

HAYKA



20
24

VOL. 3

**SOMEWHERE, SOMETHING
INCREDIBLE IS WAITING
TO BE KNOWN**

-Sharon Begley

THE HAYKA MAGAZINE



TABLE OF CONTENTS

1

FROM THE PRINCIPAL'S DESK

2

FROM THE VICE PRINCIPAL'S DESK

3

FROM THE STAFF EDITOR

4

FROM THE EDITORIAL BOARD

5

SPACE RESEARCH ORGANISATIONS

6

ARTICLES ON SPACE

7

HAYKA LEISURE





FROM THE PRINCIPAL'S DESK

**“Sometimes you have
to go really high to
know how small you
really are.”**

Space, the final frontier has encaptured humanity for centuries, with its vastness, mysterious and breathtaking beauty. Space continues to fascinate scientists and enthusiasts alike. The magnificent studies were achieved by numerous missions like NASA's Artemis Program, Space X, and Blue Origin. The James Webb Telescope has tried to reveal the secrets of the universe. As technology advances and International collaboration grows, we can expect further human exploration of Man and beyond, breakthroughs in asteroid mining and space-based solar power, unveiling the secrets of The Cosmos and much more. Space exploration is an ongoing journey driven by human curiosity and ingenuity. As we push the frontiers, such profound efforts by our budding explorers through "HAYKA" may help uncover answers to age-old questions and discover new wonders.

All the best Team HAYKA

**Mr Ajay Singh
Principal
The Scindia School**

FROM THE VICE PRINCIPAL'S DESK



**“Everything is
theoretically
impossible until it is
done.”**

We are living in an extraordinary era of space exploration, where the boundaries of human knowledge are being expanded beyond our planet. The future holds immense potential for the study of space, the possibility of living in space colonies, and even tourism on distant planets. As these frontiers open up, space science must become an integral part of school curricula, equipping students with the knowledge and curiosity to meet the challenges of tomorrow.

It is essential that students develop a scientific temperament, fostering critical thinking, creativity, and problem-solving skills that will be vital in this ever-evolving landscape. The interests of today's students are diverse, and through this magazine, we aim to provide a platform for them to share their ideas, perspectives, and discoveries.

By encouraging open dialogue and exploration of scientific topics, this publication seeks to ignite curiosity, inspire innovation, and help shape the minds that will lead the next wave of advancements in space science and technology. Together, we can cultivate a generation of thinkers and explorers ready to navigate the unknown and contribute to a brighter, more innovative future.

The Hayka magazine aspires to be more than just a source of information—it aims to be a catalyst for inspiration and engagement. By providing a space for students to share their ideas and insights, we are fostering a community of young minds ready to explore the universe and tackle the challenges of tomorrow. As we look to the stars, let this magazine serve as a reminder that the future of space exploration begins in the classrooms of today, and with the curious minds that fill them. Together, let us nurture the spirit of discovery and prepare our students to boldly go where no one has gone before.

**Ms Smita Chaturvedi
Vice Principal
The Scindia School**



LETTER FROM THE STAFF EDITOR

“There are billions of places out there that we know nothing about and I want to go out and find out about them and that's what science is..”

Dear Readers,

It gives us immense pleasure to release the third edition of annual science magazine, Hayka. The Hayka Magazine covers various fields of Space Science I believe that space science magazines play a crucial role in expanding students' horizons and nurturing their curiosity about the universe. Hayka, with it's captivating articles and interviews, ignite a sense of wonder and awe in students. They provide a gateway to understanding complex scientific concepts such as planetary exploration, cosmology, and astrophysics in accessible ways. These magazines not only stimulate interest in STEM fields but also encourage critical thinking and inquiry-based learning. By exploring the mysteries of space, students develop a broader perspective of our place in the cosmos and gain insights into the technological advancements driving space exploration. Ultimately, space science magazines inspire a new generation of explorers, scientists, and innovators who will shape the future of space exploration and scientific discovery.

We hope that you will learn something new with us and heartfully welcome the release of Hayka.

Happy Reading

**Mr Rahul Bharadwaj
Science Faculty
The Scindia School**

FROM THE EDITORIAL BOARD

“Science is simply common sense at its best.”

Dear Readers,

Welcome to the latest edition of Hayka! We're delighted to have you with us on this exciting journey through the cosmos. As your editorial board, our mission is to make the wonders of space science accessible and engaging for young minds like yours. Each issue is meticulously designed to spark your curiosity and expand your understanding of the universe, whether it's through exploring the latest space missions, unraveling the mysteries of black holes, or delving into the science behind cosmic phenomena.

In this issue, you'll find articles that cover a range of topics—from the cutting-edge technologies that make space exploration possible to the intriguing behaviors of distant celestial bodies. We aim to present these complex subjects in a way that is both informative and captivating, encouraging you to delve deeper and think critically about the universe around us.

Remember, the study of space science is not just about understanding what exists beyond our planet; it's about fostering a sense of wonder and curiosity that drives innovation and discovery. As you read through our articles, let your imagination take flight and think about how you might contribute to the field in the future.

**Happy Exploring!
Team Hayka
The Scindia School**



SPACE RESEARCH ORGANISATIONS ACROSS THE GLOBE



HAYKA-24

05

THE MAGNIFICENT

7

ISRO (Indian Space Research Organisation) is a government space agency that can conduct space shuttle launches, deploy cryogenic engines, launch extraterrestrial missions, and operate a large fleet of artificial satellites. In 1972, the government of India set up a space commission which flourished with the help of the DoS. The establishment of ISRO thus resulted in the growth of space research activities in India. ISRO has recently developed a high-thrust cryogenic engine which has been classified as one of the most powerful engines and has made India proud.



NASA, which stands for the National Aeronautics and Space Administration of USA, is an agency that does its bit to preserve the same nature and world. Established in 1958; succeeded the National Advisory Committee for Aeronautics able to accomplish the U.S. space development effort with a distinctly civilian orientation and to confront the Soviet Union in the Cold War Space Race; the Space Act was signed on July 29, 1958. Since then, it has conducted most of America's space exploration missions, with the 1968-1972 Apollo Moon landings and the Space Shuttle. NASA primarily focuses on understanding the Earth through the Earth Observing Systems which has helped humankind take its step towards the future.

The **European Space Agency** is a 22-member intergovernmental body that is devoted to space research and helping the world advance into the future. The headquarters of the European Space Agency are situated in Paris, and it was founded in 1975. ESA usually conducts human spaceflight and launches crewless explorations to other planets.



The **China National Space Administration** is the national space agency of China, responsible for the planning and development of space activities. These duties include overseeing or planning international exchanges and cooperation in the aerospace sector. As an administrative body, the CNSA reports to the nation's cabinet, the State Council, and has responsibility for the planning and development of space activities.

SPACE RESEARCH ORGANISATIONS

SpaceX, founded by Elon Musk in 2002, aims to reduce space transportation costs and establish a sustainable colony on Mars. It manufactures Falcon rockets, operates Dragon and Starship spacecraft, and offers internet services via Starlink, the largest satellite constellation with over 6,000 satellites as of April 2024.



The Roscosmos State Corporation for Space Activities, commonly referred to as Roscosmos, is a state corporation within the Russian Federation. It oversees space flights, cosmonautics programs, and aerospace research. Originating from the Soviet space program of the 1950s, Roscosmos was established after the dissolution of the Soviet Union in 1991. Initially known as the Russian Space Agency, it was founded on February 25, 1992.

ПОККОСМОС

The Japan Aerospace Exploration Agency is Japan's national air and space agency. Through the merger of three previously independent organizations, JAXA was formed on 1 October 2003. JAXA is responsible for research, technology development, and the launch of satellites into orbit, and is involved in many more advanced missions such as asteroid exploration and possible human exploration of the Moon. Its motto is One JAXA and its corporate slogan is Explore to Realize. JAXA has been researching and developing technologies to receive faint downlink light from a satellite using a small telescope at an optical ground station. This includes automatically acquiring and tracking the light using image processing technology for future applications in high-speed optical communications between space and ground.





ARTICLES

THE ENIGMATIC BEAUTY OF THE HALLEY'S COMET

Edmond Halley, an astronomer from the United Kingdom, lent his name to a comet that is regarded as one of the most famous in history. This comet has been around for approximately 76 years and consequently held human beings' attention for centuries now. It still fascinates both experienced astronomers and inexperienced stargazers because of its mystic beauty.

Discovered by Edmond Halley in 1705, this is a periodic comet with historical records dating back millennia. After that it reappeared in 1986, this time becoming visible to terrestrial observers after a long break. The realization that these kind of comets were repeating visitors was a major milestone in terms of understanding their orbits and provided crucial evidence for Newtonian physics. Among other things found out through the investigation into various cultures such as ancient China, Babylonians or medieval Europeans who referred to different celestial anomalies but all pointed towards one object - Halley's Comet we know today.

Halley's comet, due to its study of composition, structure and behavior; provides important scientific details that in turn explain the nature of comets and the process by which our solar system came into existence. For example, Giotto probe was sent by European Space Agency into space 1986 so as to understand what goes on inside Halley's comet and nucleus which are puzzling features.

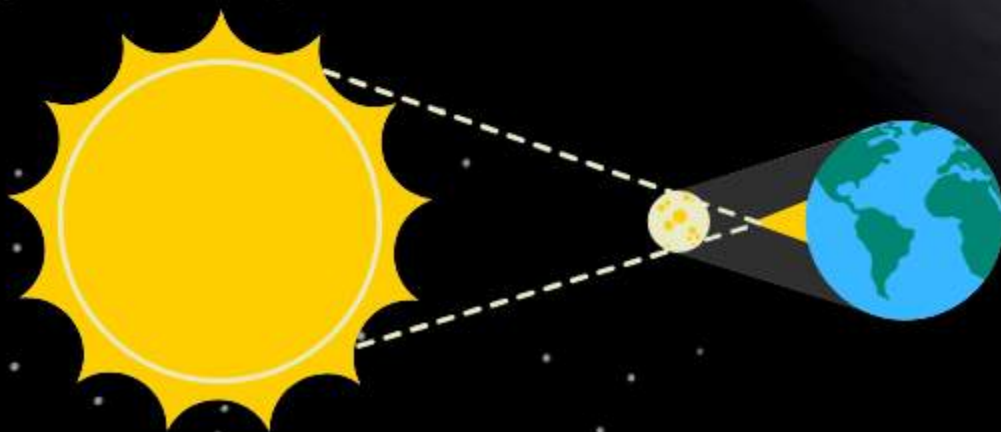
Halley's Comet is due to come back in our skies once more in the year 2061 and this will give a chance for the forthcoming generation to have a glimpse of its celestial magnificence. The next visitation will, however, be equipped with better technology than previous ones with which it will try to establish facts on the comet's structure, composition and behavior. While we await eagerly for the return of Halley's Comet, it should remind us that beyond Earth is extensive beauty and many unknowns. Very famous author mark twain was born on the year that it came and died on the year that it reappeared.

TOTAL SOLAR ECLIPSE, APRIL 8 2024

In a total solar eclipse, the Sun is fully obscured by the Moon. In partial and annular eclipses, only a part of the Sun is obscured. A total solar eclipse is revered as it is the only chance for a civilian to be able to see the Sun's Atmosphere, which is known as the Corona. It is the layer from which solar flares are ejected and is a very important part of the Sun. Unlike a lunar eclipse which we can view from anywhere on the night side of THE Earth, a solar eclipse can only be viewed from a relatively small area of the world. As such, although total solar eclipses occur somewhere on Earth every one and a half months on average, they recur at any given place only once every 360 to 410 years. This is one of the reasons that this event was significant the other being that it was the second total solar eclipse to be seen in America since independence.

The path of the eclipse continued from Mexico, entering the United States in Texas and leaving it through Maine. The eclipse entered Canada in Southern Ontario, and the eclipse exited continental North America on the Atlantic coast of Newfoundland, Canada, at 5:16 p.m. NDT.

People across the country got ready with solar viewers and even attractions like the world's largest solar viewer were made for this event.



STAR COLORS: A KEY TO THEIR UNDERSTANDING

Stars are very interesting objects in the sky, and their colour is an important key to knowing what temperature a given star is, as well as what composition of elements it is composed of. The relationship between a star's color and its temperature is found in a concept known as black-body radiation, which explains how objects emit light based on their temperature.

Stars emit light across all wavelengths within the spectrum and may, in general, be divided into five groups—blue, white, yellow, orange, and red. Colour is another characteristic which can be easily linked to the surface temperature of a star, in Kelvin (K). The colors that a star will emit depend on its temperature; when above 10,000 K in blue light. Such stars, like Sirius, are incredibly bright and burn at high rates due to nuclear fusion.

A cooler temperature means that stars emit light warmer in hue. A star with a surface temperature as close to 5,800 K as our Sun has a yellowish-white color. Any star's temperature smaller than 3,500 K is considered cooler and is represented by a red light hue. This gradient illustrates a key principle: the higher the temperature, the bluer the color of the star; the cooler the star, the redder its color.

This relationship is quantified by the Hertzsprung–Russell diagram and stars are plotted according to luminosity and temperature, which reveals a clear grouping. Since astronomers know what colors stars possess, they can classify stars into groups, which gives them an insight into their life cycle, age, and distances. The knowledge comes by studying the characteristics of stars, which in turn gives greater understanding of the universe and the stellar evolutionary process.

EARTH OBSERVATION SATELLITES

A detailed illustration of an Earth observation satellite in orbit. The satellite is shown from a perspective that highlights its solar panels, a large parabolic antenna, and various instruments. Below the satellite, the Earth is depicted with realistic cloud patterns and colors, showing the curvature of the planet. The background is a dark, starry space.

An Earth observation satellite or Earth remote sensing satellite is a satellite used or designed for Earth observation (EO) from orbit, including spy satellites and similar ones intended to monitor energy radiated by the Sun for solar research that includes data on particles from the Sun. Most Earth observation satellites carry instruments that should be operated at a relatively low temperature. Many orbit polarimetric imaging devices have improved technology to measure a wide variety of phenological changes

The first occurrence of satellite remote sensing can be dated to the launch of the first artificial satellite, Sputnik 1, by the Soviet Union on October 4, 1957. Sputnik 1 sent back radio signals, which scientists used to study the ionosphere. The United States Army Ballistic Missile Agency launched the first American satellite, Explorer 1, for NASA's Jet Propulsion Laboratory on January 31, 1958. The information sent back from its radiation detector led to the discovery of the Earth's Van Allen radiation belts. The TIROS-1 spacecraft was launched by the United States on April 1, 1960 as part of NASA'S Television Infrared Observation Satellite (TIROS) program; it sent back to ground stations the first television footage of weather patterns taken from space.

Most Earth observation satellites carry instruments that should be operated at a relatively low altitude. For VHR (very high resolution) optical and radar sensors only long time series of data can provide valuable information on the seasonal effects in forests and crops and other land use factors. Hence these Earth observation satellites are placed in Sun-synchronous orbits at an altitude of about 800 km (500 mi).

SUPERNOVAS

A Supernova is one of the most dramatic events in the universe, marking the explosive death of a star when it can no longer sustain nuclear fusion. There are basically two kinds of supernovae: Type I and Type II.

Type I Supernovae occur in binary systems with a white dwarf. At the end, material it is accreting from its companion fills up the mass of the white dwarf to roughly 1.4 times that of the Sun, and then carbon will start fusing rapidly in a thermonuclear explosion that outshines all the stars of a galaxy and sends elements into space.

Type II Supernovae stem from the core collapse of heavy stars with a mass of more than eight times that of the Sun. The nuclear fuel depletion causes the star's core to shrink to a smaller size, and its outer shell expands into a red supergiant. When the core reaches an iron buildup and its fusion stops, it collapses, sending the outer material of the star into a cosmic explosion while spreading heavy elements necessary for making planets.

Supernovae are the important constituent in the cosmological economy; they distribute heavy elements and, therefore, are essential for the star and planet formation in the stars. They compress surrounding gas clouds that can spur nearby star formation.

Astronomically, supernovae have assisted scientists as "standard candles" to measure cosmic distances, basically due to their predictable brightness. Indeed, research on supernovae has also shed light into the understanding of the expansion of the universe specifically in terms of dark energy.

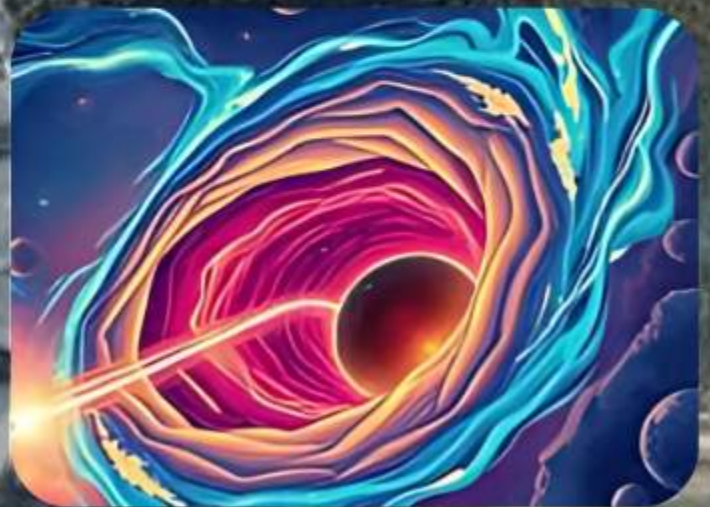
WORMHOLES



The universe holds many wild thoughts that grab our interest. One of the most amazing ideas is wormholes. These imagined paths through space and time are seen as doors to distant stars or even other worlds. This idea draws in scientists. Fans of the stars find it very exciting too. In theory, wormholes are like shortcuts through space and time. They link two different places, making it quicker to move stuff. This idea comes from the thought that space and time can bend if there's enough mass and energy around, like when you fold a sheet of paper to make a curve.

But the actual existence of wormholes is just a guess. While a lot of ideas hint they are real, we haven't seen proof in the big sky.

Yet, scientists keep thinking about this idea to know more about the universe.



Wormholes' possibility to enable interstellar travel is one of their most fascinating aspects. Given a stable wormhole between distant points in space and time, the astronauts may take centuries to travel through cosmic distances that normally require them millions of light years so as to achieve it - unless they can be made to fly faster than the speed of light.



However, it is still doubtful whether such journeys through wormholes are feasible. The presence of mass and energy within a wormhole might affect its structural integrity, causing either its collapse or strange things coming up.

Wormholes make us wonder about reality itself. If these hypothetical constructs did exist, could they function as doorways leading into dimensions unlike our own or help us talk to our past and future selves, maybe even manipulate time per se? This enables unlimited speculation.

To sum up, it remains unproven if wormholes exist in real life or not, hence they still belong to the mysterious side of theoretical physics. These are the subjects that capture both young and old minds alike reflecting on the timeless attraction of celestial enigmas.



MYSTERIOUS HOLES ON MARS

Mysterious 'hole' on Mars could be scientific jackpot for future home for astronauts and human colonization

What are those mysterious holes on Mars?

The holes, aka pits, are located on the flanks of ancient volcano in Mars's Tharsis region, the largest volcanic region on the red planet and home to some of the biggest volcanoes in our solar system like Olympus Mons, Arsia Mons.

The pit, which is only a few meters across, was actually imaged on Aug. 15, 2022 by NASA's Mars Reconnaissance Orbiter, which was about 159 miles (256 kilometers) above the Martian surface at the time.

Potential Significance -

1. Safety and Shelter for future human race - These pits have a significant potential that not only provide shelter to the future astronauts providing shelter and safety from the solar radiations making it significant for the development of human habitation.



- 2. Study of ancient microbial Studies and Past Habitability –** These pits could provide a vast knowledge regarding past martial life as they can harbor the traces of ancient microbial life offering valuable insights of past microbial habitability.
- 3. Future Exploration landing site –** The NASA's Ingenuity helicopter could provide us new perspectives by hovering over and descending into the pits. If these pits do open up into caves, they may become a preferred landing site for future crewed missions to Mars that will require astronauts to build a sheltered base camp away from the world's unrelenting radiation.

Conclusion –

It still remains a mystery how deep these holes descend. In addition, it is also unclear whether these holes open into a large cavern or they are contained to a small, cylindrical depression.

The report concluded by saying that if these pits open up into caves, in future they may become a preferable landing site for crewed missions to Mars. Such a mission would require the astronauts to build a sheltered base camp far from the world's unrelenting radiation.

MY ARYABHAT ADVENTURE



After qualifying in the top 50 students for the final round in Madhya Pradesh, In a competition in which 8,323 students had participated, I bagged the 9th position in The Aryabhat Astronomy Quiz 2024. This victory allowed me to visit The Udaipur Solar Observatory and the Gurushikhar Observatory in Mount Abu.

I embarked on this Journey on the 18th of May, and after a tiresome yet fun train journey, I reached Udaipur on the morning of the 19th. In Udaipur, I visited the City Palace, the 'Under the Sun' Aquarium, and the Maharana Pratap Park, but most important of all, I visited The Udaipur Solar Observatory where we gave a presentation on the Evolution of Astronomy. There, I met many researchers and saw many telescopes including the SPAR Solar Full Disk Telescope, the GONG (Global Oscillations Network Group) Telescope, which is a set of solar telescopes used to measure the sun at any time, and, most importantly, the MAST (Multi Application Solar Telescope), which is largest Solar Telescope in India with an aperture of 50 centimeters. Here, I also got the chance to interview Dr. Nandita Srivastava, a CME researcher there.

The following morning, we left for Mount Abu, The Beautiful Hill station of Rajasthan. There, I got to visit GOALS (Gurushikhar Observatory for Astrophysical Sciences), Where I got a rare chance to see the TACTIC Gamma Ray Telescope which had a huge 4-meter aperture. Next, I visited the Gurushikhar Observatory, where, I was entitled to see India's 3rd largest telescope, The Gurushikhar 2.5m Optical Telescope, and also gave a presentation to the researchers there.

In the end, this was a very fruitful trip, and I enjoyed it very much. I thank Mr. Akash Verma and Mr. Sanjay Gupta, from Aryabhat for the trip, Rahul Sir and Sangeeta Ma'am for their everlasting support, and Principal Sir and Vice Principal Ma'am for the opportunity.

An Interview of Dr. Nandita Srivastava



Dr. Nandita Srivastava is a CME (Coronal Mass Ejection) researcher at the Udaipur Solar Observatory of the Physical Research Laboratory. She has more than 20 years of experience in the field and has worked with many researchers and scientists of different countries. Here, Aadi Dev Goel has asked a few questions

- Ma'am, how did you find out that you wanted to become a research scientist?
- So, I always had an interest in the sun and it always motivated me, I also felt that it was important to have awareness about space. Fast-forward to 12th class, and I had taken this as my career opportunity.
- Ma'am, please tell me something about your field of research?
- As you know, I am a Coronal Mass Ejection researcher and in this field, I research about the solar flares and what they do, well, the field is always interesting as it also involves auroras, and recently, they have been a pretty interesting subject as most of us know how they were recently visible in lower latitudes like Ladakh.
- How do you keep yourself motivated?
- Actually, the sun is a very motivating subject for me and for its unpredictability, so I do not need to keep myself motivated.
- What are your goals?
- My dream goal is to predict when CMEs occur, but as that is almost impossible, I think that a more possible goal will be to calculate when they occur and study them
- What do you like to do in your free time?
- In my free time, I like to listen to music. As I have travelled to many countries for my profession, I have also studied their music.





FACTS ABOUT ASTRONOMY

1. Space science dates back to ancient civilizations like Babylon, Egypt, and Greece, who studied stars and planets. It was not until the 1900s, however, that space science advanced significantly with human space exploration.

2. The Space Race was a competition between many countries to advance in space exploration. In 1957, the Soviet Union launched Sputnik 1, sparking a rivalry with the United States that led to milestones like the first human in space and the Apollo moon missions.

3. Space science investigates stars, planets, and galaxies, using telescopes to explore distant events and the early universe. Robotic probes and rovers have explored planets like Mars and moons such as Titan, revealing new and intriguing discoveries.

4. The future of space science promises exciting developments, from moon missions and Mars exploration to searching Jupiter's and Saturn's moons for signs of life. This quest reflects humanity's drive to explore and understand our universe, enhancing our knowledge and potentially improving life on Earth.

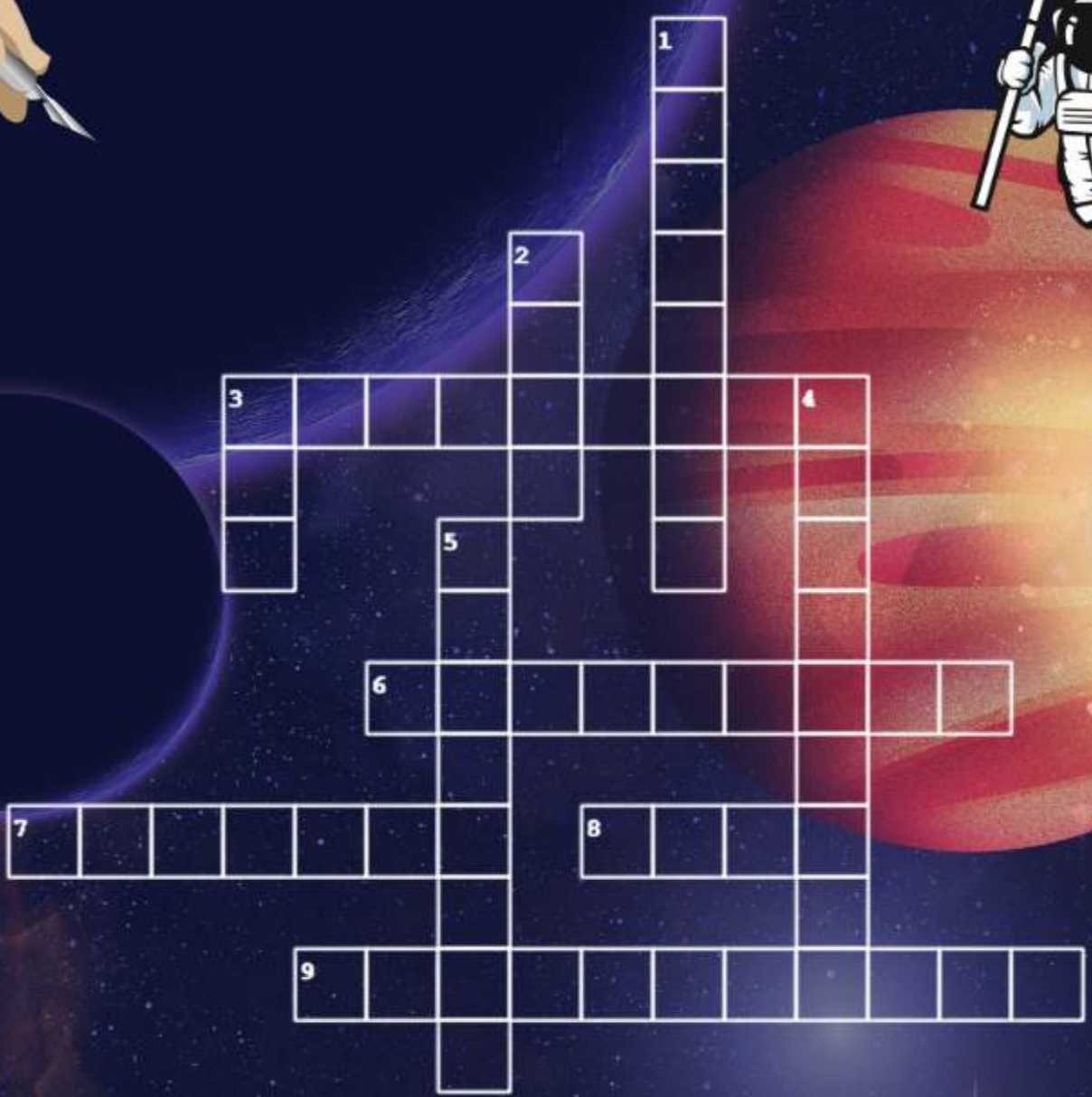
SCIENCE RIDDLES

1. I SEE ALL BUT CANNOT BE SEEN, FAR ABOVE WHERE THE SKY IS CLEAN. I TRANSMIT NOTES FROM AFAR, HELPING YOU NAVIGATE, NEAR AND FAR. WHAT AM I?
2. WHY DID THE SUN GO TO SCHOOL?
3. WHAT IS ALWAYS HUNGRY, BUT NEVER SATISFIED? IT CAN SWALLOW HUMONGOUS OBJECTS, BUT IT'S NO BIGGER THAN A POINT?
4. WHAT IS AN ALIEN'S FAVORITE OUTDOOR GAME TO PLAY WITH HUMANS?
5. I AM THE BEGINNING OF THE END AND THE END OF TIME AND SPACE. I AM ESSENTIAL TO CREATION, AND I SURROUND EVERY PLACE. WHAT AM I?

MASTER RIDDLE

I AM STRONGEST WHEN YOU SEE ME AS ROUND, BUT I AM OFTEN VIEWED IN OTHER FORMS. I LIFT AND DROP THE SEA WITH MY STRENGTH, AND A MAN WITH A NAME LIKE 'POWERFUL BICEP' WAS THE FIRST TO WALK ON ME. WHAT AM I?

CROSSWORD PUZZLE



ACROSS

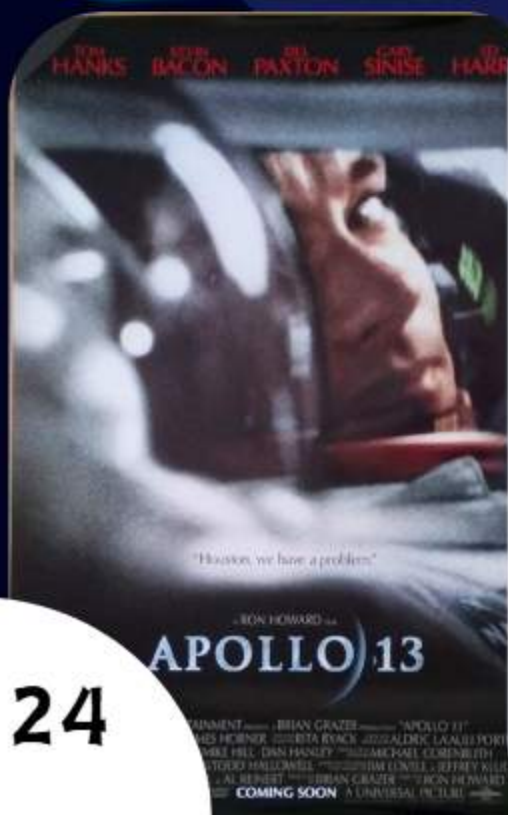
- 3. THE EXPLOSION OF A DYING STAR.
- 6. AN OBJECT WHOSE GRAVITY IS SO STRONG, NOT EVEN LIGHT CAN ESCAPE.
- 7. THE PLANET CLOSEST TO THE SUN
- 8. NAME OF INDIA'S SPACE AGENCY.
- 9. THE NAME OF INDIA'S MOON MISSIONS.

DOWN

- 1. BLACK DOTS ON THE SUN'S SURFACE.
- 2. THE INNERMOST LAYER OF THE EARTH.
- 3. THE CLOSEST STAR TO EARTH.
- 4. THE STUDY OF THE MOON, STARS, AND OBJECTS IN SPACE.
- 5. NAME OF OUR GALAXY



Movie Recommendations



SCIENCE DEPARTMENT



Left to Right:

Top row: Mr Mukesh Chawla, Mr Aniket Garud, Dr Ishani Roy Chowdhury, Ms Mrinal Bhatt, Mr Pulkit Sharma and Mr Rahul Bharadwaj (Staff Editor)

Bottom row: Ms Sangeeta Jain (HOD: Science), Ms Niharika Kulshreshth, Mr Ajay Singh (Principal), Ms Smita Chaturvedi (Vice Principal) and Mr Akash Sharma

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