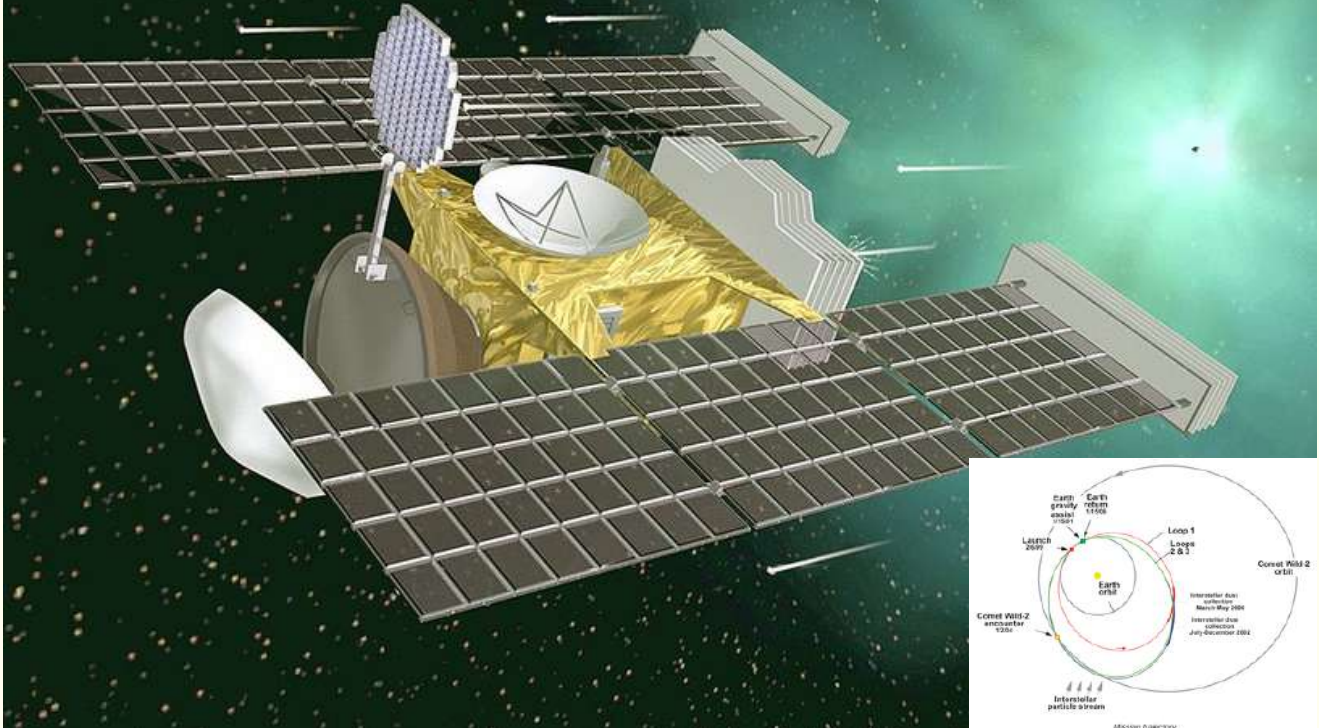
Nicolaus Copernicus, born February 19, 1473 - died May 24, 1543, East Polish astronomer who proposed that the planets have the Sun as the fixed point to which their motions are to be referred; that Earth is a planet which, besides orbiting the Sun annually, also turns once daily on its own axis; and that very slow long-term changes in the direction of this axis account for the precession of the equinoxes. This representation of the heavens is usually called the heliocentric, or "Sun-centred". He stated that the seasons, the sun's rise and fall each day, the planetary movement, and the movement of the stars were all caused by the earth's rotations.



FEBRUARY 19, 1473

HISTORICAL EVENTS HAPPENED IN FEBRUARY

NASA collected dust from space!



NASA's Stardust spacecraft successfully shot into a clear blue sky atop a Delta II rocket from Florida's Cape Canaveral Air Station at 4:04:15 p.m. EST (1:04:15 p.m. PST) on February 7th, 1999 to become the first U.S. mission destined for a comet, and the first-ever spacecraft sent to bring a sample of a comet sample back to Earth. Almost immediately after the second-stage ignition, the fairing or nose-cone enclosure around the Stardust spacecraft was jettisoned. The spacecraft's signal was successfully acquired by the NASA Deep Space Network complex in Canberra, Australia, 51 minutes after launch at 4:55 p.m. EST

On Jan. 2, 2004, Stardust came within approximately 149 miles of comet Wild 2 (pronounced Vilt 2) and acquired 72 detailed images of its surface features. The spacecraft also collected comets and interstellar dust that flows through our solar system. It gathered particles flying off the nucleus of the comet and captured in a glass foam called aerogel, Two years later, the samples made it back to Earth in a return capsule that landed in the Utah desert. The Stardust mission samples indicated that some comets may have included materials ejected from the early sun and may have formed very differently than scientists had theorized.



Stardust Capsule, transferred from NASA, Lyndon B. Johnson Space Center.

A RECORD-BREAKING LAUNCH BY ISRO!

Indian Space Research Organisation (ISRO) created history by successfully launching the 714 kg Cartosat-2 Series Satellite along with 103 co-passenger satellites on February 15, 2017, from Satish Dhawan Space Centre SHAR, Sriharikota. This is the thirty-eighth consecutively successful mission of the Polar Satellite Launch Vehicle (PSLV). The total weight of all the 104 satellites carried onboard this PSLV-C37 was 1378 kg.

PSLV-C37 lifted off at 0928 hrs (9:28 am) IST, as planned, from the First Launch Pad. After separation, the two solar arrays of the Cartosat-2 series satellite were deployed automatically and ISRO's Telemetry, Tracking, and Command Network (ISTRAC) at Bangalore took over the control of the satellite. Of the 103 co-passenger satellites carried by PSLV-C37, two – ISRO Nano Satellite-1 (INS-1) weighing 8.4 kg and INS-2 weighing 9.7 kg – are technology demonstration satellites from India.

The remaining 101 co-passenger satellites carried were international customer satellites from the USA (96), The Netherlands (1), Switzerland (1), Israel (1), Kazakhstan (1), and UAE (1).



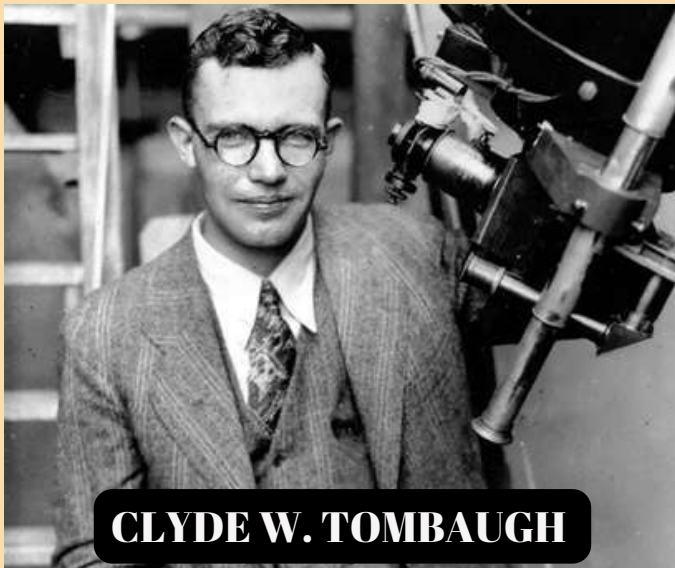
With this successful launch, the total number of customer satellites from abroad launched by India's workhorse launch vehicle PSLV has reached 180. With this launch, ISRO created a new world record for the largest number of satellites ever launched on a single rocket, surpassing the previous record of Russia, which 2014 launched 37 satellites using the Dnepr rocket. This record set by ISRO stood until 24 January 2021, when SpaceX launched the Transporter-1 mission on a Falcon 9 rocket carrying 143 satellites into orbit.



PSLV C 37 Cubesat(PEASSS)

PSLV-C37 also carried two ISRO Nano satellites (INS-1A and INS-1B), as co-passenger satellites. These two satellites carry a total of four different payloads from the Space Applications Centre (SAC) and Laboratory for Electro Optics Systems (LEOS) of ISRO for conducting various experiments.

DISCOVERY OF PLUTO!!



CLYDE W. TOMBAUGH

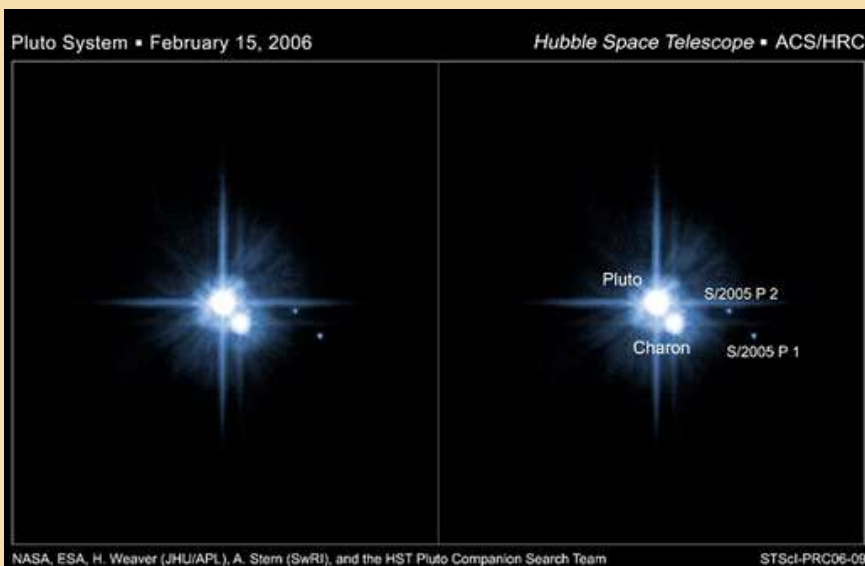


FEBRUARY 18, 1930

The object formerly known as the planet Pluto was discovered on February 18, 1930 at the Lowell Observatory in Flagstaff, Arizona, by astronomer Clyde W. Tombaugh, with contributions from William H. Pickering.

In 1906, Percival Lowell, a wealthy Bostonian who had founded the Lowell Observatory in Flagstaff, Arizona in 1894, started an extensive project in search of a possible ninth planet, which he termed "Planet X." By 1909, Lowell and Pickering had suggested several possible celestial coordinates for such a planet. Lowell and his observatory conducted the search until his death in 1916, to no avail. Unknown to Lowell, on March 19, 1915, his observatory had captured two faint images of Pluto, but they were not recognized for what they were. Lowell was not the first to unknowingly photograph Pluto. There are sixteen known pre-discoveries, with the oldest being made by the Yerkes Observatory on August 20, 1909.

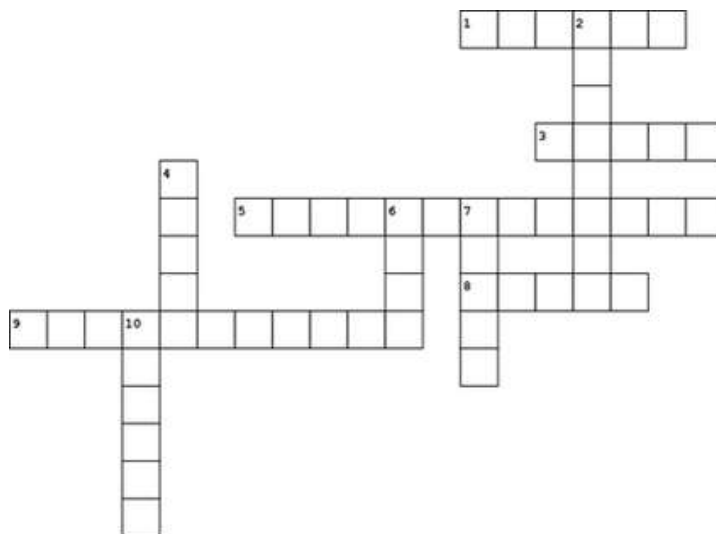
The search for Planet X did not resume until 1929 when the job was handed to Clyde Tombaugh, a 23-year-old Kansan who had just arrived at the Lowell Observatory. Tombaugh's task was to systematically image the night sky in pairs of photographs taken two weeks apart, then examine each pair and determine whether any objects had shifted position. Using a machine called a blink comparator, he rapidly shifted back and forth between views of each of the plates to create the illusion of movement of any objects that had changed position or appearance between photographs. On February 18, 1930, after nearly a year of searching, Tombaugh discovered a possible moving object on photographic plates taken on January 23 and January 29 of that year. After the observatory obtained further confirmatory photographs, news of the discovery was telegraphed to the Harvard College Observatory on March 13, 1930.



The discovery made headlines across the globe. The Lowell Observatory, which had the right to name the new object, received over 1,000 suggestions from all over the world; the name Pluto was proposed by Venetia Burney, an eleven-year-old schoolgirl in Oxford, England. The name was announced on May 1, 1930. In 2006, The International Astronomical Union (IAU) downgraded the status of Pluto to that of a dwarf planet because it did not meet the three criteria the IAU uses to define a full-sized planet.

TRAIN YOUR BRAIN

CROSSWORD



Across

1. Name of the dwarf planet that is ellipsoid in shape and has a ring?
3. Which is the second reddest object in the solar system?
5. Who was the first person to discover Pluto?
8. Which is the only dwarf planet that has no natural satellite in our solar system?
9. What is the name of the space probe that was launched toward Pluto in 2008?

Down

2. Which dwarf planet has a day length similar to the earth?
4. Which dwarf planet comes in the orbit of neptune?
6. Which is the heaviest known dwarf planet in our solar system?
7. Which dwarf planet is called 'anti-pluto'?
10. Which is the smallest dwarf planet?

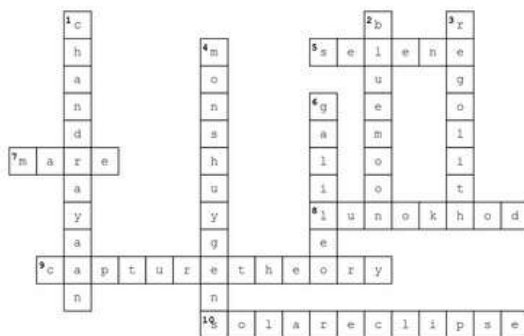
ASTRONOMY WORD PUZZLE

Find the names of the Natural satellites of Neptune from the mixed letters and mark them.

F	N	D	G	O	E	N	N	E	N	Z	K	N	B
E	U	L	U	R	I	H	E	A	T	T	Y	E	W
D	P	T	U	K	W	X	A	S	I	W	H	R	L
H	F	H	I	D	E	O	G	L	O	A	I	E	A
I	T	A	W	A	F	X	A	N	I	X	D	I	O
P	P	L	A	R	I	S	S	A	B	M	D	D	M
P	S	A	V	P	X	A	N	G	G	L	E	U	E
O	A	S	U	R	Q	D	X	A	Q	H	T	D	D
C	M	S	V	O	V	E	K	L	W	W	R	G	E
A	A	A	U	T	L	S	F	A	K	Y	I	N	I
M	T	I	O	E	X	P	Z	T	V	S	T	B	A
P	H	M	P	U	V	I	S	E	C	R	O	T	D
S	E	L	J	S	R	N	M	A	M	A	N	A	A
D	M	R	J	I	P	A	Q	C	O	T	Y	Q	I

- NAIAD
- THALASSA
- LARISSA
- HALIMEDE
- SAO
- DESPINA
- GALATEA
- HIPPOCAMP
- LAOMEDEIA
- PSAMATHE
- PROTEUS
- TRITON
- NEREID
- NESO

Answers for last month puzzles.



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

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

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CELESTRON SKYMASTER 35X70
PRISM SYSTEM: HOLOGRAPHIC
PRISM GLASS: BAK-4
APERTURE: 70MM
EXIT PUPIL: 4.7MM
MAGNIFICATION: 35X
ANGULAR FOV: 6.4 Deg

CELESTRON SKYMASTER 20X80
PRISM SYSTEM: HOLOGRAPHIC
PRISM GLASS: BAK-4
APERTURE: 80MM
EXIT PUPIL: 4MM
MAGNIFICATION: 20X
ANGULAR FOV: 5.7 Deg

CELESTRON SKYMASTER 25X100
PRISM SYSTEM: HOLOGRAPHIC
PRISM GLASS: BAK-4
APERTURE: 100MM
EXIT PUPIL: 4MM
MAGNIFICATION: 25X
ANGULAR FOV: 5 Deg

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REFRACTOR TELESCOPES

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

CELESTRON POWERSEEKER 80EQ
TYPE: REFRACTOR
MOUNT: EQ
APERTURE: 80MM
FOCAL LENGTH: 800MM

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

REFLECTOR TELESCOPES

SPACE LAUNCHER 70MM
TYPE: REFLECTOR
MOUNT: ALT-AZ
APERTURE: 70MM
FOCAL LENGTH: 700MM

KSON 80MM NEWTONIAN
TYPE: REFLECTOR
MOUNT: ALT-AZ
APERTURE: 80MM
FOCAL LENGTH: 800MM

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

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