THE SCIENCE MAGAZINE

QUANTA

FROM THE EDITORS' DESK

Pahel Agarwal and Avni Agarwal

Welcome to this year' s edition of Quanta - the MCGS Science Magazine!

As we embarked on creating this edition of the Science magazine, our vision was clear: we wanted to present science in a way that is not only engaging but accessible to everyone. Our aim was to bridge the gap between complex scientific ideas and everyday understanding, so that readers of all ages could connect with the wonders of discovery and invention. In recent years, as we've faced some of humanity's greatest trials, it has been science that has provided us with solutions, hope, and the drive to move forward. This issue celebrates that spirit of resilience and exploration.

This issue covers a range of thought-provoking topics, from the age-old clash between Science and Superstitions to the cutting-edge innovation of Graphenesis. We explore the challenges faced with modern-day science, the Paleo Diet, and the journey into the cosmos with discussions on Astronomy, Supernovae, and life cycle of stars. Science, at its core, is about curiosity—the drive to question, explore, and create. We hope that within these pages, you will find both inspiration and insight into the discoveries that are shaping tomorrow.

This magazine would not have been possible without the guidance of the Science Department teachers. We hope this magazine brings you as much joy as we had while creating it.
For us, it represents the conclusion of our time within the walls of school.

Enjoy the journey!
Sincerely,
Pahel Agarwal
Avni Agarwal

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CONT

ENTS

The Life Cycle of Stars:

FROM BIRTH TO SUPERNOVA

Agrima Vaishnava
K/2728 VIII-D

Imagine a world where stars are born, live spectacular lives, and end in a dramatic explosion. Stars, the building blocks of galaxies, go through an incredible life cycle that shapes the universe. Stars begin their lives in stellar nebulas, vast clouds of gas and dust. Gravity pulls these materials together, creating dense regions that form protostars. As the protostar contracts, it heats up, marking the first step in a star's journey. In the protostar stage, the core temperature rises until nuclear fusion ignites, converting hydrogen into helium. This process releases immense energy, stabilizing the star and marking its entry into the main sequence phase. Our Sun is an example of a main sequence star, shining steadily for billions of years. During the main sequence phase, nuclear fusion in the star's core produces a balance between gravity and pressure, making it stable. This phase is the longest in a star's life, during which it maintains a constant brightness.

When a star exhausts its hydrogen fuel, it expands into a red giant or supergiant. The core contracts while the outer layers cool and expand. In this stage, helium fusion and the fusion of heavier elements occur, leading to further changes in the star's structure. For small to medium stars like our Sun, the outer layers are shed, forming a planetary nebula. The remaining core becomes a white dwarf, gradually cooling over time. Massive stars, however, end their lives in a supernova explosion. This dramatic event scatters elements into space, leaving behind a neutron star or black hole, depending on the remaining mass. Stellar remnants from supernovae contribute to the formation of new stars, illustrating the cyclical nature of the universe. This cosmic recycling enriches the interstellar medium with elements essential for life. The life cycle of stars, from birth in stellar nebulas to their ultimate fate as white dwarfs, neutron stars, or black holes, is a fascinating process that drives the evolution of the universe. Stars not only light up the night sky but also play a crucial role in creating the elements necessary for life.

MALIGNANT

The flesh eating bacteria of Japan

The world we live in is so uncertain that anything can change in a blink of an eye. Sometimes its really unbelievable to see how variations of different diseases come every single year leaving us shocked or even perplexed. A disease came in 2019 that changed our system of living, surving and even breathing. Lately, according to the recent news a new fatal disease or bacteria has come. Have you ever heard about a flesh eating bacteria that is so fatal that it can lead to death of a human in 2 days ? Yes A rare, deadly, flesh-eating bacteria is on the rise in Japan, with hundreds of people infected.

Over 1,000 cases of streptococcal toxic shock syndrome (STSS) were reported in Japan earlier this year, surpassing the total number recorded last year in the country. Tokyo alone reported 145 cases in the first half of 2024. The majority of cases are in adults over 30, while the death rate has hovered at around 30 per cent, as per a report by local newspaper Asahi Shimbun.

"Most of the deaths happen within 48 hours. As soon as a patient notices swelling in the foot in the morning, it can expand to the knee by noon, and they can die within 48 hours," Ken Kikuchi, a professor in infectious diseases at Tokyo Women's Medical University, told Bloomberg.

What is Streptococcal Toxic Shock Syndrome?

Streptococcal Toxic Shock Syndrome (STSS) is a rare but serious bacterial infection. It develops quickly and becomes life-threatening. The bacteria spreads into deep tissues and the bloodstream and releases certain toxins that can lead to the development of shock and organ failure. Once initial symptoms occur, hypotension generally develops within 24 to 48 hours. The first symptoms of STSS include fever and chills, muscle aches, nausea and vomiting. Soon, after the symptoms kick in, it results in low blood pressure (hypotension), organ failure, tachycardia (faster than normal heart rate) . The first symptoms of STSS include fever and chills, muscle aches, nausea and vomiting. Soon, after the symptoms kick in, it results in low blood pressure (hypotension), organ failure, tachycardia (faster than normal heart rate) and tachypnea (rapid breathing).

So to prevent it necrotizing fasciitis is treated with antibiotics, and early treatment is critical. Hospitalization, usually with treatment in the intensive-care unit (ICU), is required. These diseases won't stop affecting humanity hence its well said by Benjamin Franklin

"An ounce of prevention is worth a pound of cure "

– By Dia Choudhary
k/2971
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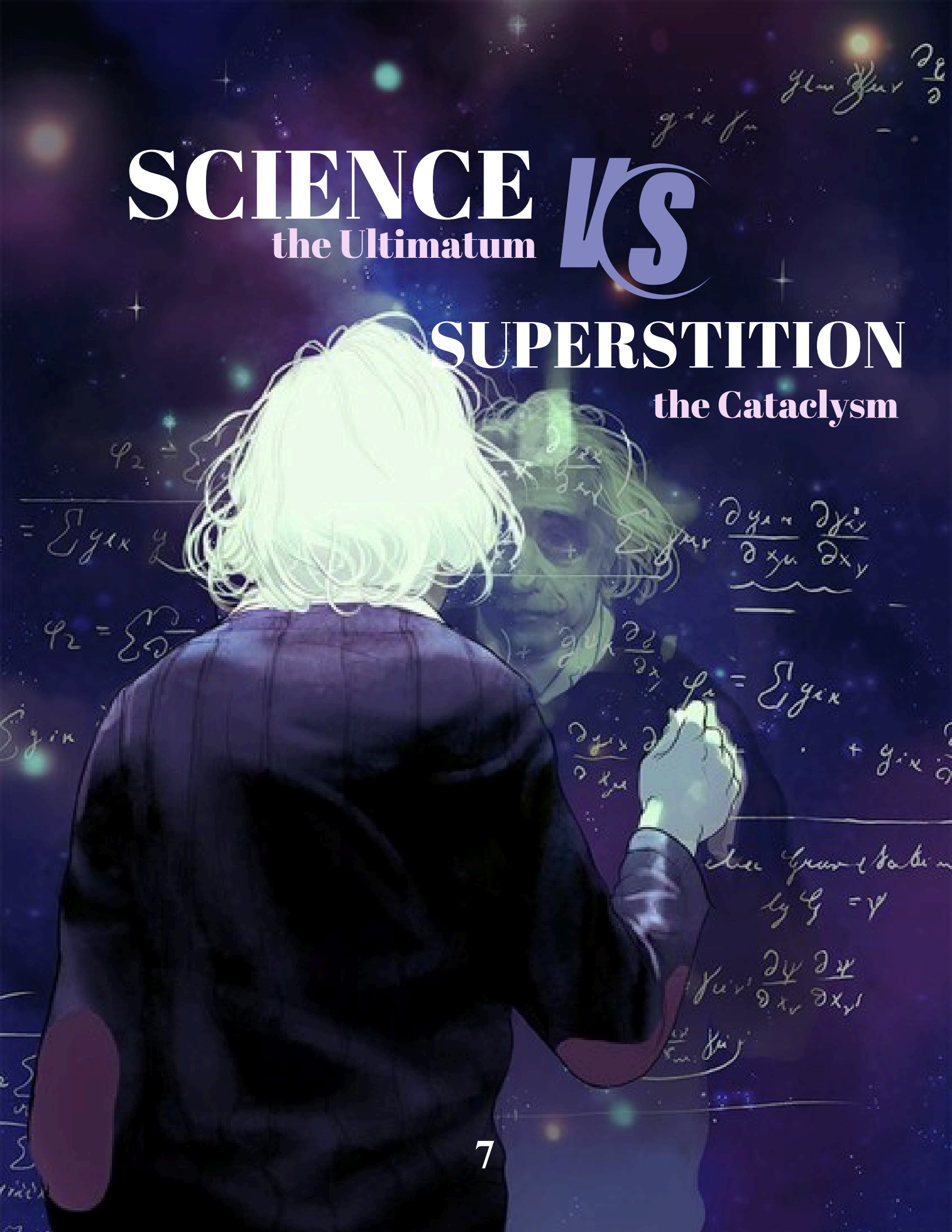

SCIENCE
the Ultimatum
VS
SUPERSTITION
the Cataclysm

"Science is the great antidote to the poison of enthusiasm and superstition." — Adam Smith.

Superstitions and science are diametrically opposed in the modern period, although they are intertwined. While science is thought to be realistic and to make the unreal real, superstitions are self-imposed beliefs that are both fictitious and unthinkable. Superstitions have no beginning and no end, while science has a beautiful beginning and occasionally a bitter ending. Nevertheless, these two ideas are linked by erratic divine threads that extend beyond the cosmos. Superstitions are completed by science, just as explanations fulfil presumptions. Sometimes explanations fall short, but irrational justifications might justify taboos.

Consumption of curd and sugar before pursuing endeavours-

Consuming curd and sugar before leaving is believed to bring good fortune as it cools the stomach and produces immediate glucose, facilitating labour. Indians consider this mixture essential and its consumption has become associated with good fortune.

Menstruating women are not allowed in temples-

In India, menstruating women were considered impure and unclean, leading to superstitious beliefs. Women were not allowed in religious places, kitchens, and household duties due to their weakness due to blood loss. Ancient stone statues of God were also not allowed inside temples due to the risk of cracking due to heat release during menstruation. This was due to the potential for disturbances in the natural equilibrium of the statues.

Usage of nimbu and tadka to avoid buri nazar-

The nimbu mirchi tadka is a popular superstition in society, derived from lemon and chillies, which are rich in vitamins and have an acidic odour that repels insects. It was traditionally used as a symbol during ceremonies, now transformed into a tadka.

Bats: "A symbol of Death"-

It's interpreted as a terrible omen. The true reason for this myth is that bats carry many terrible diseases, and in those days without access to medical care, people would die from rabies, Ebola, Nipah, and other illnesses brought in by the illness.

Residence of Ghost in peepal tree-

The myth that trees release oxygen during the day and release carbon dioxide at night is scientifically incorrect. Excess carbon dioxide levels under a tree can cause feelings of being possessed by spirits, as it releases oxygen during the day and releases oxygen at night.

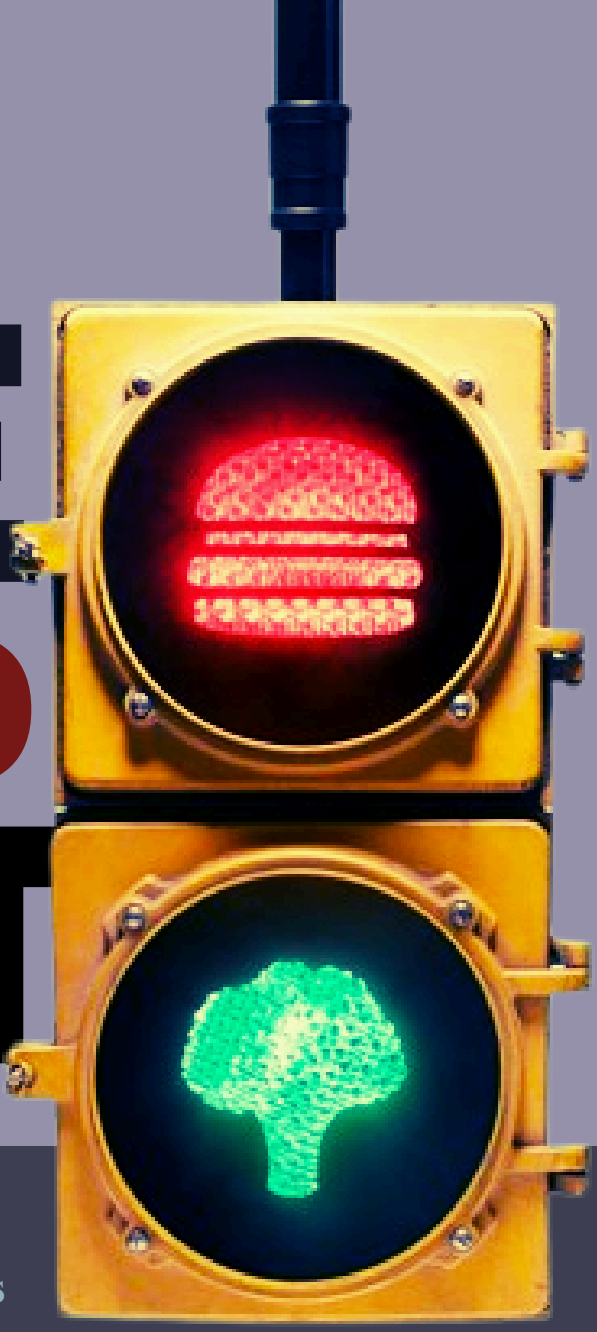
Tossing coins in rivers and wells brings good luck-

Ancient copper coins were believed to ensure pure water consumption by throwing them into rivers. Copper has antimicrobial properties, killing 99.9% of infection-causing bacteria. However, today, we don't use copper coins or drink water directly from rivers, leading to more pollution than good luck.

A right key opens a right lock because it matches the right mechanism. Science is that significant key that slowly but surely will open the locks of each and every superstition.

Mudita Sikaria 8B C/2582
Ananya Agarwal 8C C/2796

THE PALEO DIET



Is the paleo diet (eating mostly meat) really the way prehistoric people lived? Is it the optimal diet for humans?

The paleo diet is a nutritional plan based on the types of foods presumed to have been eaten by early humans during the Paleolithic Era, focusing on whole foods such as fruits, vegetables, lean meats, and fish, while excluding grains, legumes, dairy products, and processed foods. It aims to align with the idea that human bodies are not adapted to modern agricultural diets. The concept of the Paleolithic diet started in the 1970s, and its popularity soared after the publishing of the book *The Paleo Diet: Lose Weight and Get Healthy by Eating the Foods You Were Designed to Eat* by Loren Cordain in 2002.

Does it reflect the true diet of prehistoric humans?

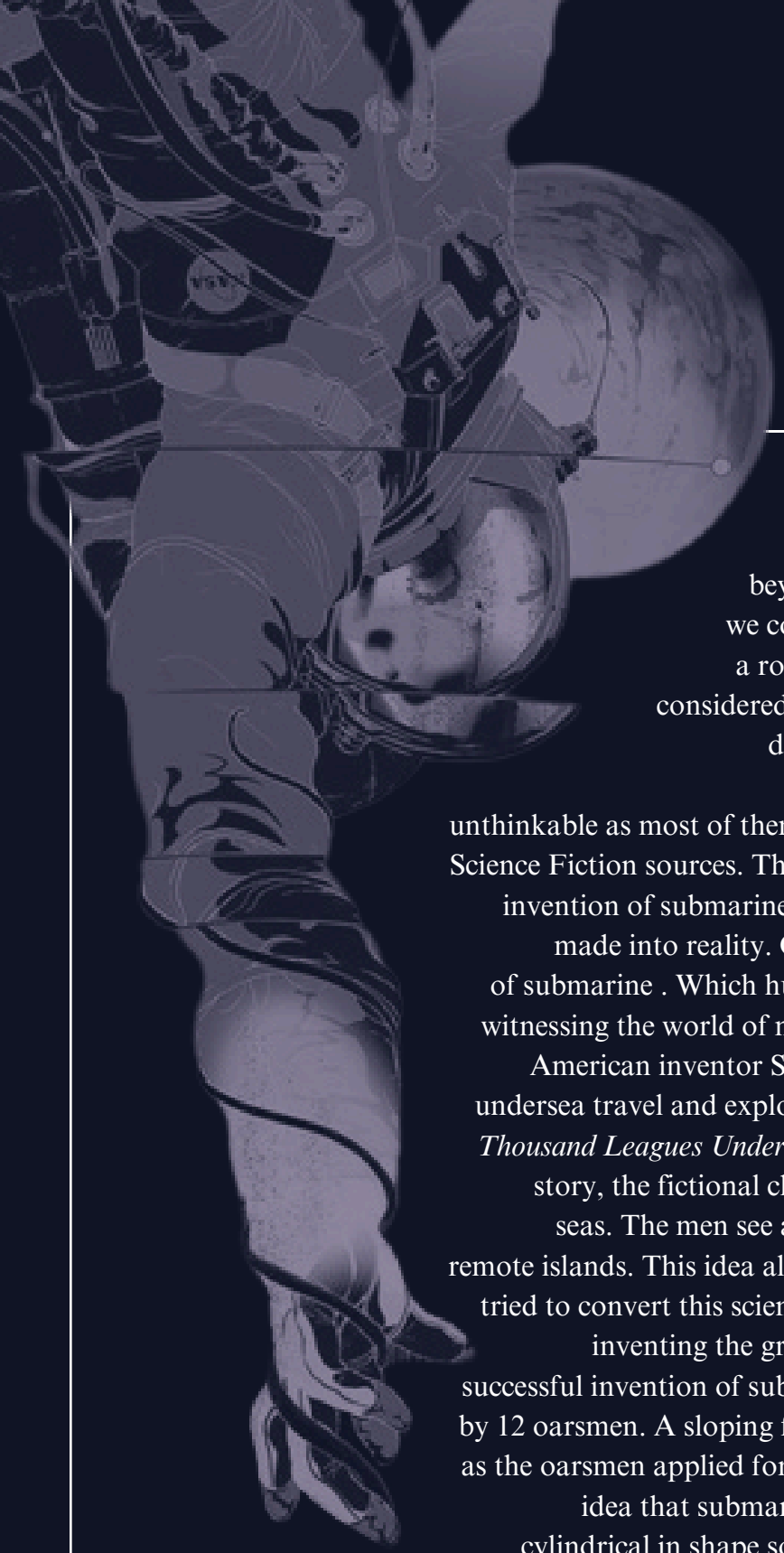
The Paleo diet is not a true representation of the dietary habits of prehistoric humans and may not be suitable for today's lifestyle. While some researchers have found that a Paleo diet intervention can improve glucose tolerance, this benefit appears to be independent of energy intake and macronutrient distribution. The diet's restrictive nature limits whole grains and dairy, potentially leading to nutritional deficiencies. Additionally, it can be challenging to maintain long-term and may increase the risk of heart disease due to high saturated fat intake. Therefore, consulting a healthcare professional is advisable before starting this diet.

Is the Paleo Diet Optimal Today?

The paleo diet's healthfulness is debated, with potential short-term benefits such as weight loss and improved metabolic markers due to its focus on whole, unprocessed foods. However, the diet's exclusion of grains, legumes, and dairy may lead to nutritional deficiencies, particularly in calcium and fiber. Increased red meat consumption raises concerns about higher risks of heart disease and certain cancers due to cholesterol clusters in your arteries leading to CHD. Additionally, the diet can be restrictive, making it challenging for long-term adherence. Compared to well-researched alternatives like the Mediterranean diet, the paleo diet may not be optimal for everyone.

In conclusion, while the Paleo diet aims to mimic prehistoric eating patterns, it may not accurately represent them. Its restrictive nature can lead to nutritional deficiencies and increased health risks. A balanced diet that includes a variety of foods may be more suitable and beneficial for long-term health and wellness.

Freya Amar Shah
P/2977 IX E



VISION:

Astronomy fiction into reality

As humans , don't we think that the technologies and the artificial intelligence that we have achieved today are beyond our imagination? In past, who knew that we could have a helicopter? A telephone? And even a rocket? If we see the past , these inventions were considered impossible but with our continued effort and determination, humans made many inventions. All these inventions were considered unthinkable as most of them drew attention from people's imagination or Science Fiction sources. The motive of this article is to throw light on the invention of submarine: to show that unimaginable inventions can be made into reality. One of the major inventions was the invention of submarine . Which human could imagine going in the deep sea and witnessing the world of marine life? This was only made possible when, American inventor Simon Lake had been captivated by the idea of undersea travel and exploration ever since he read Jules Verne's *Twenty Thousand Leagues Under the Sea* as a boy. According to the plot of the story, the fictional character , Nautilus travels through the world's seas. The men see amazing deep-sea creatures, and they travel to remote islands. This idea always influenced the American inventor and he tried to convert this science fiction concept to reality and is credited for inventing the groundbreaking submarine technologies and the successful invention of submarine. This enclosed rowboat was propelled by 12 oarsmen. A sloping foredeck helped force the boat under the water as the oarsmen applied forward momentum. In Marin Mersenne had an idea that submarines should be made by copper and should be cylindrical in shape so it could withstand the pressure of deep ocean depths better. From this point, early designs of submarines all had a shape like a porpoise. Even with these advances and the Drebbel I prototype, more than 200 years passed before the French Navy launched an actual precursor of the modern submarine. As it is said that just because something is unbelievable does not mean you shouldn't believe it. **Put another way, some things are worth believing in whether they're true or not."** – Jeb Dickerson

Dia Choudhary K/2971 9th D

There are many issues and many promises associated with modern science. Researchers may be able to produce life itself in a test tube and solve the mystery of life in the near future. It is possible to get most diseases under control. Additionally, science is attempting to manage the environment, for example, by dispersing hurricanes before they have a chance to damage property or human lives. The ability to control extraterrestrial settings and the development of new energy sources could enable life to exist on the moon and other planets. Practical problems like producing and distributing enough energy to fulfill rising demand and reducing or eliminating environmental pollution are among the difficulties facing modern science. Among these issues, political, social, and scientific issues are present, as are issues like regulating the use of computers and other electronic gadgets that might substantially violate people's privacy and freedom, as well as control over nuclear and other weapons (biological and chemical). Some, including those involving organ transplantation, gene editing, and the ability to prolong life past the point at which it would have ended, have significant ethical ramifications. Additionally, science raises philosophical issues. For example, the uncertainty principle of the quantum theory sets a limit on the accuracy of some physical measurements and, consequently, on the predictions that can be made based on those measurements; the quantum theory itself suggests that at the atomic level much depends on chance; and in certain paradoxical discoveries in mathematics and mathematical logic. Even a detailed account of the history of science cannot be complete, for scientific activity is not isolated but takes place within a larger matrix that also includes, for example, political and social events, developments in the arts, philosophy, and religion, and forces within the life of the individual scientist. In other words, science is a human activity and is affected by all that affects human beings in any way. But that doesn't mean that anyone should stop finding their way around it because after all, you'll only do something if you try.

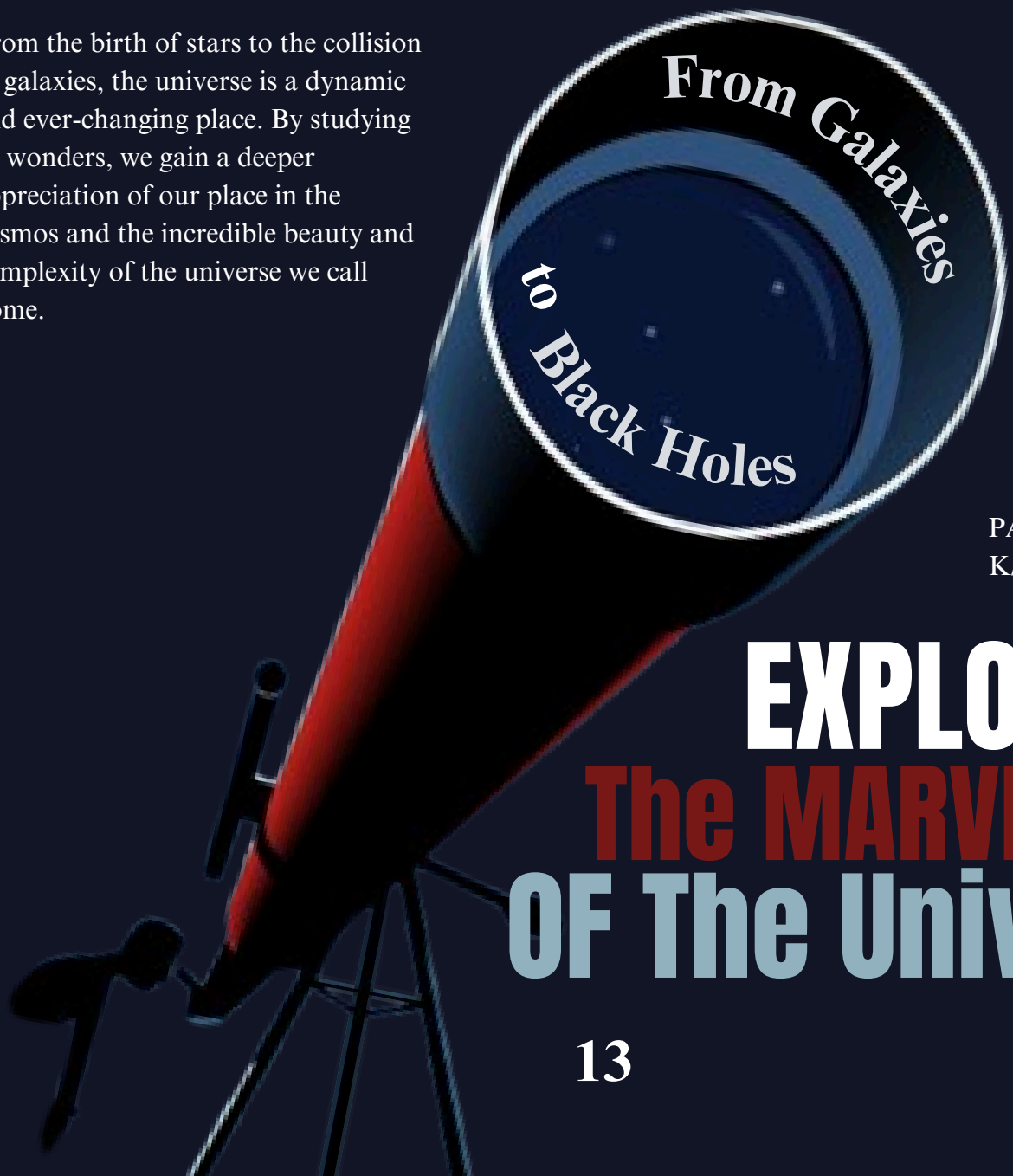
PROBLEMS WITH MODERN DAY SCIENCE

Amaaira Arora
K/2523 IX D

Our Universe is vast and filled with wonders beyond imagination. Galaxies, like the Milky Way, where our solar system resides, are massive collections of stars, gas, and dust held together by gravity. They come in various shapes and sizes, from spirals with swirling arms to ellipticals that are more rounded. Deep within some galaxies lie supermassive black holes, regions where gravity is so strong that even light cannot escape.

Stars are the engines of the universe, burning hydrogen gas to produce light and heat. When they run out of fuel, stars can explode in spectacular supernovas, spreading elements like carbon and oxygen into space, which are essential for life. Exploring our universe requires powerful telescopes and spacecraft. Telescopes capture light from distant stars and galaxies, revealing their secrets and helping scientists understand how the universe works. Space missions like NASA's Hubble Space Telescope have shown us breathtaking images of distant galaxies and nebulae, expanding our knowledge and sparking our curiosity about the cosmos. As we continue to study the universe, we uncover new mysteries, like dark matter and dark energy, which make up most of the universe but remain unseen. These discoveries challenge our understanding of physics and the fundamental nature of reality.

From the birth of stars to the collision of galaxies, the universe is a dynamic and ever-changing place. By studying its wonders, we gain a deeper appreciation of our place in the cosmos and the incredible beauty and complexity of the universe we call home.



PARI SHARMA
K/3364 8-A

EXPLORING The MARVELS OF The Universe

GRAPHENESIS

How can atom-thick graphene be used to create new technologies? Can this one element create genuine wonders in chemical technology?

Graphene is a single layer of carbon atoms arranged in a hexagonal lattice, known for its exceptional electrical and thermal conductivity, mechanical strength, and flexibility. As graphene is only 1 atom thick, it is possible to create other materials by interjecting the graphene layers with other compounds (for example, one layer of graphene, one layer of another compound, followed by another layer of graphene, and so on), effectively using graphene as atomic scaffolding from which other materials are engineered, because of the graphene layer the new materials gain more exceptional capabilities which expands its horizons of innovation and application. The discovery of graphene has sparked interest in other two-dimensional materials, such as Boron Nitride and Niobium Diselenide. These materials can be combined to create new technologies, enhancing properties like superconductivity and flexibility. For instance, layering graphene with Magnesium Diboride improves its efficiency as a superconductor, while combining it with Molybdenite in NAND flash memory creates smaller, more flexible devices. This emerging field promises a multitude of applications across various disciplines.

It is also expected to play a significant role in bioengineering, offering properties like high conductivity, strength, and large surface area. Despite potential, its widespread application may not occur until 2030 due to safety and regulatory trials. Once established, graphene could revolutionize bioelectronic devices, enabling real-time monitoring of health indicators and potentially serving in tissue regeneration and targeted drug delivery systems. Understanding its biocompatibility is crucial for successful integration into medical applications.

Especially its exceptional transparency and electrical conductivity make it a promising candidate for optoelectronic applications, such as touchscreens and OLEDs. It can transmit up to 97.7% of light and may outperform traditional materials like Indium tin oxide (ITO) in various applications. The ability to alter optical absorption by adjusting the Fermi level further enhances its potential. Future developments could lead to flexible, interactive electronic devices and e-paper that displays dynamic content, showcasing graphene's versatility in consumer technology. In conclusion, we look forward to more innovations, by igniting minds about the exceptional usage of graphene in various fields.

Freya Amar Shah
P/2977 IX E

OUR VISIT TO ISRO

On the 4th to the 8th of August, a group of 19 students from our school visited the Vikram Sarabhai Space Centre(VSSC) in Thiruvananthapuram as part of an educational trip aimed at enhancing our understanding of space science and technology. The day began with a welcome session introducing ISRO's significance, followed by a tour of the Space Museum showcasing models of rockets and satellites, and an interactive session with ISRO scientists who shared their experiences and challenges in space exploration. Students engaged in a virtual simulation of satellite launching, which further enriched their learning. Key insights included ISRO's remarkable achievements, such as the Mars Orbiter Mission and Chandrayaan, the importance of indigenous technology, and the various career opportunities in STEM fields.

We had the privilege of visiting three prestigious institutions: IIST (Indian Institute of Space Science and Technology), Technopark, and LPSC (Liquid Propulsion Systems Centre). At IIST, we explored the world of space science and engineering, gaining insight into cutting-edge research and academic programs that nurture future scientists and engineers. The visit to Technopark exposed us to the largest IT park in India, where innovation and technology converge to drive the IT industry forward. Finally, our visit to LPSC, a vital part of ISRO, allowed us to witness the critical role this facility plays in developing liquid propulsion systems for India's space missions. This trip was an eye-opening experience, highlighting India's advancements in space science and technology.

The trip not only provided valuable knowledge but also inspired many students to consider careers in science and engineering. Overall, the visit was a resounding success, fostering a deeper interest in space science among participants and reinforcing the importance of such educational experiences. We extend our gratitude to VSSC for their hospitality and the enriching experience they provided.

What Element of the Periodic Table Are You?

It's Saturday night! What are you up to?

A) Out on an adventure, exploring the unknown.
B) At home, relaxing with a good book.
C) Partying with friends, I love to be the center of attention!
D) Working on a creative project

How would your friends describe you?

A) Always on the move, full of energy.
B) Calm, reliable, and grounded.
C) Sparkly, vibrant, and a bit unpredictable.
D) Inventive and always thinking outside the box.

Pick your ideal vacation destination:

A) A backpacking trip through the mountains
B) A serene beach where I can chill and recharge.
C) A bustling city full of lights and excitement.
D) A futuristic science museum or tech hub

What's your favourite school subject?

A) Physics – I love understanding how the world works.
B) History – there's something about learning from the past.
C) Drama or Art – anything that lets me express myself!
D) Design & Technology – I'm always creating something.

Which quote resonates with you the most?

A) "Fortune favours the bold."
B) "Good things come to those who wait."
C) "Life is a party, and I'm the host!"
D) "Creativity is intelligence having fun."

How do you react under pressure?

A) I stay focused and charge ahead!
B) I remain calm and think things through before acting.
C) I thrive on the excitement – pressure makes me more creative!
D) I find an innovative solution no one else thought of.

If you were a colour, what would you be?

A) Fiery red – I'm full of energy and passion.
B) Deep blue – I'm calm, collected, and dependable.
C) Electric neon – I'm a little flashy but fun!
D) Sleek silver – I'm polished and cutting-edge.

Mostly A's – You Are Hydrogen (H)

Just like hydrogen, you're full of energy and always on the move! As the most abundant element in the universe, you bring life to everything you do, lighting up the room like the stars.

Mostly B's – You Are Gold (Au)

You're timeless, valuable, and people can always rely on you. Just like gold, you have a calm, steady presence that draws others to you. You appreciate the finer things in life, and you always stay true to your values.

Mostly C's – You Are Neon (Ne)

Bright, vibrant, and a little bit mysterious – you're neon! You're the life of the party and love being in the spotlight. Like the glowing signs that light up city streets, you bring energy and excitement wherever you go.

Mostly D's – You Are Silicon (Si)

Innovative and forward-thinking, you're the tech-savvy element, silicon! Like the building block of modern technology, you're always looking for ways to solve problems and create new ideas.

Mayo College Girls' School

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