SPACE™
EMPOWERING LIFE

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Galactica

Astronomy and Space Science Magazine

Sanjana Sanghi
(Actor, UNDP Youth Champion & Gold Medalist from Delhi University)
Brand Ambassador of Space India & Space Arcade

www.space-global.com

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.

Team

ABOUT SPACE

Legacy of 23 years | Pioneer Organization | 10000+ Activities Developed | 1000+ Schools Associated | 1.5M+ Students Engaged | 10K+ Outreach Events | 10+ Cities Presence

SPACE is the pioneer organization working towards the 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, and 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 the 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, and professional organizations, government agencies, and space observatories.

CMD's Message

Dr. Sachin Bahmba, CMD, SPACE

Space and Astronomy are 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 for students wherein they explore the real world of science, I wish for young students to let their ambitions soar and think big as they are the future of our country.

MD's Message

Mr. Shivam Gupta, MD, SPACE

Education is integral to humankind growth and it strongly contributes towards innovation and developments. Space is transforming India to provide better learning opportunities through Experiential and Hands-on learning in the very niche field of Astronomy and Space Science. Our mission to build from the grassroots level is what drives us stronger and to inculcate scientific temperament so the next generation can be entrepreneurs, scientists, and astronauts!

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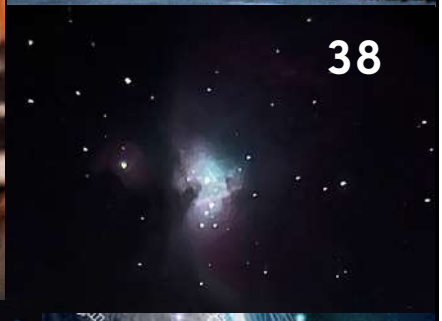
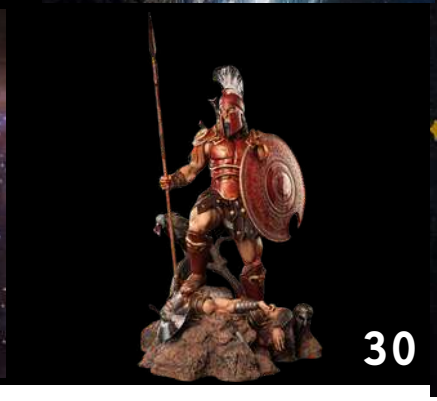




SPACE INSIGHTS

SPACE INDIA & SPACE ARCADE WELCOMES BOLLYWOOD'S MILLENNIAL STAR SANJANA SANGHI AS THEIR BRAND AMBASSADOR

The Brand Ambassador, Sanjana Sanghi stated, "My partnership with SPACE India truly feels like one that was meant to be. Aiming for the stars has literally and metaphorically been a guiding philosophy for me, and to learn more about the work SPACE India does through increasing accessibility to Space Education, has resonated so deeply with my commitment to ensuring my work in education activism. Increasing access to education lies at the core of my humanitarian endeavours, and thus I hope our collective synergy leads to the greatest possible change."

Scan this QR code to watch the latest video of Sanjana Sanghi with Space India

About Sanjana Sanghi: A rising young Bollywood star and UNDP Youth Champion. Her commitment to social activism and advocacy for education make her the ideal fit for this role at SPACE India and SPACE Arcade. Her passion for anything she sets her mind to is commendable, and her numerous achievements at a young age resonate with absolute excellence. Furthermore, Sanjana is a gold medalist from the Lady Shri Ram College (University of Delhi). This further solidifies her suitability for a position that encourages education.

#RocketScienceAsaanHai

SPACE India's Co-founder, Shalini Bahmba and Managing Directors, Shivam Gupta and Mitul Jain, envision that Sanjana's integration into the SPACE family will further amplify awareness about the features and offerings of both SPACE India and SPACE Arcade. SPACE recognizes the imperative to mainstream Astronomy as a core subject while democratizing it to increase enthusiasm among parents, schools, students, and the general public.

ENGAGING ASTRONOMY SHOWCASE CAPTIVATES ALL AGES

The school's Astronomy Showcase on April 20, 2024, orchestrated by the Astronomy Educator and students at KRM Vikaspuri and KRM Vaishali, proved to be a resounding success, captivating attendees of all ages. From 8:30 AM to 11:30 AM, the venue buzzed with excitement as participants delved into a myriad of enthralling astronomy-based activities.

The event boasted an array of interactive and informative engagements, from the thrill of Stomp and Hydro rocketry to the challenge of Attack the Space Rocks dart game. Participants tested their lung capacity, navigated through Ring the Planets, and unleashed their creativity with Comet Making and the Tattoo Station. Solar observations through solar view goggles, pinhole projectors, and the Dobsonian telescope with solar filter provided awe-inspiring glimpses of our nearest star.

Enthusiastic participation from both students and parents underscored the event's success, highlighting their scientific curiosity and logical thinking prowess. As participants immersed themselves in hands-on learning, the showcase served as a stress-relieving and educational oasis within the school.

The positive feedback received from attendees underscored the event's impact, affirming its role as a beacon of science engagement within the community. In essence, the Astronomy Showcase was not just a gathering of activities but a celebration of curiosity, learning, and joy for all involved.

ECLIPSE ODDITIES: A BIZARRE PHENOMENA

iASTRONOMER

On the 8th of April, a celestial spectacle unfolded–a total solar eclipse that captivated observers across the globe. The iAstronomer Club, the world's largest online astronomy community, orchestrated an enlightening live webinar for its members. Led by the esteemed iAstronomer, Abhay Dhanush Sabhu, the event delved into the fascinating science behind solar eclipses, dispelled myths, and explored the intricate dance of shadows in the cosmos.

Facilitator Abhay explained what is a solar eclipse. He explained that a solar eclipse occurs when the Moon gracefully positions itself between Earth and the Sun, casting its shadow upon our planet. This shadow comprises two distinct regions: **a) The Umbra:** Imagine a cosmic cone where no direct sunlight penetrates. Within this dark inner shadow, the Sun is completely blocked–a phenomenon that results in a total solar eclipse for observers within the umbra. **b) The Penumbra:** Beyond the umbra lies the penumbra, a lighter outer shadow. Here, only a portion of the Sun's disk is obscured. Observers within the penumbra witness a partial eclipse, where the Moon's disk appears projected against the Sun's disk, creating a mesmerizing overlap.

Club members learned that the geometry plays an important role in the visibility of solar eclipses. Abhay explained that the umbral cone passes over a specific strip of land or sea.

Earth's fortuitous alignment with the Sun and Moon allows them to appear nearly identical in angular size (about 0.5°) from our vantage point. However, their apparent sizes vary based on their distances from Earth.

Total Eclipse: Within the umbra, the Sun's disk is entirely covered by the Moon's disk. This awe-inspiring moment lasts for a mere 7½ minutes–the maximum duration of totality.

Partial Eclipse: In the penumbra, the Moon's disk partially overlaps the Sun's disk. People across a broader area experience this partial eclipse.

Types of Solar Eclipses

Total Solar Eclipse: The Sun's complete blockage within the umbra creates a breathtaking spectacle. Day turns to twilight, and the Sun's corona–a shimmering halo–becomes visible.

Annular Solar Eclipse: When the Moon is farther from Earth, it doesn't fully cover the Sun. Instead, a ring of sunlight–the "ring of fire"–surrounds the Moon's silhouette.

Hybrid Solar Eclipse: Rare and enigmatic, hybrid eclipses transition between total and annular phases along their path.

Safety Measures for Eclipse Viewing

While witnessing a solar eclipse, safety is paramount. Here are essential precautions:

Solar Glasses: Use certified solar eclipse glasses to protect your eyes. Never look directly at the Sun during an eclipse.

Pinhole Projectors: Create a pinhole projector to view the eclipse indirectly. It projects the Sun's image onto a surface, allowing safe observation.

Online Streams: If you can't be in the path of totality, watch live streams or webinars like the iAstronomer Club's event.

Throughout history, solar eclipses have sparked awe, fear, and wonder. Ancient Chinese legends spoke of dragons devouring the Sun during eclipses. Today, we marvel at the cosmic choreography that unites our celestial companions.

In summary, the total solar eclipse of April 8, 2024, reminded us of our place in the grand cosmic ballet–a dance of shadows that transcends time and connects us to the universe. As we bid adieu to this celestial marvel, let us continue to gaze upward, seeking answers among the stars, and cherish the moments when Earth, Moon, and Sun align in perfect harmony.

Global Astronomy Month
presented by Astronomers Without Borders

CELEBRATING GAM WITH THE THRILL OF ROCKETRY

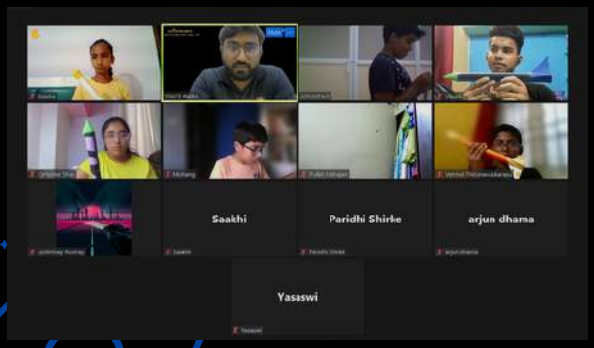
iASTRONOMER

Every April, the celestial stage lights up with a cosmic spectacle known as Global Astronomy Month (GAM). This awe-inspiring event, organized by SPACE India in collaboration with the International Organization Astronomers Without Borders (AWB), transcends geographical boundaries and languages. Its motto, "One People, One Sky" resonates with stargazers worldwide, inviting them to look up, connect, and marvel at the vastness of our universe.

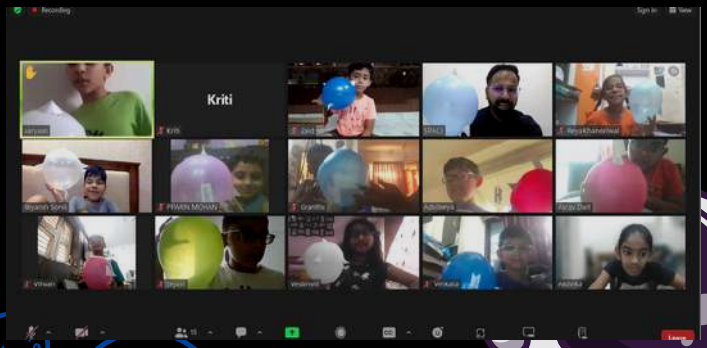
Why does GAM matter? It's not just about distant galaxies and twinkling stars; it's a shared human experience. GAM inspires wonder, curiosity, and education. SPACE India, during GAM, offers a constellation of various astronomy competitions, reaching out to the public, schools, and students alike. The global community of sky-watchers grows stronger, connecting us all under the same celestial canopy.

Now, let's zoom in on SPACE India's initiatives during GAM. The **iAstronomer club**, Space India's ed-tech department orchestrated workshops for all age groups. Kids, juniors, and seniors donned their cosmic hats. The theme? Rocketry! Armed with enthusiasm and PVC pipes, our budding "iastronomers" crafted their own pop rockets and balloon rockets. These miniature vessels soared into the sky, leaving Earth's gravity behind. Dreams took flight alongside those rockets–perhaps a future astronaut or astrophysicist stood among them.

As GAM unfolded, the night sky became our canvas. From urban rooftops to rural observatories, eyes turned skyward. We traced constellations, whispered wishes, and pondered our place in the cosmic ballet.



iAstronomers made & launched their own Pop-rockets



iAstronomers made & launched their own Balloon rockets

Astrophotography Contest

SELFIE WITH THE MOON

iASTRONOMER

iAstronomer Shiv Shailesh from jrs. batch

iAstronomer Aarav Dixit from jrs. batch

iAstronomer Reya Khandelwal from jrs. batch

iAstronomer Aaryaan Dalvi from jrs. batch

EXPLORING THE COSMOS: A RECAP OF GAM AT KR MANGALAM WORLD SCHOOL

April was a month of cosmic exploration at KR Mangalam World School as students and educators alike celebrated Global Astronomy Month. With a plethora of activities designed to ignite curiosity and foster a love for the wonders of the universe, participants embarked on a journey through space and time right from the comfort of their classrooms.

The students of K. R. Mangalam World School, Vikaspuri have performed activities like Astro Drawing, AstroQuiz, making rockets and sun from clay, constellation making from stars, Solar Observation from solar view goggles, pinhole projector and telescope, Let's race rockets.

The artistic talents of the students of KR Mangalam World School, Gurgaon took center stage as they delved into outer space planets coloring, creating vibrant and imaginative interpretations of distant worlds. Astro-themed bookmarks adorned with constellations and celestial bodies became cherished keepsakes, while the Astro band echoed with melodies inspired by the cosmos. From Astro Cooking to Solar System crosswords, storytelling with captivating pictures to modeling rockets with clay, every day was a cosmic adventure. Galaxy Painting sessions brought out the artistic flair, while Astro poetry competitions sparked creativity.

From observing the sun's mesmerizing dance across the sky to unleashing creativity through art and crafts, the month-long event offered a diverse range of engaging activities. Students had the opportunity to peer through telescopes during solar observations, marveling at the sun's surface and sunspots while learning about solar phenomena and safety precautions.

Parents of younger students of K. R. Mangalam World School, Vaishali joined in, observing the Sun through solar view goggles and telescope, emphasizing safe solar observation. Meanwhile, students crafted edible rockets and celestial scenes, blending gastronomy with astronomy.

On Earth Day, students of K. R. Mangalam World School, Vaishali led a rally, advocating for environmental stewardship with poignant slogans like "Save Earth, Save Life," reminding us all that there's no Planet B.

From Yuri's Night celebrations to Earth Day skits, and poster making to hydorocketry, every activity underscored the importance of understanding and preserving our universe and our planet.

In a month-long cosmic odyssey, K. R. Mangalam World School truly embraced the spirit of exploration and stewardship, inspiring young minds to reach for the stars while keeping our precious planet firmly in focus.

SPACE India sponsored PSIT COSMONAUTS in the IN-SPACe CANSAT Competition

On April 17th, IN-SPACe and Astronautical Society of India (ASI) in collaboration with ISRO, organised the CANSAT Student Competition, to inculcate space science and technology temperament among the student community. This competition involved the design, development and launch of a CAN sized satellite to an altitude of 800 meters to 900 meters above the launch site. Among the 85 participant teams across India, PSIT Kanpur (represented by the team name PSIT Cosmonauts) was selected as one of the final 27 teams for the satellite launch.

Under the leadership of Dr. Sachin Bahmba, Founder of SPACE India, a sponsorship grant was allocated to PSIT Cosmonauts to help them compete at the top level. His mission has always been to foster a scientific temperament among the masses and make space science experiences easily accessible to every human on Earth. We take great pride in sponsoring and promoting such initiatives in the field of space science. PSIT and SPACE India are prepared to further develop CanSat technology and collaborate on future space projects.

The PSIT team designed and launched their CanSat from Ahmedabad in the presence of Chairman - ISRO, Shri S. Somanath, CBPO - ISRO, Dr. Sudheer Kumar N, Chairperson - Vikram Sarabhai Space Centre, Dr. A. S. Kiran Kumar, Chairman - IN-SPACe, Dr. Pawan Goenka, and received a positive response from both the ISRO and IN-SPACe team.

One standout participant in this grand event was a team from PSIT Kanpur, sponsored by Space India. Led by the diligent Sandeep Khare, who also works at Space India, the PSIT Cosmonauts showcased exceptional skill and determination. Their CanSat not only successfully soft-landed from an altitude of 1000 meters but also transmitted crucial atmospheric data to the ground control software.

The PSIT team's stellar performance garnered praise from the competition's jury, including none other than the esteemed ISRO Chief, Shri S. Somnath. His presence at the event, along with words of encouragement for the participating students, added excitement and motivation.

The pinnacle of recognition came when Shri S. Somnath honored the PSIT Cosmonauts with his autograph on their CanSat–a cherished the moment that symbolized their achievement and the spirit of exploration.

ASTROPORTS: INDIA'S FIRST ASTRONOMY AND SPACE EXPERIENCE DESTINATIONS

Astroports are the first concept-based unique tourism destinations in India focusing on experiential learning. The strategically designed serene sites are located in nature's lap far away from the polluted cities with a heavy twinkling sky above. They are located near popular tourist attractions to ensure the mesmerising experience of amusement, adventure & exposure in Astronomy learning and thus, making it a must-visit place for all ages/categories of travelers. Astroports are built to provide not only the comforts and facilities of a 'conventional' tourist destination but also lead to exploring and learning through well researched and well-presented programs/activities.

"Starry Nights, Himalayan Heights: Astroport Ladakh Beckons"

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Step into the cosmic realm at Astroport Ladakh, where earthly marvels meet celestial wonders. Nestled in the heart of Ladakh, our sanctuary offers unparalleled stargazing experiences amidst lush landscapes. Choose from cozy yurts or transparent bubble tents, allowing you to slumber under a blanket of stars. Professional astronomers guide you through the mysteries of the universe, unveiling mysterious galaxies and nebulae ablaze with stardust. **Join us in May 2024,** as we inaugurate Astroport Ladakh–a celestial union where every night becomes a symphony of stars. Let's embark on this cosmic journey together.

Visit: www.astroportglobal.com

INDIA'S MOST LOVED STARGAZING DESTINATION

*Few Captures from Astroport across India

MONTHLY TELESCOPIC OBSERVATION

SPACE ARCADE team conducted 2024's 4th Monthly Telescopic Experience session on the 20 th of April 2024 in Chennai and Delhi.

People from various places joined the observation with their telescopes, binoculars, and other astronomical equipment. They learned and experienced the breathtaking view of the Moon and planet Jupiter. They also learned 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, Planet Jupiter through the 8'' Dobsonian telescope and Schmidt-Cassegrain telescope set up by the SPACE team.

Visit: www.spacearcade.in

HIGHLIGHTS OF APRIL 2024

Venus is leaking carbon and oxygen, a fleeting visit by BepiColombo reveals

BepiColombo spent ninety minutes in August 2021 traveling through this feeble magnetosphere in the form of a comet in order to slow down and correct its trajectory as it approached its final destination, Mercury. However, after examining the spacecraft's brief journey, scientists discovered some important information about Venus.

Because of sunlight's ability to accelerate molecules in the atmosphere to incredibly high speeds, charged particles, or ions, seemed to be departing the planet. In fact, the ions were traveling at such high speeds that they were able to flow out into space and escape the planet's gravity.

Flyby observations from Europe's BepiColombo space probe show that a large amount of gases, including carbon and oxygen, are being removed from Venus' atmosphere. This information, which was captured while the Mercury-bound spacecraft passed Venus, may provide fresh insight into Venus's leaking atmosphere.

In the future, the discoveries might also aid in the cataloging of Venus' delicate magnetic environment by scientists. Venus lacks a steady magnetic field of its own, in contrast to Earth, a planet having an inherent magnetic field that keeps its atmosphere from fleeing into space.

This is due to the fact that its cooler interior is unable to slosh around molten material, which is required for the creation and maintenance of a magnetic field. Instead, the amber-hued orb is charged by sunlight striking its atmospheric atoms, which in turn generates electric currents that lead to the creation of an unstable, solar-dependent magnetosphere.

Although carbon dioxide predominates in Venus's dense, hellish atmosphere, nitrogen and other trace gases are present in smaller proportions. Little amounts of oxygen were known to exist on Venus' nightside before, and in November of last year, a separate team of scientists discovered the molecule on the planet's dayside as well.

The latter team also came to the conclusion that as solar radiation decreases, Venus' oxygen concentration decreases. BepiColombo is anticipated to arrive at Mercury in late 2025, having completed seven years of travel.

In the meantime, Venus will be visited by a fleet of robotic explorers in the upcoming ten years. While NASA's DAVINCI was initially scheduled to launch in 2029, it was postponed to 2031.

Meanwhile, Europe's Envision spacecraft is scheduled to launch in 2031.

DARK ENERGY COULD BE GETTING WEAKER, SUGGESTING THE UNIVERSE WILL END IN A 'BIG CRUNCH'

Using data from the first year of the Dark Energy Spectroscopic Instrument (DESI), one of the deepest maps of the universe ever constructed included fresh hints regarding the evolution of dark energy. The 5,000 robotic eyes of the equipment gather light from over a third of the sky as seen from Earth, representing millions of galaxies.

After that, this light is divided into a spectrum of colors, which enables scientists to calculate the "redshift," or change in wavelength of light, to determine how much the cosmos has expanded over billions of years. The data obtained from the survey, which covered a mere 5% of DESI's operational duration, is already quite promising and has cosmologists eager to see what discoveries may be made.

The Lambda Cold Dark Matter (LCDM) model is the accepted "standard model" for the universe, its formation, and its evolution. However, the validity of this model, in which lambda stands for dark energy and the cosmological constant, may be seriously threatened at this time.

To put it briefly, this is because recent studies of the universe indicate that dark energy, the force responsible for the universe's rapid expansion, may be waning. Although it may not seem like much in and of itself, this discovery has the potential to lead to the first significant paradigm shift in cosmology since the universe's accelerated expansion was discovered just more than 25 years ago.

Although it may not seem like much in and of itself, this discovery has the potential to lead to the first significant paradigm shift in cosmology since the universe's accelerated expansion was discovered just more than 25 years ago. It might even imply that our universe will end in a "Big Crunch" rather than a "Big Rip" or "Big Chill."

On the other hand, the new DESI map might point to an alternative cosmic ending, in which the universe collapses back into the hot, dense condition observed just after the Big Bang. "If what the first year of DESI results suggests is true, then the accelerated expansion of the universe will cease and eventually reverse, and the universe could begin drawing together under the influence of gravity,". "This could eventually lead to the universe ending in a 'Big Crunch' scenario."

Cosmologists like García Peñaloza are excited to see what insights the next four years of DESI observations may yield into our understanding of the universe's origins and ultimate fate. "From two entirely different missions, we're going to have a very complementary vision of the universe," García Peñaloza said in closing. "They are going give us a completely and brand new vision of how the universe is behaving and how dark energy is shaping the larger scale universal structure."

An illustration of the Dark Energy Spectroscopic Instrument (DESI) year-one data, showing a slice of the larger 3D map that DESI is constructing during its five-year survey. (Image credit: DESI Collaboration/KPNO/NOIRLab/NSF/AURA/P. Horálek/R. Proctor)

We finally know why NASA's Voyager 1 spacecraft stopped communicating — scientists are working on a fix

In 2012, Voyager 1, which was launched in 1977, became the first artificial object to depart from the solar system and reach interstellar space. 2018 saw Voyager 2, the spacecraft's brother, depart the solar system. Voyager 2 is still alive and well and is in good communication with Earth.

In November 2023, after 11 years of interstellar travel, Voyager 1's computer language, known as binary code, ceased to make sense. Its 0's and 1's lost all of their meaning.In actuality, Voyager's "voice" was substituted with a monotonous dial tone for the conversation between the spaceship and Earth.

The reason behind a communications failure between Earth and the interstellar spacecraft Voyager 1 has been identified by NASA experts. It seems that one of the spacecraft's computers has a tiny amount of damaged memory.

The fault, which can be located in the NASA spacecraft's flight data subsystem (FDS), led Voyager 1 to transmit unintelligible data back to Earth. Before the telemetry modulation unit (TMU) and radio transmitter transmit the science and engineering data from the probe back to mission control, that system is in charge of packing it. As soon as Voyager 1 operators sent the spacecraft a "poke" on March 3, 2024, the root of the problem became apparent. The idea behind this was to get FDS to transmit a complete memory readout back to Earth.
The readout verified to the NASA team that the computer was unable to perform its regular functions because around 3% of the FDS memory had been damaged. The team has a strong suspicion that the malfunction is caused by a single chip that stops functioning, which is in charge of storing a piece of the FDS memory that is impacted.

But as of right now, NASA is unable to pinpoint the precise reason of that specific problem. The chip might have simply worn out after 46 years of service to Voyager 1, or it might have been impacted by a high-speed energetic particle from space.

As of right now, Voyager 1 is around 15 billion miles (24 billion kilometers) from Earth. This implies that it takes the spacecraft 22.5 hours to receive a radio signal from Earth and an additional 22.5 hours for the Deep Space Network's antennae to provide a response. Therefore, resolving this communication problem is no easy task.

Nevertheless, NASA engineers and scientists are hopeful that they may figure out a method to keep FDS functioning properly without the useless memory gear. NASA estimates that it may take weeks or perhaps months to overcome this problem, but once it is, Voyager 1 should be able to begin returning scientific data about what's outside the solar system.

INGENUITY TEAM SAYS GOODBYE TO PIONEERING MARS HELICOPTER

Originally intended to do merely five exploratory test flights over a 30-day period, Ingenuity is the first vessel to undertake a powered flight on a different planet. However, during its nearly three years of operation on the Martian surface, it flew over 14 times the distance that was anticipated of it and logged over two hours of total flying time.

Due to rotor damage sustained during its most recent flight, the Ingenuity Mars Helicopter has been out of service for some time. Tuesday was the last time the agency's helicopter engineers got together in a control room at the Jet Propulsion Laboratory in Southern California.

The historic helicopter has been in contact with the Perseverance Mars rover, which serves as a communications relay, even though the mission officially concluded on January 25. It was the final broadcast the team would collaborate on on Ingenuity, and it was received by the agency's Deep Space Network antennae.

However, Ingenuity will continue to function as a stationary testbed for the remainder of its life, gathering data that will aid in future Mars exploration, so it is not necessarily dying.

It is almost unbelievable that she still has anything to offer after more than a thousand days on the surface of Mars, seventy-two flights, and one harrowing landing. And because of this incredible team's commitment, not only did Ingenuity surpass our expectations, but it might possibly teach us new things in the future," remarked Josh Anderson, the JPL Ingenuity project lead, in a press release.

A fresh software patch has been applied to it. From now on, each day Ingenuity will awaken, turn on its flight computers, and assess how well its batteries, solar panels, and electronic devices are working.

Then, using one of its numerous sensors to measure temperature, it will use its color camera to snap an image of the Martian surface.

The developers at Ingenuity think that this long-term data collecting could be useful for future aircraft and other vehicle designs that will be operating on the red planet.

Mars' Subsurface is 'Burping' out Methane and Scientists aren't sure why

NASA's Mars Curiosity rover took this selfie on June 13, 2018. The six-wheeled robot has repeatedly detected methane during its exploration of Mars' Gale Crater, and scientists are still trying to figure out where the gas is coming from. (Image credit: NASA/JPL-Caltech)

Methane has been consistently found on Mars since 2012 by NASA's Curiosity rover, particularly in the vicinity of its landing site within the 96-mile-wide (154-kilometer) Gale Crater.

However, the methane on Mars is acting strangely. It only shows up at night, varies with the seasons, and suddenly peaks at 40 times the normal amount. The gas isn't noticeable high in the Martian atmosphere, and it hasn't been found close to the surface in any other Red Planet locations, which adds to the mystery. What is happening at Gale Crater, then?

It looks like planetary scientist Alexander Pavlov and his team at NASA may finally have at least part of the answer. The team proposes that the Mars methane is trapped in the regolith at Gale under a layer of hardened salt. Warm days may erode the crust, making it easier for methane to escape at night. Furthermore, if a heavy rover drives across the crust, its weight may cause a breach in it, which would let methane explode in a concentrated puff.

Neon, a methane analog, perchlorate, a salt that is commonly found on Mars, and a model of Martian regolith were used by the researchers to test their theory here on Earth. Their experiments, carried out in a Mars simulation chamber at NASA's Goddard Space Flight Center in Maryland, demonstrated that, in certain circumstances, a salt crust may form and trap methane underneath it.

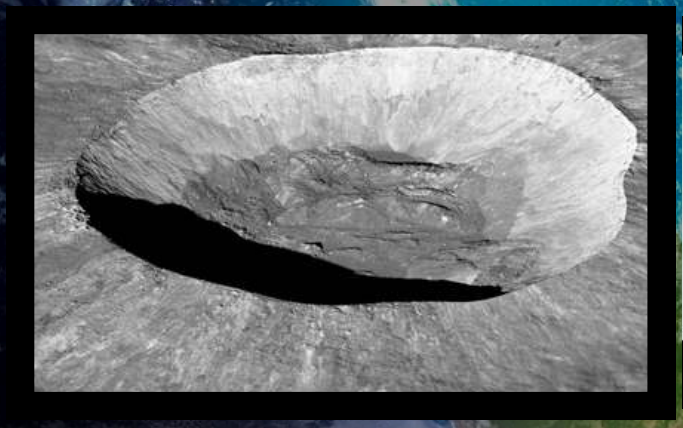
The erratic behavior of Martian methane may be explained by a coating of crystallized salt, but the reason methane even exists on Mars is still a mystery to scientists. Although living things on Earth are the main producers of methane, there are currently no indications of life on Mars. To be clear, methane does not always indicate the presence of life; geological processes can also produce the gas.

EARTH'S WEIRD 'QUASI-MOON' KAMO'OALEWA IS A FRAGMENT BLASTED OUT OF BIG MOON CRATER

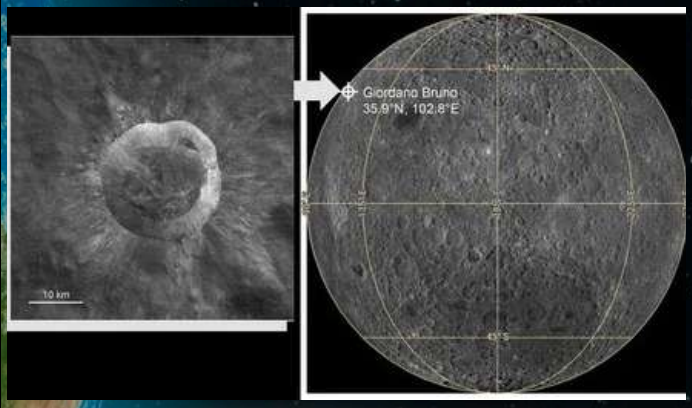
The study found that between 1 million and 10 million years ago, an asteroid collision freed Kamo'oalewa, a 131- to 328-foot-wide (40 to 100 meters) near-Earth object (NEO). This smashup produced the moon's 13.7-mile-wide (22 kilometers) Giordano Bruno crater.

The official designation of Kamo'oalewa is "469219 Kamo'oalewa." It was found in 2016 by the Pan-STARRS 1 asteroid survey telescope on Haleakalā, Hawaii. The mission was part of NASA's planetary defense effort to find space rocks that might potentially impact Earth.

It was eventually discovered that Kamo'oalewa, which translates to "an oscillating celestial object" in Hawaiian, orbits the sun in coordination with Earth and spins at an incredible pace for an asteroid. These intriguing features prompted scientists to look into the origins of the quasi-moon. According to studies conducted in 2021, Kamo'oalewa may have originated on the moon because of its composition, which is comparable to rocks found there. The question was, where on the moon did it originate precisely?



Home sweet home? The lunar crater Giordano Bruno may have been the home of Earth's Kamo'oaelewa quasi-moon. (Image credit: NASA/Goddard/Arizona State University)



The Giordano Bruno crater on the moon, the home of the asteroid Kamo'oalewa. (Image credit: Nature Astronomy)

The team utilized a crime scene investigation approach to establish a connection between Kamo'oalewa and the Giordano Bruno crater. To simulate the kind of impact that might have created a space rock similar to this quasi-moon, they employed a computer model.

Researchers outlined Kamo'oalewa's unstable orbit, which led the scientists to associate it with a relatively young crater that may have formed between one and ten million years ago. "Then we also needed the crater to be not too large, so that an intact fragment of the size of Kamo'oaelewa can be produced," . "The best candidate was then Giordano Bruno, which matches both constraints."

The size of the space projectile that would have formed the almost 14-mile-wide lunar crater and associated quasi-moon ejecta was also estimated by the team using their impact simulation. They calculated that in order to carve out the Giordano Bruno crater and free Kamo'oalewa, the asteroid that struck the moon had to have been roughly one mile (1.6 kilometers) wide.

Indian-Origin Astronaut Sunita Williams set for Third Space Mission

Together with Butch Wilmore, Indian-origin astronaut Sunita Williams will embark on her third space mission as they get ready to board the National Aeronautics and Space Administration's (Nasa) Boeing crew flight test to the International Space Station (ISS) on May 6.

Launching from Space Launch Complex-41 at Cape Canaveral, Florida, the astronauts will board Boeing's Starliner spacecraft atop an Atlas V rocket from United Launch Alliance. Once they arrive in the orbiting laboratory, they will dock and spend around a week there.

This mission is the first crewed flight of the Starliner spacecraft as part of NASA's Commercial Crew Program. Its goal is to conduct a thorough assessment of the spacecraft's capabilities, starting with launch and ending with its landing in the western United States.

NASA will begin the last steps of approving Starliner and its systems for upcoming crewed space station flights following a successful crewed flight test. Sunita Williams was selected by NASA to be an astronaut in 1998. According to the IE, she has two space flights under her belt: Expeditions 14/15 and 32/33.

The duration of Expedition 14/15 was December 9, 2006–June 22, 2007. Sunita Williams performed the duties of a flight engineer on Expedition 14. After completing her mission and joining the STS-117 crew on their return to Earth, she joined the Expedition 15 crew and landed at Edwards Air Force Base in California.

As per the Indian Express report, Sunita Williams achieved a significant milestone for female astronauts when she was on board. She completed four spacewalks, totaling 29 hours and 17 minutes. Nevertheless, astronaut Peggy Whitson (who accomplished five spacewalks) beat her record in 2008. Williams also took part in a longer trip, leading Expedition 33 as the commander of the International Space Station and working as the flight engineer for Expedition 32.

Between her two missions, she has been in orbit for a total of 322 days. With 50 hours and 40 minutes, Sunita Williams reclaimed her position as the female astronaut with the most cumulative spacewalk time. Nevertheless, Whitson went on to break this record with ten spacewalks in total.

Indian-American Astronaut Sunita Williams

FROM THE EYES OF WEBB – APRIL 2024

NASA's Webb Probes an Extreme Starburst Galaxy

A team of astronomers led by Alberto Bolatto from the University of Maryland, College Park, has utilized NASA's cutting-edge James Webb Space Telescope (JWST) to conduct a comprehensive survey of the starburst galaxy Messier 82 (M82), situated 12 million light-years away in the constellation Ursa Major. This galaxy, though relatively compact, is a hotbed of star formation activity, boasting a rate ten times faster than our own Milky Way.

The study focused on observing M82's center using Webb's Near-Infrared Camera (NIRCam) instrument, which provided a closer examination of the physical conditions conducive to new star formation. According to Bolatto, M82 is an ideal target for study due to its status as a prototypical starburst galaxy, having been previously observed by NASA's Spitzer and Hubble space telescopes. The high resolution and capabilities of Webb allowed the team to uncover intricate new details within this star-forming region.

Through Webb's infrared capabilities, the telescope was able to penetrate the dusty and gaseous veils surrounding the star formation process, revealing previously obscured features. The NIRCam images unveiled a multitude of stars and star clusters, represented as white dots, enabling a more accurate count and detailed analysis of these stellar populations within M82.

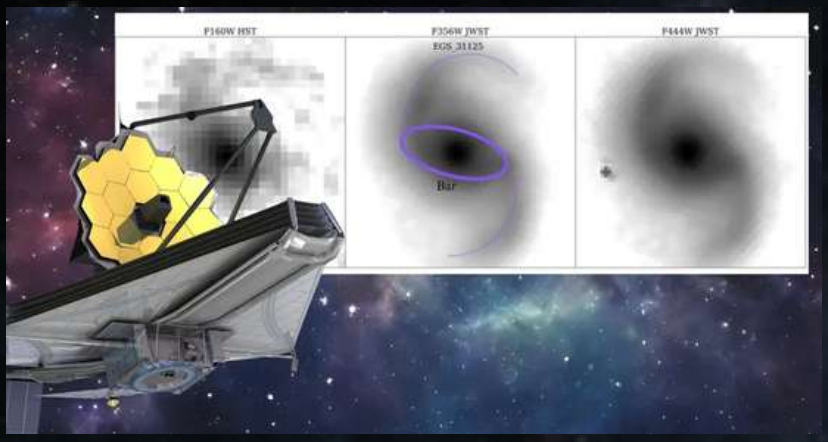
Additionally, longer infrared wavelengths captured clumpy gaseous tendrils extending from M82's core, indicative of a galactic wind driven by the intense star formation activity and resulting supernovae. The team investigated the origins and impacts of this galactic wind, focusing on the interactions between hot and cold components within it.

One notable discovery was the unexpected similarity between the emission patterns of sooty chemical molecules (polycyclic aromatic hydrocarbons or PAHs) and that of hot, ionized gas within the galactic wind. This finding challenges existing theories and underscores the need for further investigation into the dynamics of starburst galaxies like M82.

Looking ahead, the team plans to analyze additional data from Webb, including spectroscopic observations of M82, to unravel more mysteries surrounding star formation processes and galactic dynamics. These insights not only enhance our understanding of nearby galaxies like M82 but also provide valuable clues about the early universe and the evolution of cosmic structures over time.

JWST DISCOVERS SOME EARLY UNIVERSE GALAXIES GREW UP SURPRISINGLY FAST

Recent discoveries from the James Webb Space Telescope (JWST) are reshaping our knowledge of early galaxy evolution. Led by Durham University, researchers found that galaxies matured rapidly after the Big Bang, with "star bars" forming just billions of years later. Star bars are dense, elongated regions that regulate star formation in galaxies. The findings challenge previous ideas of a chaotic early universe and were made possible by JWST's extended observation range (up to 11.5 billion years ago). Discovering bar-driven galaxy evolution early on suggests longer cosmic processes, prompting a reevaluation of cosmological models. The team plans to study even older galaxies (up to 12.2 billion years ago), pushing the boundaries of cosmic exploration.



NASA's Webb Maps Weather on Planet 280 Light-Years Away

The spectra show clear signs of water vapor on the nightside as well as the dayside of the planet, providing additional information about how thick the clouds are and how high they extend in the atmosphere.

Surprisingly, the data also shows a distinct lack of methane anywhere in the atmosphere. Although the dayside is too hot for methane to exist (most of the carbon should be in the form of carbon monoxide), methane should be stable and detectable on the cooler nightside.

“The fact that we don't see methane tells us that WASP-43 b must have wind speeds reaching something like 5,000 miles per hour,” explained Barstow. “If winds move gas around from the dayside to the nightside and back again fast enough, there isn’t enough time for the expected chemical reactions to produce detectable amounts of methane on the nightside.”

WHAT'S UP IN THE SKY - MAY 2024

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.

MOON CALENDAR MAY 2024

PLANETS VISIBILITY

Mercury

Swiftest planet of solar system is unlikely to be seen this month.

Venus

Morning planet, unlikely to be seen this month.

Mars

Morning planet emerging from the Sun's glare, best at the end of the month.

Jupiter

Solar conjunction on 18 May and unlikely to be seen this month.

Saturn

Lord of rings planet is poorly visible in the morning sky in the month of May.

Uranus

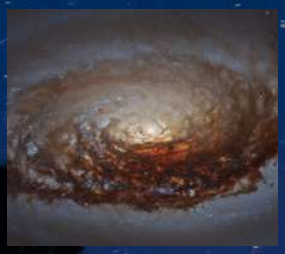
The ice giant is not visible in the month of May

Neptune

Windy planet of our solar system is not visible this month.

BRIGHT DEEP SKY OBJECTS

The galaxy M94 is a barred spiral. Out of the approximately twenty galaxies in the constellation Canes Venatici, it is the brightest member of the M94 group. M64, sometimes referred to as the Black Eye Galaxy, is another Messier object in the group. The Cat's Eye Galaxy appears as a tiny, dim patch of light through binoculars under extraordinarily clear and dark skies.



The MM64 is a spiral galaxy in the Coma Berenices constellation that is also referred to as the evil eye galaxy. Its dark belt of dust in front of its light nucleus gave rise to its namesake. It appears to be 8.5 in magnitude. Using a modest telescope or 10x50 binoculars, you can observe the Black Eye Galaxy, which appears as a faint, elongated glow.

M100, sometimes referred to as the Blowdryer Galaxy, is a striking illustration of an intermediate grand-design spiral galaxy. Strong star formation activity is present in this galaxy, which is among the largest and brightest in the Virgo Cluster. It is a star in the Coma Berenices constellation with an apparent magnitude of 9.3.

The galaxy NGC 4631 is a barred spiral. Its wedge-like shape earned it the moniker "Whale Galaxy." The galaxy is about the same size as the Milky Way galaxy. It is 9.2 in apparent magnitude. It is visible from the northern hemisphere and is located in the Canes Venatici constellation.

ROCKET LAUNCHES IN MAY 2024

Chang'e 6

Date: May 3 , 2024
Rocket: Long March 5
Agency: China Aerospace Science and Technology Corporation
Country: China
Launch Site: Wenchang Space Launch Site, People's Republic of China.
Purpose: Chang'e 6 or CE-6 aims to gather samples from the Moon's Far Side near the Apollo Basin's southern edge. This mission represents the first attempt to collect lunar samples from this region. It will carry instruments from several countries including France, Italy, Sweden, and Pakistan by using its heavy lift launch system 'Long March 5'.

It is capable of carrying up to 25,000 kilograms to Low Earth Orbit and about 14,000 kilograms to Geostationary Transfer Orbit. These capabilities position the Long March 5 on par with heavy-class vehicles like the American Delta IV Heavy, underscoring China's advancements in space launch technology.

CST-100 Starliner Crewed Flight Test

Date: May 6, 2024
Rocket: Atlas V N22
Agency: United Launch Alliance
Country: USA
Launch Site: Cape Canaveral, FL, USA
Purpose: The CST-100 Starliner Crewed Flight Test is classified as a test flight, targeting Low Earth Orbit. The estimated launch cost for this mission is $110,000,000. It represents the inaugural crewed test flight of the Starliner spacecraft, transporting NASA astronauts Barry Wilmore and Suni Williams to the International Space Station. The goal of the program is to provide safe, reliable, and cost-effective transportation on space station missions, which will allow for additional research time.

The Atlas V N22 is a crew-rated version of the Atlas V 422 rocket, featuring two solid motor strap-on boosters along with two liquid-fueled stages. Its primary purpose is to support NASA's Commercial Crew program by transporting the CST-100 Starliner spacecraft to orbit.

Maiden Flight

Date: Expected In May
Rocket: SR75
Agency: HyImpulse
Country: Germany
Launch Site: Pad 1, Koonibba Test Range, South Australia
Purpose: The Maiden Flight, designated as a Test Flight, is set to take place with the HyImpulse SR75 sounding rocket. This single-stage suborbital rocket is developed by the German private company HyImpulse. The launch will occur from Pad 1 at the Koonibba Test Range in South Australia.The HyImpulse SR75 serves multiple purposes, including offering commercial microgravity services and acting as a test bed for the company's SL1 orbital rocket. This maiden flight represents a crucial step in the development and testing of HyImpulse's rocket technology.

Ionosfera-M 1 & 2

Date: Expected in May
Rocket: Soyuz 2.1b/Fregat-M
Agency: Russian Federal Space Agency (ROSCOSMOS)
Country: Russia
Launch site: Cosmodrome Site 1S, Vostochny Cosmodrome, Siberia, Russian Federation
Purpose: Ionosfera-M 1 & 2 are a pair of Earth science satellites designed for ionospheric and magnetospheric research as part of the Ionozond project under Roscosmos. They form a constellation comprising four satellites, with each pair positioned in two orbital planes. Operating in circular sun-synchronous orbits (SSO) at an altitude of approximately 800 km, these satellites conduct crucial studies to deepen our understanding of the Earth's ionosphere and magnetosphere.

EarthCare

Date: 09 March 2024
Rocket: Falcon 9 Block 5
Agency: Space X
Country: USA
Launch Site: Vandenberg SFB, CA, USA
Purpose: EarthCARE (Earth Cloud Aerosol and Radiation Explorer) represents a collaborative effort between the European Space Agency (ESA) and the Japan Aerospace Exploration Agency (JAXA). Operating within a sun-synchronous orbit, this mission aims to comprehensively observe and analyze clouds and aerosols while also measuring the reflected solar radiation and the infrared radiation emitted from Earth's surface and atmosphere.

By leveraging advanced observational capabilities, the mission seeks to characterize the distribution, composition, and dynamics of clouds and aerosols, which play crucial roles in regulating Earth's energy balance and climate. It has four major instruments: Cloud Profiling Radar (CPR): Offers high-resolution vertical profiles of cloud and precipitation structures, facilitating detailed cloud characterization. Atmospheric Lidar (ATLID): Provides accurate measurements of aerosol and cloud properties, including their spatial distribution, optical properties, and vertical profiles. Multi-Spectral Imager (MSI): Captures images across different spectral bands to determine cloud properties, aerosol characteristics, and surface albedo. Broadband Radiometer (BBR): Measures the reflected solar radiation and the infrared radiation emitted from Earth's surface and atmosphere, aiding in the understanding of Earth's energy budget.

STARLINK LAUNCHES

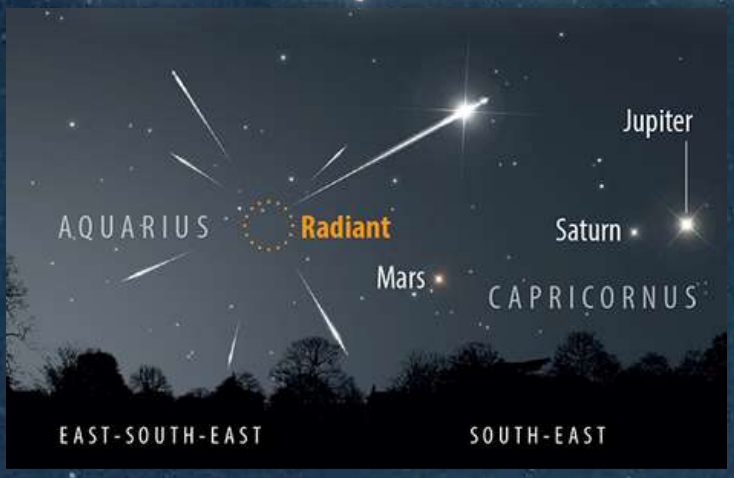
Starlink Group 7-28| Starlink Group 7-29| Starlink Group 8-4| Starlink Group 8-3| Starlink Group 8-5 | Starlink Group 7-30| StarLink Group 7-19/20/21/22/23/24/25/26/27/30 |

Starlink is a satellite internet constellation project developed by SpaceX, with the goal of providing high-speed internet access to underserved and remote areas globally. Satellite Deployment: SpaceX regularly launches batches of Starlink satellites into orbit aboard its Falcon 9 rockets. Each batch typically contains dozens to hundreds of satellites.

***Note: Launch dates of the missions are scheduled to be launched in May 2024 but may subject to change.**

ASTRONOMICAL EVENTS - MAY 2024

Eta-Aquarid Meteor Shower



The radiant of the Eta Aquarid meteor shower.
(AN Graphic by Greg Smye-Rumsby)

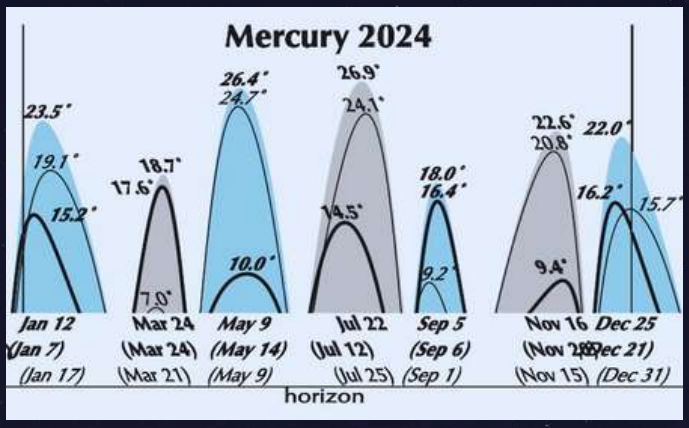
Every year in early May, the Eta Aquarids reach their height. The Eta Aquarid meteor is renowned for its high speed; as it enters Earth's atmosphere at a speed of roughly 66 km/s, or 148,000 m/h. During its height, approximately 30 Eta Aquarid meteors can be observed every hour. In the predawn hours, one can observe the Eta Aquarids in the Northern and Southern hemispheres. But viewing the Eta Aquarids is best done in the Southern Hemisphere as the hourly rate of meteors in the Northern Hemisphere is only about 10. This is because different latitudes provide varied viewing locations for the radiant and the radiant of the Eta Aquarids is found in the constellation Aquarius, which is higher in the sky in the Southern Hemisphere than it is in the Northern. These meteors originate from the region of Aquarius that contains Eta Aquarii, one of the brightest stars in the constellation and hence the name of the shower derived from this star and constellation.

Comet 1P/Halley is the source of the space debris fragments that interact with our atmosphere to form the Eta Aquarids. A covering of ice and rock is released into space by Halley's nucleus on each of its trips back to the inner solar system. If the dust grains impact with Earth's atmosphere, they finally transform into the Orionids in October and the Eta Aquarids in May.

Peak dates: 5-6 May
Parent Comet: 1P-Halley
Duration of shower: 19 April to 28 May
Radiant: Constellation Aquarius
Expected meteors at peak, under ideal Conditions: In a dark sky with no moon, you might see upto max 10 meteors per hour in the Northern Hemisphere while, upto max 55 meteors per hour in the Southern Hemisphere
Note: Note: The Eta Aquariids' radiant will be on the ecliptic, which will ride low in the sky on spring mornings as seen from the Northern Hemisphere. That's why this shower favors the Southern Hemisphere. It's often that hemisphere's best meteor shower of the year.

An image of an Eta Aquarid meteor, space dust from Halley's Comet, taken by the NASA All Sky Fireball Network station in Tullahoma, Tennessee in May, 2013.

MERCURY AT GREATEST ELONGATION WEST



Mercury elongations compared. Here, gray areas represent evening apparitions (eastward elongation). Blue areas represent morning apparitions (westward elongation). The top figures are the maximum elongations, reached at the top dates shown beneath. Curves show the altitude of the planet above the horizon at sunrise or sunset, for latitude 40 degrees north (thick line) and 35 degrees south (thin line). Likewise, maxima are reached at the parenthesized dates below (40 degrees north bold). Chart via Guy Ottewell's 2024 Astronomical Calendar.

Mercury is always near a line in the sky known as the Ecliptic, Mercury is always near a line in the sky known as the ecliptic, which is the sun's apparent path on the celestial sphere during the year. This line depicts the plane of the Earth's orbit around the Sun as well as the route that the Sun follows through the zodiacal constellations each year. Because all planets orbit the Sun in almost the same plane, it also closely follows the planes of the other planets' orbits. When Mercury is far distanced from the Sun, it is separated along the ecliptic line. At sunset, however, the ecliptic intersects the horizon at varied angles depending on the time of year. This implies that Mercury appears at varying elevations above the horizon at different times of the year, even if its distance from the Sun remains constant.

At greatest western elongation, Mercury or Venus is visible as a morning object that rises in the east before the sun. At greatest eastern elongation, Mercury or Venus is visible as an evening object that sets in the west after the sun. In between these times, Mercury's swift orbit carries it either directly behind the Sun as seen from Earth (superior conjunction), or in front of it (inferior conjunction). Mercury's separation from the Sun varies between 18 and 28 degrees with each apparition.

PLANETARY ALIGNMENT WITH MOON

Place: New Delhi/ Date: 3rd May / Time:04:45 a.m.

Planets revolve around the Sun at multiple rates and distances. This implies that they constantly move relative to one another in our night sky. Hence, their paths occasionally appear to overlap, resulting in an alignment or conjunction. The word "Planetary alignment" doesn't mean that the planets are lined up perfectly straight in space. Rather, it is a celestial event where numerous planets seem close together in the sky from Earth's perspective. The alignments we see from Earth are based on our line of sight.

When to look: On May 3rd, 2024 at 04:45 a.m. IST; just before the sunrise

Where: Near constellation Aquarius, the water bearer which is one of the zodiac constellation

Planets aligned: Mercury, Mars, Saturn and the Moon

Type: A mini morning alignment

CONJUNCTIONS FOR THE MONTH

A phenomenon grabs the imagination of scientists and stargazers alike in the vast panorama of the night sky, where stars shine like distant diamonds and planets roam over the cosmic canvas. Conjunctions, those ethereal moments in the heavens when heavenly bodies appear to collide, provide a mesmerizing sight that connects us to the beauty of the cosmos. The word "Conjunction" comes from Latin, meaning to join together. From Earth's perspective, a conjunction occurs when two planets or a planet and the Moon or Sun align. Solar conjunctions are invisible to us. Moon-planet conjunctions occur throughout the month, every month, as the Moon passes past each planet. The planets in The Great Conjunction and when multiple align are rare and captivating conjunctions. 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.

Conjunction of Moon and Saturn

On May 4th, the Ringed Planet Saturn will meet the moon in the constellation Aquarius. These pairs will be visible in the dawn sky rising at 02:56 IST & reaching an altitude of 25° above the south-eastern horizon. Saturn will be at a magnitude of 1.0 & the moon will have a magnitude of -11.2.

Place: New Delhi/ Date: 4th May / Time:04.00 a.m.

Place: New Delhi/ Date: 5th May / Time:04.22 a.m.

Conjunction of Moon and Mars

On May 5th, the red planet Mars and the Moon will have the closest approach in the dawn sky and reaching an altitude of 16° above the eastern horizon. The Moon will be at mag -10.5, and Mars at mag 1.1, both in the constellation Pisces.

Conjunction of Moon and Saturn

On May 31st, the ringed planet Saturn and the Moon will have the closest approach in the dawn sky & reaching an altitude of 41° above the south-eastern horizon. The Moon will be at mag -11.8, and Saturn at mag 0.9, both in the constellation Aquarius.

Place: New Delhi / Date: 31st May / Time: 04:10 a.m.

Decoding StoneHenge

In southwest England, not too far from Bath, a stone structure breaks the sprawling hills and endless grass fields. For over 5000 years this structure, in varying forms, stood on Salisbury Plain, Wiltshire. Stonehenge is a structure from the Bronze Age period, which lasted between 3300 BCE and 1200 BCE.

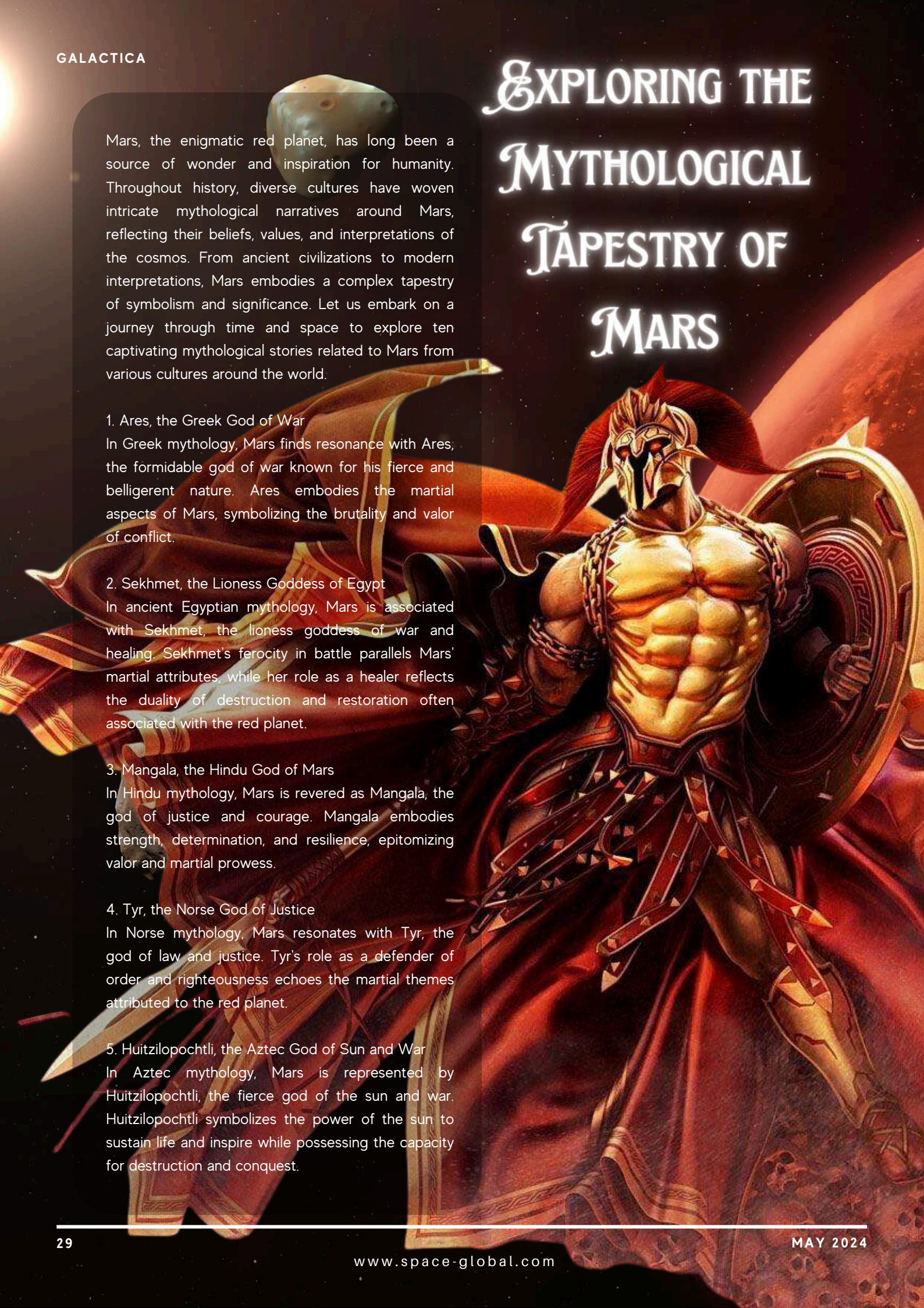
Construction of the first monument began around 3100 BCE. It was a circular 'henge' earthwork approximately 110 meters in diameter. In archaeology, a 'henge' is a circular or oval-shaped flat area enclosed by a boundary earthwork. The structure of Stonehenge Phase I potentially contained a ring of 56 wooden posts. Around 3000 BCE, Stonehenge seemed to have functioned as a cremation cemetery, and a type of timber structure may have been built. Construction of the Stonehenge we know today began around 2550 BCE and took place until 1600 BCE. During this time, the simple earth and timber henge were refashioned into a unique stone monument.

Today, Stonehenge is known for the unique spectacle that occurs during the summer solstice, where the sun rises right next to the Heel Stone. However, archaeologists believe that the people who built Stonehenge gathered during the winter solstice, which was culturally more important to them for a variety of reasons. During this time, the sun sets through the central pillar of the structure highlighting its significance.
Need to insert a photo that explains the geography of Stonehenge with the named stones marked out.

The exact purpose of Stonehenge is unknown, yet when Gerald Hawkins claimed to have observed several solar and lunar alignments in 1963, an archaeoastronomy debate was started. While several astronomers were keen on Hawkins' insights, archaeologists were suspicious. They were questioning if the climate would have allowed for accurate observations of astronomical events. Some archaeologists pointed out that astronomers were looking for an alignment they already knew the existence of while the builders did not have the same knowledge level.

Today, however, it is generally accepted that Stonehenge is a calendar and helped the people to keep track of time. There is a possibility that it is not only a calendar but was also an important gathering site, religious site and burial site. The lack of written records means that while we can always guess Stonehenge's purpose, we can never be 100% sure.

Exploring the Mythological Tapestry of Mars



Mars, the enigmatic red planet, has long been a source of wonder and inspiration for humanity. Throughout history, diverse cultures have woven intricate mythological narratives around Mars, reflecting their beliefs, values, and interpretations of the cosmos. From ancient civilizations to modern interpretations, Mars embodies a complex tapestry of symbolism and significance. Let us embark on a journey through time and space to explore ten captivating mythological stories related to Mars from various cultures around the world.

1. Ares, the Greek God of War

In Greek mythology, Mars finds resonance with Ares, the formidable god of war known for his fierce and belligerent nature. Ares embodies the martial aspects of Mars, symbolizing the brutality and valor of conflict.

2. Sekhmet, the Lioness Goddess of Egypt

In ancient Egyptian mythology, Mars is associated with Sekhmet, the lioness goddess of war and healing. Sekhmet's ferocity in battle parallels Mars' martial attributes, while her role as a healer reflects the duality of destruction and restoration often associated with the red planet.

3. Mangala, the Hindu God of Mars

In Hindu mythology, Mars is revered as Mangala, the god of justice and courage. Mangala embodies strength, determination, and resilience, epitomizing valor and martial prowess.

4. Tyr, the Norse God of Justice

In Norse mythology, Mars resonates with Tyr, the god of law and justice. Tyr's role as a defender of order and righteousness echoes the martial themes attributed to the red planet.

5. Huitzilopochtli, the Aztec God of Sun and War

In Aztec mythology, Mars is represented by Huitzilopochtli, the fierce god of the sun and war. Huitzilopochtli symbolizes the power of the sun to sustain life and inspire while possessing the capacity for destruction and conquest.

6. Bellona, the Roman Goddess of War
In Roman mythology, Mars is sometimes accompanied by Bellona, the goddess of war and conflict. Bellona personifies chaos and destruction unleashed in battle, emphasizing the consequences of war.

7. Nergal, the Babylonian God of the Underworld
In Babylonian mythology, Mars finds representation in Nergal, the god of the underworld and plague. Nergal embodies the darker aspects of Mars, reflecting the cyclical nature of life and death.

8. Mars in Science Fiction
Beyond ancient mythologies, Mars continues to inspire contemporary culture, particularly in science fiction literature and cinema. From Edgar Rice Burroughs' "Barsoom" series to modern Martian colonization narratives, Mars serves as a canvas for exploring humanity's aspirations, fears, and fantasies about space exploration and extraterrestrial life.

9. Take-Mikazuchi, the Thunder God in Japanese Mythology
Take-Mikazuchi, a Shinto deity associated with thunder and swords, parallels Mars' representation as a warrior god, embodying strength and valor in battle.

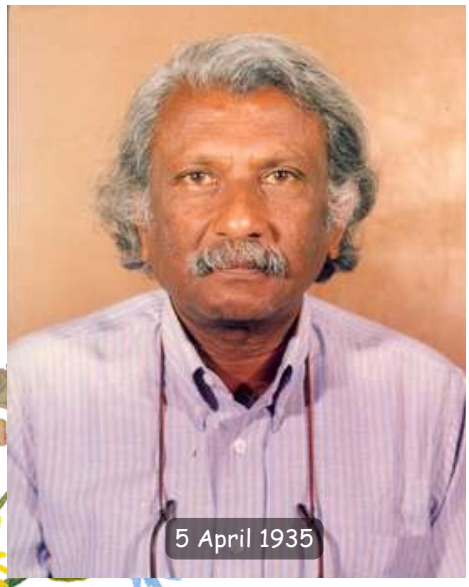
10. Mars as the Red Star in Native American Mythology
Some Native American cultures associate Mars with the red color, considering it an important celestial symbol. Mars is often seen as a harbinger of change or conflict in the skies, influencing cultural beliefs and rituals.

In conclusion, the mythological stories surrounding Mars offer a rich tapestry of cultural interpretations and symbolic representations. Whether as a god of war, a celestial body, or a muse for artistic expression, Mars continues to captivate and intrigue humanity, inviting us to contemplate our place in the cosmos and the mysteries that lie beyond. Through these narratives, we glimpse the enduring fascination and reverence that Mars has evoked across civilizations, revealing profound insights into the human condition and our eternal quest for understanding the universe.

Happy Birthday

Nancy Grace Roman

Dr. Nancy Grace Roman (16th May 1935 - 25th December 2018) Born in Nashville, Tennessee, Dr Roman grew up in an era when women were encouraged to not pursue mathematics and science.Dr Roman joined NASA a mere six months after the agency's founding and was its first female executive. She served as NASA's first Cheid of Astronomy throughout the 1960s and 1970s where she played a pivotal role in establishing NASA's space-based observatories. Dr Roman was instrumental in taking the Hubble Space Telescope program from an idea to reality. For this role, she is known to many as the "Mother of Hubble". NASA has named one of its next-generation space telescopes, which is still under development, after her. The Nancy Grace Roman Space Telescope will launch sometime within the next decade.



Venkataraman Radhakrishnan

Venkataraman Radhakrishnan (18th May 1929 - 3rd March 2011) was a renowned astrophysicist who expanded the field of radio astronomy. Born in Tondiarpet, a suburb of Madras, he served as the director of Raman Research Institute between 1972 and 1994. During his tenure as director, the institute developed an international reputation for work in the areas of pulsar astronomy, liquid crystals, and other areas of frontline research in astronomy. Additionally, he was involved in the construction of the 10.4-meter millimetre wave radio antenna at the Raman Research Institute. Throughout his career, he served on various committees in various capacities. One such example was his service as the vice president of the International Astronomical Union between 1988–1994.

Sally Kristen Ride

Dr. Sally Kristen Ride (26th May 1951 - 23rd July 2012) was the star of NASA's Space Shuttle program. Born in Los Angeles, United States of America, Dr Ride was one of the first female astronauts selected by NASA. In June 1983, she became the first American woman to fly in space. To date, she is the youngest American Astronaut to go to space. She left NASA in 1987 and became a physics professor at the University of California, San Diego. Two years later she became a director of the California Space Institute. Dr Ride was a firm believer in motivating girls and young women to pursue careers in STEM in 2001, she founded her own company, Sally Ride Science. Dr Ride was also the only person who served in both communities that investigated the loss of the Challenger and Columbia Space Shuttle.

STUDENT'S CORNER

The General Theory of Relativity and the Concept of Time Dilation

Sai Karthik Susarla, IAstronomer

Introduction:

The general theory of relativity and the concept of Time dilation is an astounding piece of discovery, presented by one of the brilliant minds of the modern 20th century-Albert Einstein.

History:

Albert Einstein had a huge insight. He thought of a way to connect gravity and general relativity through the idea of acceleration since the two were equivalent.

He imagined a man inside a room and the room was inside a spaceship traveling with a uniform acceleration of 9.8m/s^2. According to him, the man's weight would be 80 kilograms for example when he measured it on a bathroom scale IN THE ROOM INSIDE THE SPACESHIP. This was because when the man pushed down against the bathroom scale on the spaceship due to his weight, a counter force was exerted by the spaceship itself on the bathroom scale. Since the man is not falling downward due to the effect of gravity there appears to be a force that resists the downward motion of the man. This is called the normal force. Since the man is not falling downwards, the normal is equal to the weight of the man. Therefore, the bathroom scale would mention 80N which is the force exerted by the spaceship. The normal force is equal because the spaceship is moving at an acceleration of 9.8m/s^2. Therefore, the force exerted by the spaceship is equal to that of gravity

This would be no different than his weight on earth. We could the same concept we learnt earlier. Since the man does not levitate or is pushed upwards. We could say that the normal force here to is equal to that of gravity.
Hence N=mg where N is the normal force m=mass of object and g is acceleration due to gravity.

The Theory:

Okay provided, you have understood the concept I have mentioned above, you have reached halfway through understanding general relativity. Congratulations!!! Now Einstein thought"Why not apply the same concept to light ??"
Therefore, he imagined a man in a spaceship in a room, where the man had a torchlight and switched it on. Now the light from the torchlight would have a bent trajectory because of the room traveling upward at a speed of 9.8m/s^2.
According to Einstein because the effects of gravity in a spaceship moving at an acceleration of 9.8 m/s^2 is the same as that of Earth, the light should be bending in the earth too in the presence of gravity. But here is the catch, we don't have light bending in a room on Earth. Light travels in a straight line and always takes the shortest part between two points. So, what is happening??

Einstein thought that maybe the light was taking the shortest path between two points in space and it was a bent trajectory. Therefore, Einstein proposed the general theory of relativity where there was a space-time fabric in which a body with a mass such as a sun bends the fabric of space and time.
And the planets orbit around the sun because of the 3 dimensional interaction of matter and space which is very hard to visualize.
Time too gets dilated due to this curvature in the space-time fabric.
We all know that the speed of light is constant at 3,00,000 km/s. Suppose light travels in a straight line between two points whose distances in space are 3,00,000 Km. Obviously, it is going to take 1 second for the light to reach the point

But according to Einstein the shortest point between two points for light to travel is a bent trajectory provided if the two points are near a star to bend the very fabric of space.
So, the Distance between A and B will increase to for example 6,00,000 km. But here is the catch, the speed of light is constant at all times i.e 3,00,000 km/s.

Therefore now light would take 2 seconds to cover the same points A and B . That is one additional second.
That is why near a black hole we say that time gets so distorted. This is because black holes have so much mass and so bend the fabric of space to a greater extent. This slows or dilates time so much that second near a black hole

Conclusion:

To conclude my essayI would like to say that both Newton and Einstein were excellent scientists who formulated their own theories and came up with many ways to describe the universe as a whole.

THE BUILDING BLOCKS OF THE UNIVERSE

Sajan Saravanan, IAstronomer

The Universe is all matter, energy, space and time. It's size alone makes it seem incomprehensibly vast and baffling, but even the Universe's largest structures are made of the same chemical elements that are around us on earth, indeed in our own bodies and all atoms and subatomic particles are subjected to the four same fundamental forces.

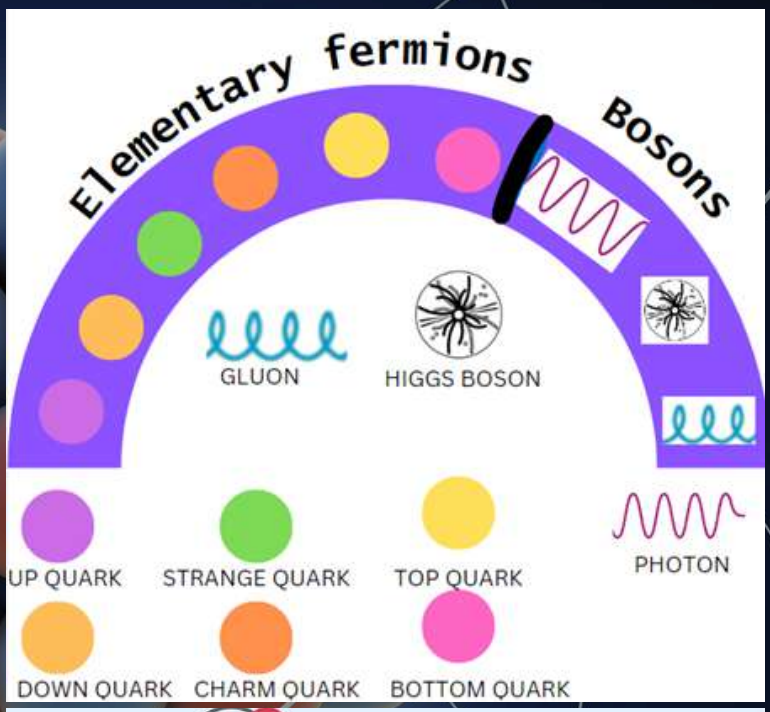
Matter is built from atoms made of protons neutrons and electrons. The protons' positive charge is balanced by the electrons' negative charge so an atom has no overall charge. If it gains or loses electrons it becomes a charged particle called as an ion.

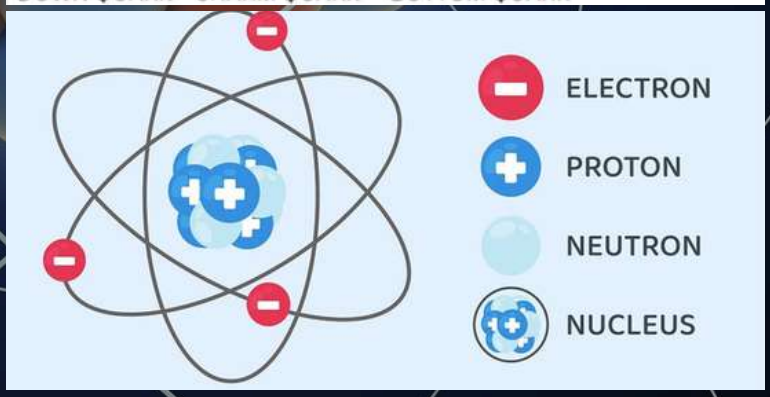
The atoms are made up of same extremely small units known as particles. The particles that form matter are called as Fermions there are other particle known as bosons that transfer force between fermions.

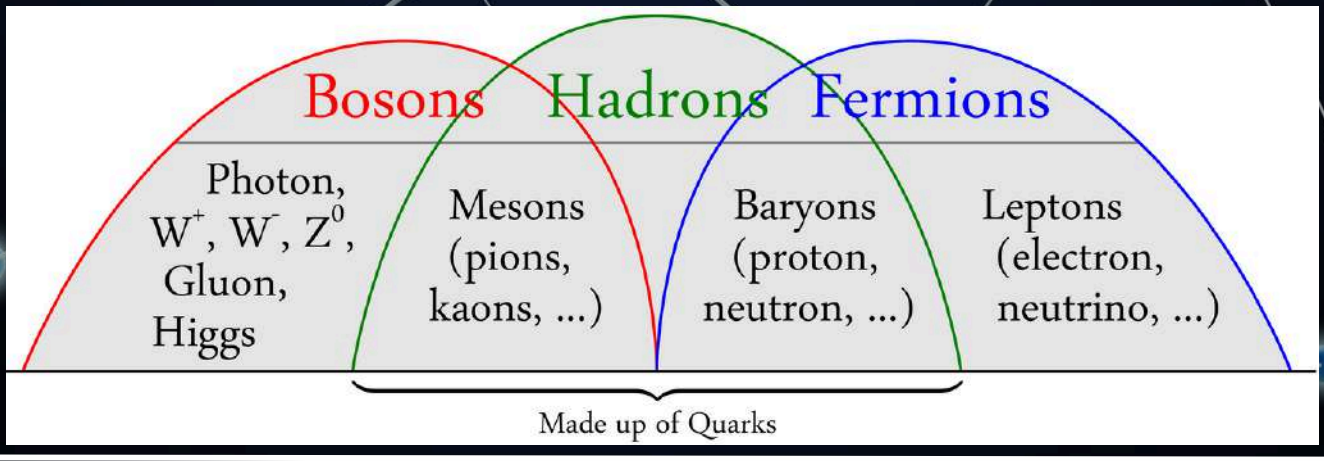
Composite particles also known as hadrons, have an internal structures. They include protons and neutrons which were oncer thought to be elementary but are now known to be made of quarks held together by gluons.

In conclusion, our understanding of the universe's composition has evolved significantly over time. We've come to recognize that everything around us, from the stars in the sky to the atoms in our bodies, is composed of the same fundamental building blocks: atoms and their constituent particles. Atoms, in turn, are made up of protons, neutrons, and electrons, which are governed by the four fundamental forces of nature.

Furthermore, we've discovered that even the seemingly elementary particles like protons and neutrons have internal structures, consisting of even smaller entities called quarks held together by gluons.







EXPANSION OF UNIVERSE

Souryadeepta Majumdar
IAstronomer

The very dominant theory of the beginning of the universe and the introducing topic of Cosmology; The Big Bang, is a prominent theory that establishes and justifies a point that says that the universe is expanding. Knowing the expansion rate of the universe can help us determine the age of the universe, which in turn can help in studying the evolution of planets, the distribution of different celestial bodies and Messier objects, and also enhances the prediction of movements and transformations that all the stellar systems may go through in future.

Although there was a debate on expansions of the universe and even the validation of The Big Bang theory was questioned for hundreds of years, Einstein's General Theory of Relativity introduced field equations, which could be interpreted to establish the scale factor of the universe as a function of time. However, it was also justified by Stephen Hawking in his book "A Brief History of Time", stating how the universe could be seen as an event and how the Second Law of Thermodynamics can be applied to this event, claiming the creation of each celestial object to be entropy.
According to Stephen Hawking, as entropy increases with time, the size of the universe also increases to maintain the distribution of the systems within it. The field equations laid the foundations for the metric known as the Friedmann-Lemaître-Robertson-Walker metric which is a mathematical model that modifies the field equations to make General Relativity acceptable to Quantum Mechanics and hence forms what is known as the Standard Model of Modern Cosmology. This was an independently developed model deployed in different stages between the 1920s and the 1930s that assumes all the spatial components are time-dependent and hence maintain a hypothetical homogeneity and isotropy of space.

Similarly, there is a theory by Edwin Hubble that introduces Hubble's law. If we take the rate at which an object is moving away from us and divide it by the apparent distance of the object from us, the ratio is known as the Hubble Rate and is the mathematical expression of Hubble's Law. This ratio is used with different components to determine the components. The recent numerical output that provides the expansion rate of the universe has been calculated using a Type IA Supernova as a reference. A Supernova is a luminous stellar explosion in space and a Type IA Supernova is a particular variant that occurs in binary systems (i.e. stellar systems with two stars involved) and one of the stars is a White Dwarf (i.e. a star whose mass is almost 8 times less than the Sun).

Using these, the Hubble rate has been calculated to be 73.24±1.74 (km/s)/Mpc (kilometres per second for every million parsecs). This is an estimation with relatively higher precision but work is still going on that can yield an expansion rate as the expansion rate of the universe is a relative phenomenon and variable with time as well.

A matter of wonder, the expansion rate of the universe has no generalized algorithm to compute it. Almost all existing computations and algorithms are valid either on a hypothetical phenomenon or they support an instantaneous estimation. Also, there are factors like cosmic inflation and gravitational forces driven by inertia that vary the expansion rate of the universe. Looking into these factors, a generalized theorem can make a breakthrough in the field of Astronomy and may reform several theorems and predictive measures.

UNLOCKING THE UNIVERSE'S MYSTERIES: THE FASCINATING REALM OF RADIO ASTRONOMY

Navya Kiran, IAstronomer

The exploration of the universe has always challenged human curiosity, leading to the development of various tools and techniques to unravel its mysteries. Among these tools, radio astronomy stands out as a powerful means to study celestial phenomena through the detection and analysis of radio waves emitted by cosmic objects. In this essay, we dive into the realm of radio astronomy, exploring its significance, techniques, and major discoveries.

Radio astronomy utilizes radio telescopes to detect and analyze radio waves emitted by celestial bodies. Unlike optical telescopes, which observe visible light, radio telescopes capture longer wavelengths, providing unique insights into cosmic phenomena. These instruments consist of large antennas equipped with receivers sensitive to radio frequencies, enabling scientists to collect data from distant corners of the universe.

One of the key advantages of radio astronomy lies in its ability to detect cosmic dust and gas, allowing astronomers to observe regions hidden from optical telescopes. This capability has revolutionized our understanding of phenomena such as pulsars, quasars, and cosmic microwave background radiation.

Pulsars, for instance, were first discovered using radio telescopes in 1967 by Jocelyn Bell Burnell and Antony Hewish. These rapidly rotating neutron stars emit regular pulses of radio waves, providing astronomers with precise cosmic clocks and offering insights into stellar evolution and the behaviour of matter under extreme conditions.

Quasars, another enigmatic cosmic phenomenon, are incredibly bright and distant objects powered by supermassive black holes. Radio observations have been instrumental in studying their properties, revealing energetic jets of particles extending over millions of light-years and shedding light on the evolution of galaxies and the universe itself.

Moreover, radio astronomy played a crucial role in confirming the Big Bang theory through the detection of cosmic microwave background radiation (CMB). This faint glow, leftover from the early universe, was first detected in 1965 by Arno Penzias and Robert Wilson using a radio telescope. The precise measurements of the CMB have since provided invaluable insights into the composition, age, and evolution of the universe, supporting the Big Bang model as the most accurate description of cosmic origins.

In addition to these landmark discoveries, radio astronomy continues to unveil new mysteries and phenomena. Recent advancements in technology have led to the development of interferometric arrays such as the Very Large Array (VLA) and the Atacama Large Millimetre/submillimetre Array (ALMA), enabling astronomers to achieve unmatched resolution and sensitivity in radio observations. These instruments have contributed to the study of exoplanets, gravitational waves, and the interstellar medium, expanding our understanding of the cosmos.

Furthermore, radio astronomy plays a vital role in the search for extraterrestrial intelligence (SETI). Projects such as the SETI Institute's Allen Telescope Array scan the skies for artificial radio signals that could indicate the presence of intelligent civilizations beyond Earth. While no definitive evidence has been found to date, the quest continues, fueled by advances in technology and our enduring curiosity about the possibility of life elsewhere in the universe.

In conclusion, radio astronomy stands as a cornerstone of modern astrophysics, offering unique insights into the universe's structure, evolution, and origins. From the discovery of pulsars and quasars to the confirmation of the Big Bang theory, radio observations have reshaped our understanding of the cosmos. With ongoing technological advancements and ambitious projects on the horizon, the future of radio astronomy promises even greater discoveries, ensuring that humanity's quest to unlock the universe's mysteries continues unabated.

WHAT FILLS THE SPACE BETWEEN THE STARS?

Sourajit Mandal , Club student

Have you ever wondered about how small and insignificant you are? No, not on Earth, I am talking in respect to the entire observable universe. The universe is huge. No, I mean it's extremely huge. Well that does not comprehend it. It's as big as... the human brain cannot even imagine how big it is. Your brain is simply not powerful enough to comprehend how big it is. But, there is a twist. The universe is empty. Most of it is... or is it?

Consider this analogy. Light will take a second to rotate around the Earth 7.5 times following the equator. It's the fastest thing in the entire universe. It is the universe's speed limit as we know it. Still, this light will take more than 4 years to reach Proxima Centauri-B, the closest star to the Earth after the Sun! But what fills this massive space in between? I mean, sure the planets and asteroids are present but they are also vastly separated from each other. What is between the celestial bodies? Is it really just nothingness?

There are about 1019 atoms in every cubic centimeter in the air that we breathe on Earth. In interstellar space, there is about 1 atom per cubic cm. That... is a lot of atoms. In between those atoms in emptiness. There is nothing. But, there's a twist... you too are 99.999999% empty. And so are most atoms in the entire universe. Allow me to explain.

There lies a lot of space between the nucleus and the electrons of an atom. It is a truly complicated topic but can be explained by an overly-simplified but rather common example. Imagine an atom expanded to the size of a baseball field. Then, you should not expect the nucleus to be more than the size of a peanut. All the rest of the baseball field is quite... empty. There lies nothing in between.

So... that's it... the universe is just mostly empty... and you are just a speck of dust in the vast empty universe. NO, THAT CANNOT BE TRUE. There has to be something!! Well good news for you... there in fact IS something, everywhere. Thanks to quantum physics there is a possibility that particles called "Virtual particles" exist. These particles are theorized to pop in and out of existence. They are thought to exist for about 10-22 seconds before disappearing again. These amazing particles are thought to pop in and out of existence everywhere. It is hypothesized that the acceleration of the expansion ofthe universe is because of such particles.

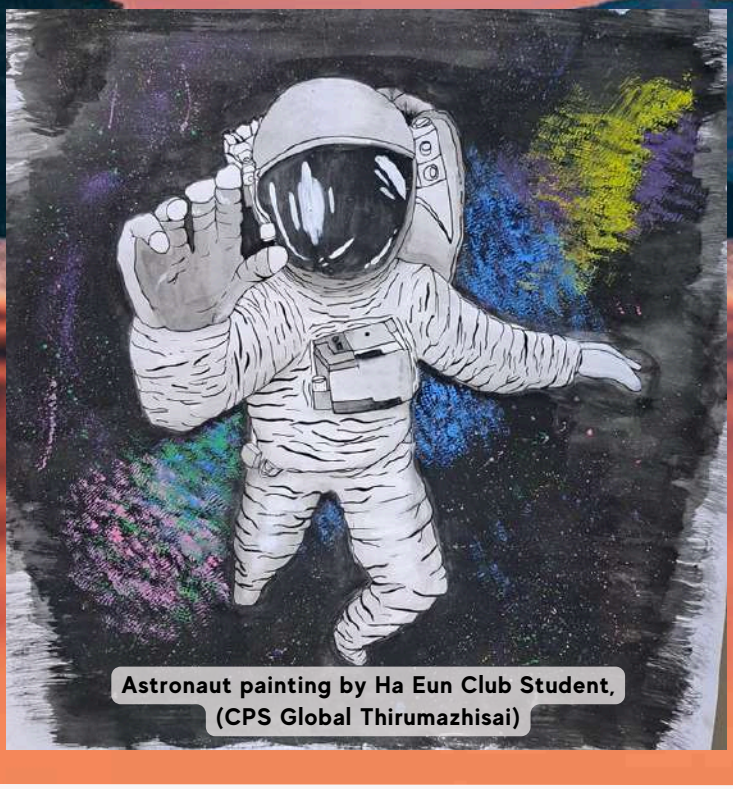
Surely all these virtual particles and quantum physics are very complicated topics and simplifying them accurately is not possible. Perhaps we will never fully understand what is actually empty and what is in the space between the stars. But we can try. We can always try our best to understand what our limited human mind can comprehend.

VISUAL ARTS FROM SPACE ASSOCIATED ASTRONOMERS

Moon Captured by Asheela Kalieeshwar, lastronomer

Astronaut painting by Hasini, Club Student(CPS Anna nagar)

Moon Captured by KS Riththika Club Student

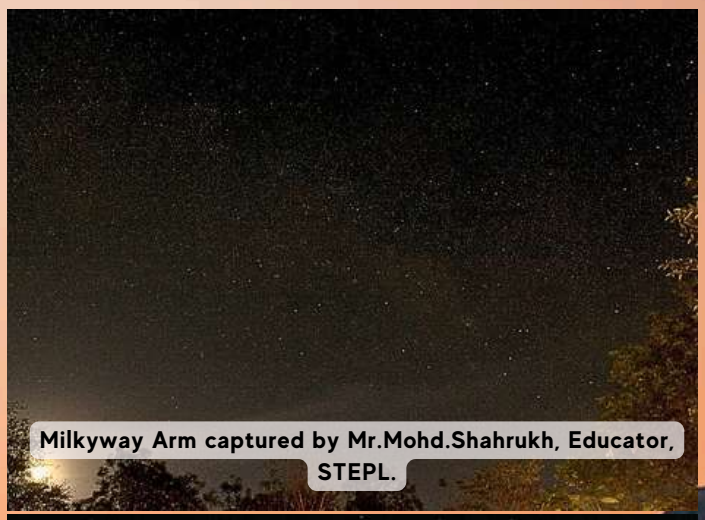


Astronaut painting by Ha Eun Club Student, (CPS Global Thirumazhisai)

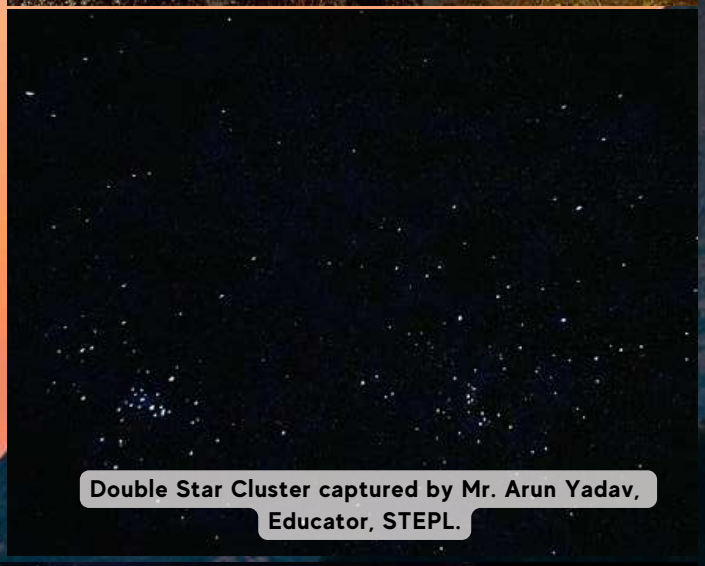
Jupiter and its Moon Captured by Manomay Pareek Club student

ASTROPHOTOGRAPHS BY SPACE

Moon Captured by Mr. Ranjith Kumar E, Team Lead, Education - Chennai, STEPL.



Milkyway Arm captured by Mr.Mohd.Shahrukh, Educator, STEPL.



Double Star Cluster captured by Mr. Arun Yadav, Educator, STEPL.

Orion Nebula captured by Mr. Javed Alam Educator, STEPL.

HISTORICAL EVENTS HAPPENED IN MAY

LIGHT THIS CANDLE

"Why don't you just fix your little problem and light this candle?"

On 5th May 1961, Alan Shepard spoke this line while waiting for ground control to deal with technical issues. By then, he had been strapped inside his Mercury capsule, Freedom 7, for four hours, with the launch being delayed by two hours. Shepard was ready to be the first American in space.

Alan B. Shepard suited up for his trip

That day was not the first time NASA attempted to launch Shepard. The first attempt, occurring a few days earlier, got cancelled because of inclement weather. On 5th May, the weather proved to be more cooperative, and Shepard climbed into Freedom 7 at the Cape Canaveral Air Force Station, known today as Cape Canaveral Space Force Station.

Alan Shepard was part of Project Mercury, the United States bid to be the first country to send a man to space. The project was initiated in 1958 by NASA's Space Task Group and was required to fulfil three objectives:

- To orbit a crewed spacecraft,
- To investigate man's ability to function in space,
- To safely recover both spacecraft and crew members.

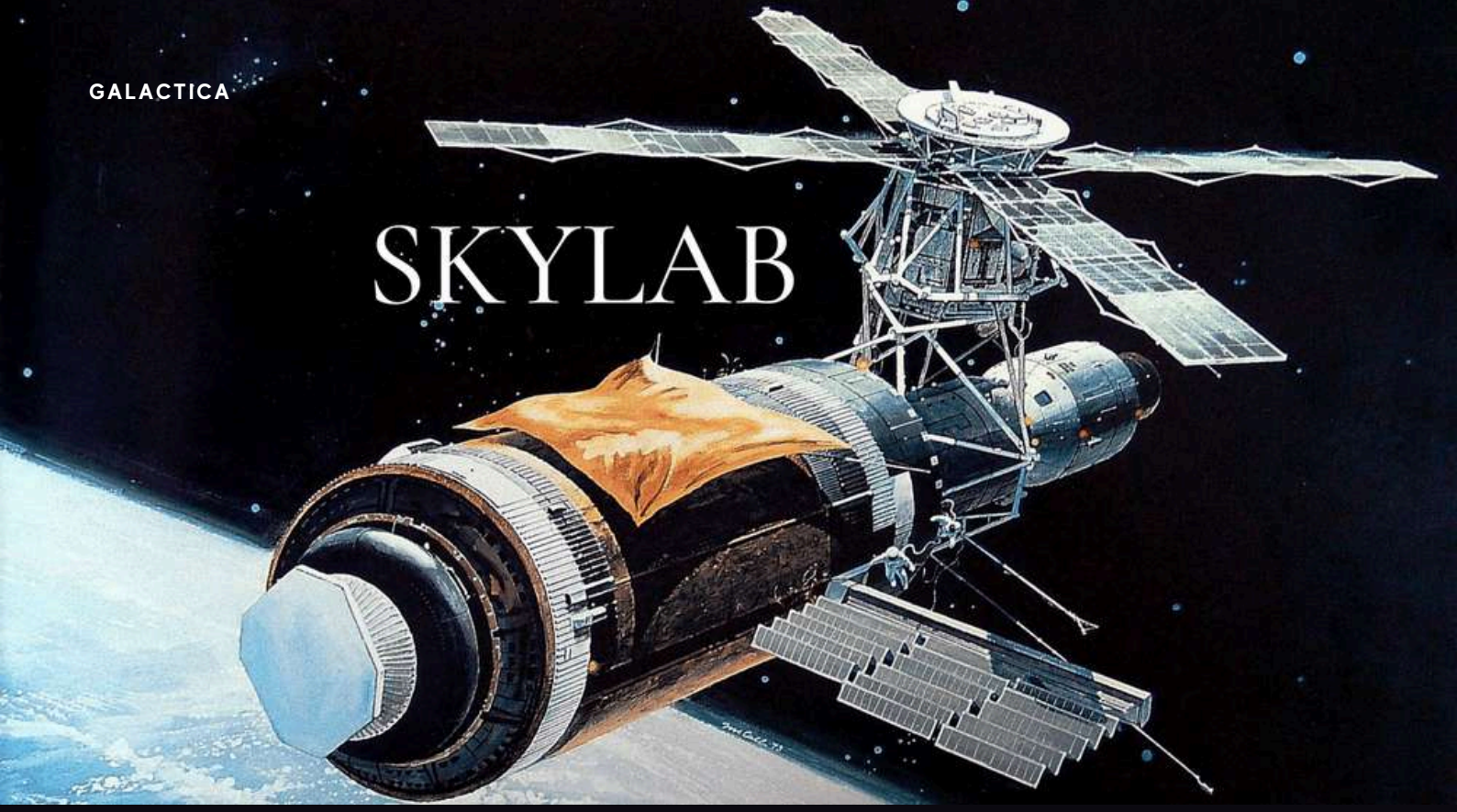
Initially, NASA aimed to launch seven suborbital flights, followed by Earth orbital missions. Corresponding to this plan, on 9th April 1959, NASA selected the seven astronauts to train. The group, who called themselves the Mercury 7, consisted of M. Scott Carpenter, L. Gordon Cooper, John H. Glenn, Virgil I. "Gus" Grissom, Walter M. Schirra, Alan B. Shepard, and Donald K. "Deke" Slayton.

Shepard, in honour of the group, included '7' in his spacecraft's name.

Shepard would not become the first human to travel to space. Yuri Gagarin claimed that honour when his Vostok spacecraft launched a few weeks earlier, on 12th April 1961. However, he did become the first American to visit space, reaching 187 km above the Earth's surface and spending 15 mins in a suborbital flight. Shepard's flight was publicized heavily, with half a million people watching at the launch site and an additional 45 million watching the event live from their homes. It was a distinct contrast to the secrecy of Gagarin's flight.

The success of Shepard's flight directly led to President John F. Kennedy's declaration that by the end of the 1960s, the United States would send a man to the moon. On 21st July 1969, Neil Armstrong became the first man to walk on the Moon.

SKYLAB



On 14th May 1973, a Saturn V rocket makes its final trip to space. Aboard it is a precious cargo Skylab. While not the first space station in space, Salyut was placed into orbit two years earlier, Skylab the United States's first space station. Till 2024, it is the only space station that NASA has exclusively maintained.
The Skylab program had two main objectives. It was to prove that humans could live and work in space for extended periods while expanding humanity's knowledge of the sun. During operation, the space station provided a detailed study of Earth, served as the greatest solar observatory of its time, acted as a microgravity and medical lab, and was a temporary home for its astronauts.

The launch of Skylab did not occur without any issues. During liftoff, its meteoroid shield got torn off the space station, causing the partial deployment of one of the solar array wings. A separate event did not allow the free movement of the second solar array, hindering power generation. Luckily, other equipment and spacecraft functions, such as the pressurisation of the space station, did not get affected.

However, repairs needed to take place to make the space station usable, and Skylab 2, the first crew to visit Skylab, had to carry it out while orbiting 435 km above the Earth's surface. The team spent a week stabilising Skylab, dealing with the overheating and finding workarounds for several issues.

Between 1973 and 1974, NASA pushed the boundaries of long-duration human space missions. Three separate crews of three spent 171 days and 13 hours aboard the space stations. While aboard, they conducted nearly 300 scientific and technical experiments, including medical experiments on humans' adaptability to zero gravity, observing the sun and detailed Earth resources experiments.

Skylab 4, the final crew that visited the Skylab space station spent 84 days aboard. At the time, the Skylab 4 crew stayed in space longer than all the earlier spaceflights combined. Their occupancy of space taught a lot about human endurance in long-term spaceflight.

Overall, Skylab taught us a lot about human spaceflight. It showed that humans could endure a long-term space flight while maintaining a space station and performing experiments. It also showed that they can remain in good physical health while living in the weightlessness of space. At the same time, it highlighted the downsides to long-term spaceflight, such as bone loss due to the lack of gravity and astronauts needed to move around in space. Additionally, scientists learned that food needs to be more flavourful due to a limitation in the astronaut's ability to taste food. They also learned that they need to plan an astronaut's schedule carefully to avoid the astronauts burning out.

FIRST OBSERVATION OF BAILY'S BEAD

When Francis Baily looked up to observe the annular solar eclipse on 15th May 1836, his goal was to time the length of the annular phase of the eclipse. He had made the relevant preparation for this, checked the accuracy of his watch, found a nice place to conduct his observation, and, most importantly, the weather was on his side, with clear skies all around. Even though he had never observed an eclipse before, he already expected that he would see something extraordinary. Unknown to him, his expectations would be surpassed. Below is an excerpt of his observation:

"...For when the cusps of the sun were about 40 degrees asunder, a row of lucid points, like a string of beads, irregular in size and distance from each other suddenly formed round that part of the circumference of the moon that was about to enter, or which might be considered as having just entered, on the sun's disc. Its formation indeed was so rapid that it presented the appearance of having been caused by the ignition of a fine train of gunpowder. This I intended to note as the correct time of the formation of the annulus, expecting every moment to see the thread of light completed round the Moon; and attributing this serrated appearance of the Moon's limb (as others had done before me) to the lunar mountains; although the remaining portion of the Moon's circumference was perfectly smooth and circular, as seen through the telescope. My surprise, however, was great on finding that these luminous points, as well as the dark intervening spaces, increased in magnitude; some of the contiguous ones appearing to run into each other like drops of water. Finally, as the Moon pursued her course, these dark intervening spaces were stretched out into long, black, thick, parallel lines, joining the limbs of the Sun and Moon: when, all at once, they suddenly gave way, and left the circumferences of the Sun and Moon in those points, as in all the rest, apparently smooth and circular, and the Moon perceptibly advanced on the face of the Sun..."

Francis Baily's description of the phenomenon was so vivid, it attracted an unprecedented amount of attention to the total eclipse of 8 July 1842.

However, Baily was not the first person to make such an observation. Sir Edmond Halley, the man who predicted the periodicity of Halley's comet, alluded to the phenomenon when he observed the total solar eclipse more than a century earlier. However, since Baily gave a better description, the phenomenon has been named after him.

Baily's Bead is a phenomenon observed during total and annular solar eclipse. It is observed when the moon "grazes" by the sun. During this, lunar topography, made up of mountains, craters, and valleys, allows beads of sunlight to shine through in some places and not in others. The most spectacular version of Baily's Bead is the diamond ring effect, which is seen when one bead is left.

FIRST SPACECRAFT TO ACHIEVE A SOFT LANDING ON MARS

After humanity landed on the Moon in 1969, the space race shifted its focus from the lunar neighbour to the Martian one. On 28th May 1971, Mars 3, the Soviet Union's third attempt to reach the Red Planet, launched from Baikonur Cosmodrome atop a Proton K rocket. Mars 3 launched nine days after its twin spacecraft, Mars 2. Both spacecraft comprised of an orbiter and an attached lander. On 2nd December 1971, Mars 3 became the third spacecraft to reach the Red Planet, after Mariner 9 and Mars 2. By then, planetary scientists learned that Mars was enveloped in a planet-wide duststorm, one of the largest storms ever observed.

As they were unable to reprogram the spacecraft computers, both Mars 2 and Mars 3 dispatched their landers immediately. Mars 2's lander crashed onto the Martian surface. This gave Mars 3 the opening to become the first spacecraft to successfully soft land on the Martian surface. This success fulfilled one of the lander's primary scientific objectives. Unfortunately, as the lander failed softly after landing, it couldn't return images from the surface or data on Mars' meteorological conditions, atmospheric composition, and mechanical and chemical properties of the soil.

Till today, the exact reason for failure was never established. However many possibilities have been raised, such as dangerous horizontal speed during landing, a voltage spike in the transmitter's antennas, due to the dust storm or battery damage.
Mars 3's orbiter continued operating, sending data about the atmosphere composition, magnetic field and plasma back to Earth from December 1971 till March 1972. Transmissions from the orbiter continued until August 1972.

The images and data returned revealed that Mars has mountains as high as 22 km, atomic hydrogen and oxygen in its upper atmosphere, and surface temperatures ranging from −110 °C to +13 °C. It also gave an insight into the surface pressure, water vapour concentration, Mars' gravity and the planet's magnetic field.
On 22nd August 1972, scientists announced that Mars 3's mission was complete after 20 orbits around the planet. Mars 3 burned up in Mars' atmosphere, giving the scientists more valuable data. from
Today, Mars 3 is a forgotten relic from the space race, overshadowed by other, more successful missions of its time. Yet Mars 3 belongs among the greats. Its legacy is best characterized as a lesson in persistence and a reminder that individuals of extraordinary intelligence and creativity worked in the Soviet space program.

NEWSLETTER

April marked a significant milestone as we celebrated **Space India's 24th Foundation Day!** Under the open sky, we came together to reflect on our incredible journey–full of memorable moments and extraordinary achievements. It was also a time to appreciate the hard work and dedication of all our colleagues, whose contributions have been instrumental in reaching new heights.

The celebration recognizes both the company's successes and its significant learnings, which ultimately led to growth and achievement. As an organization, we expanded our presence across India - reaching out new territories like Mumbai, Ludhiana, Lucknow, Pune, Bangalore, and others, this year. Our team has grown from 60 colleagues to 150 and growing. It's a source of pride to see our SPACE India grow month by month and year by year.

The celebration began with our esteemed founders, Dr. Sachin Bahmba and Ms. Shalini Bahmba, along with our directors, Mr. Shivam Gupta and Mr. Mitul Jain. The day was filled with excitement as we commenced the celebrations with the traditional lighting of the lamp, followed by captivating performances that set a festive tone. Our Chief Technical Officer, Mr. Vikrant Narang, extended warm greetings and emphasized the importance of this occasion. Our Assistant Director, Ms. Manalee Deka, then shared stories from Space's journey, reflecting on the perseverance, successes, and challenges that have shaped our history.

Dr. Sachin Bahmba, our CMD, delivered a powerful message about honoring our frontline soldiers and our commitment to supporting the UN Sustainable Development Goals. Moreover, SPACE India teamed up with the Sabal India Foundation (non-profit organisation) and invited over 20 children for a captivating educational experience focused on space, science, and astronomy. The event included a tree plantation initiative and a donation drive to support the foundation's educational efforts.

BEYOND AND ABOVE AWARD - MAYUR SOLANKI

RISHING SPACIAN OF THE YEAR - MONTY

SPACIAN OF THE YEAR - VIKRANT NARANG

SPECIAL RECOGNITION - DHAN SINGH BORA

CLIENT APPRECIATION - MUSKAN MALHOTRA

EMERGING LEADER - NEERAJ ROHILLA

Followed by an awards ceremony - held to honor the exceptional efforts of Spacians. Awards were distributed across six categories, recognizing individuals who demonstrated excellence and dedication. The winners were:

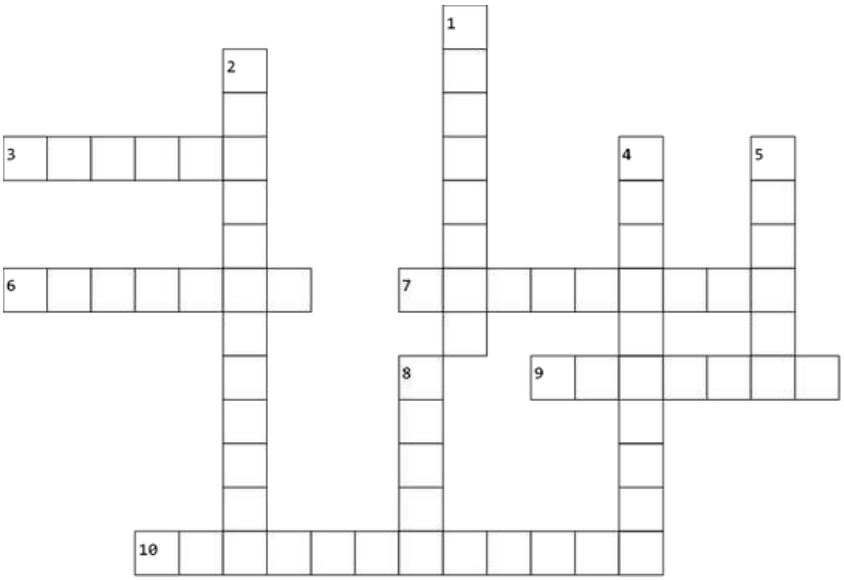
Rising Spacian of the Year: Mr. Monty
Beyond and Above Award: Mr. Mayur Solanki
Emerging Leader Award: Mr. Neeraj Rohilla
Client Appreciation Award: Ms. Muskan Malhotra
Special Recognition Award: Mr. Dhan Singh Bhora
Spacian of the Year Award: Mr. Vikrant Narang

Our CEO, Mr. Neetin Gusian, and CEO, Space Technology & Education Pvt. Ltd., Ms. Avani Patwa, shared heartfelt closing remarks.

Overall, it was a day filled with music, dance, trivia games, and heartfelt speeches, celebrating our past achievements while focusing on future goals. A special thank you to everyone who worked tirelessly to ensure the event was a success. Your efforts truly made this celebration a memorable one.

TRAIN YOUR BRAIN

CROSSWORD



Across

3. Name a space telescope launched on 24th April 1990.
6. Name the lander that detected seismic activity Martian surface in 2022.
7. Which particles are referred to as ghost particles?
9. Name the flying chariot in Ramayana.
10. Who received the first Kavil prize for Astrophysics?

Down

1. What comet caused the Lyrid Meteor Shower?
2. Which telescope captures a first view of polarized light and magnetic fields surrounding Sagittarius A?
4. Comet 12 P is also known as?
5. Where was the Cosmonautics Day commemorated on 12th April 2024?
8. Which month is celebrated as Global Astronomy Month?

ASTRONOMY WORD PUZZLE

Find the constellations from the mixed letters and mark them.

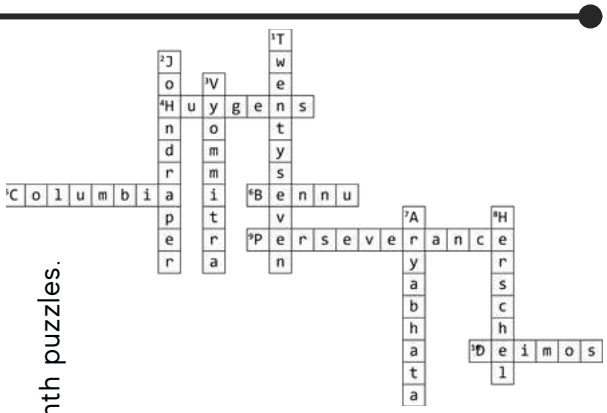
CONSTELLATIONS

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

BOOTES
HYDRA
ANTLIA
CARINA
AURIGA
FORNAX
ANDROMEDA
AQUILA
ERIDANUS
DORADO
LEPUS
CAELUM
HERCULES
DELPHINUS
CASSIOPEIA

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

Answers for last month puzzles.



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