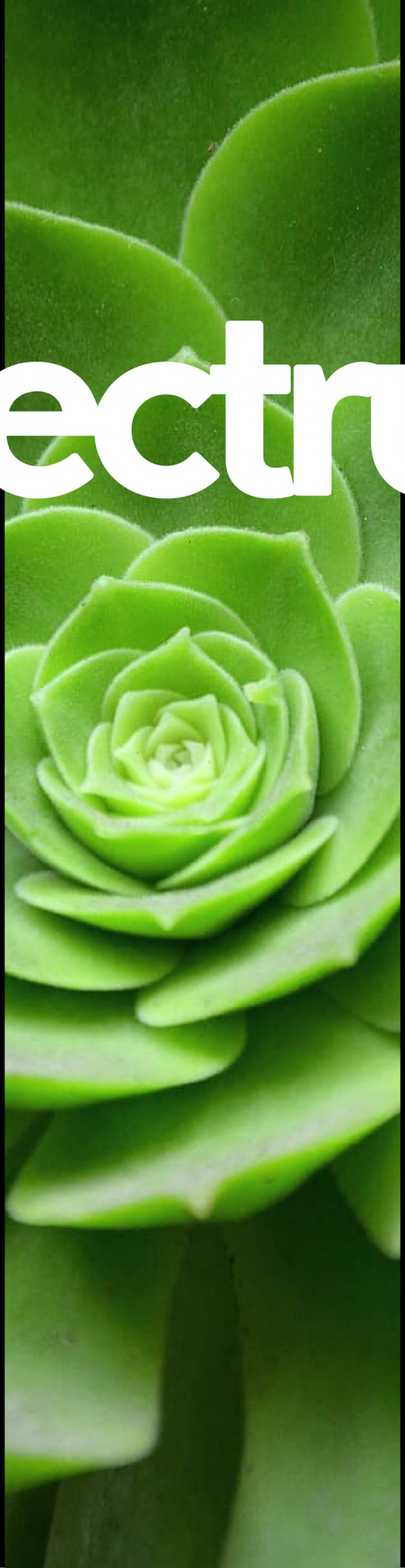
2024

Spectrum



The Science Magazine

Converging Frontiers

From The Principal's Desk

Dear Students

I am delighted to acknowledge the commendable efforts of both students and faculty members of the science departments in producing the annual magazine, Spectrum, in electronic format. As you peruse its contents, you will encounter articles spanning a wide array of subjects, from the celestial wonders of space to the intricacies of biology, from technological wonders to the marvels of nature.

Additionally, you will discover significant milestones achieved by the college this year, such as the inaugural Science Fest held on April 4th and 5th, featuring events ranging from quizzes to rangoli competitions. These endeavors help foster scientific inquiry, as well as creative and analytical thinking among students.

A magazine serves as a platform for honing writing skills and articulating knowledge in a structured manner, thus enabling effective communication to a broad audience. In my estimation, this edition of Spectrum has admirably fulfilled this purpose. Our budding talents have expressed their thoughts, ideas, hopes, feelings, aspirations, and convictions in a manner both creative and profound.

I extend my heartfelt congratulations to the Convener, faculty members, and the student editorial board of Spectrum for their collective efforts in bringing forth this edition of the magazine. I trust that you will derive pleasure from reading this edition and duly recognize the dedication and diligence exhibited by the students and teachers alike.

NSingh

Prof. Narendra Singh
Principal

From the Editorial Team

Science is not just a subject; it is a way of thinking, a means of understanding the universe. It is the best tool for comprehending who we are, where we come from, and where our future lies. The understanding of science enables us to grasp the world around us, elevating us from the status of mere animals to that of human beings.

The SPECTRUM Magazine is the culmination of collective efforts from every science department of Zakir Husain College. We believe that no field of science can exist and flourish on its own. Science exists because each field complements the others in fascinating ways.

We have endeavored to encapsulate this idea by naming the book "Spectrum," a wordplay on the spectrum of colors, where here, the spectrum represents the diversity of scientific fields. With this in mind, the book is divided into 7 sections. Spectrum 2024 would not have been possible without the immense hard work of the editorial board and the design team, who dedicated hours to making this idea a reality.

The entire editorial board would like to extend gratitude to Prof. Narendra Singh, Principal of Zakir Husain Delhi College, Mr. Anshu Rastogi, Dr. Jyoti Singh, Dr. Seema Rawat, Dr. Anubha Das, and Dr. Mohammad Wahid Ansari for their constant guidance and support. We also express thanks to all the writers who contributed to this magazine. Our heartfelt appreciation goes to the entire magazine team whose assistance brought this publication to fruition.

THE SPECTRUM TEAM

Mr Anshu Rastogi
Convener
Dept. of Electronics

Dr. Jyoti Singh
Dept. of Chemistry

Dr. Seema Rawat
Dept. of Physics

Dr. Anubha Das
Dept. of Zoology

Dr. Mohammad Wahid Ansari
Dept. of Botany

THE EDITORIAL TEAM

Yukti Singh
Coordinator
B.Sc. (H) Chemistry
3rd Year

Tanmoi Saikia
Editor
B.Sc. (H) Electronics
2nd Year

Sania
Coordinator
B.Sc. (H) Electronics
2nd Year

Shruti Bansal
Member
B.Sc.(H) Zoology
3rd Year

Aditi Jain
Member
B.Sc.(H) Botany
3rd Year

Jahnvi Singh
Member
B.Sc.(H) Botany
3rd Year

Nidhi
Member
B.Sc. Physical Science
3rd Year

Shihab
Member
B.Sc.(H) Zoology
3rd Year

Swatantra Pratap Yadav
Member
B.Sc.(H) Chemistry
2nd Year

Aman Kumar
Member
B.Sc.(H) Electronics
2nd Year

Kunal Kumar
Member
B.Sc. Physical Science
1st Year

CONTENTS

STAR STUCK

1

- BLACK HOLE: AN ENIGMA
- ESSENTIAL BLACK HOLE FACTS
- BEYOND THE HORIZON
- COSMIC CAPITALISM
- SHINING BRIGHT
- THE ILLUSION OF TIME

INTO THE WILD

2

- BLOOMING SERENITY
- THE AMAZING PITCHER PLANTS
- BIRD WATCHING BLISS
- A VISIT TO WCT
- THE FUTURE OF AGGRICULTURE
- THPS
- ARE WE DOING IT THE RIGHT WAY?
- DECIPHERING RNA
- THE HIDDEN ENEMY
- BIOPLASTICS
- DESIGNING GREENER CHEMICALS

सुVIGYAN

3

- DAY 1
- THE INTER COLLEGE COMPETITIONS
- DAY 2
- THE INTRA COLLEGE COMPETITIONS

SAGES OF SCIENCE

4

- NOBEL PRIZES 2023
- SHAPING THE AI LANDSCAPE
- WOMEN IN SCIENCE

HELLO, FUTURE

5

- A DIVE INTO NANOTECHNOLOGY
- REVOLUTIONIZING HOME ENTERTAINMENT
- AI IN HEALTHCARE

A BIT DIFFERENT

6

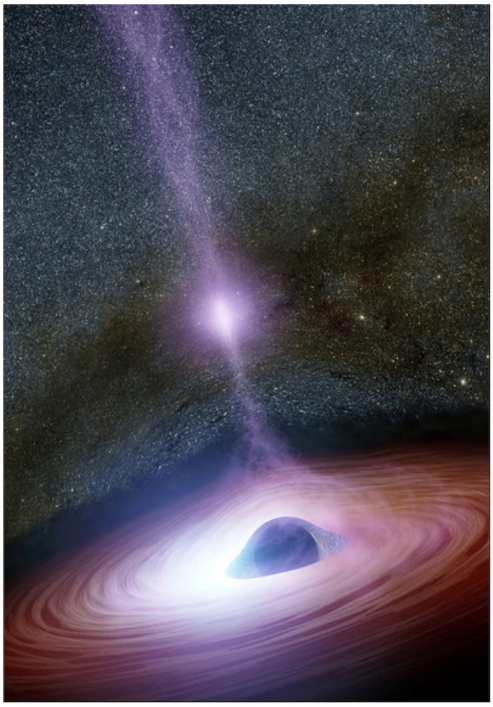
- TURNIN G PLASTIC BOTTLES INTO VANILLA FLAVOURING
- HEALING WITHOUT HARM
- THE SPICE MELANGE
- REVOLUTIONIZING COSMETICS
- PURPLE GOLD
- RESEARCH CORNER

GAME TIME

7

- BRAIN TWISTER
- MAIZE
- CROSS WORDS
- SCAN TO LEARN


STAR STUCK

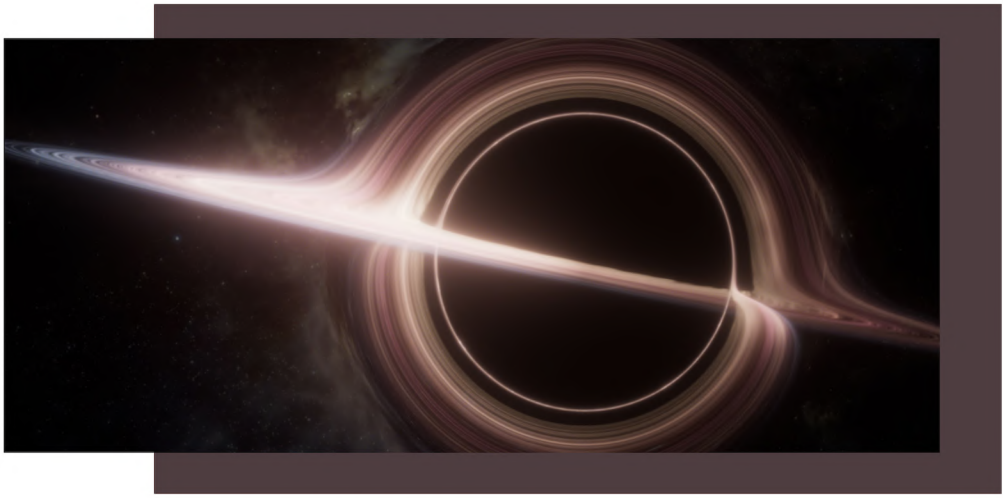


BLACK HOLE: AN ENIGMA

By: Somya Pal
B.Sc. Physical Science

Black hole one of the biggest mysteries of the space which remained unknown to humankind till 20th century. In early 1900s Einstein gave theory of relativity which is further divided into Special Theory of Relativity and General Theory of Relativity. In Special Theory, he gave the concept of kinematic time dilation like how time acts relatively for a person on earth and one that is travelling in spacecraft but in General Theory of Relativity, developed in 1916, talked about the gravitational time dilation. That is more the gravitational force you would experience the more time would slow down for you which was depicted amazingly in INTERSTELLAR (movie released in 2014 and directed by Christopher Nolan) in which the protagonist of the movie 'Cooper' landed on Aqua planet where one hour on the planet equal 7 years on Earth.

It was because the planet was close to the Gargantua black hole whose gravitational force was affecting the time of the planet. Black holes have such a high gravitational force that they can completely absorb light, and it is difficult to spot them.To Einstein concept of Black Hole seems to be very weird he was very doubtful that such type of things can exist although he predicted the existence of them. Many scientists worked on his general theory of relativity like S. Chandrashekhar, Karl Schwarzschild and Johannes Droste and they actually derived the solutions to the equations that proved that black holes do exist. Although the term Black Hole did not exist till 1960 but physicist John Wheeler popularised it back in the 1970s. Black hole is a misleading term on its own there is no hole present rather it is formed from star.



Star contains some matter in its centre and there is a nuclear fusion reaction going on inside and heat and light is getting produced which is exerting an outward force and also, an inward force is acting at the centre of star due to gravitation such that there is an equilibrium established between these outward and inward force that helps the star to remain intact and alive. This nuclear fusion reaction happens due to the abundance of hydrogen or Helium present in the star and a time comes when the present Hydrogen or Helium gets finished and this nuclear reaction does not take place further and outward force which was there is now no more. So only an inward force is acting to what the centre of the star due to the gravity. Star collapses due to its gravity as there is no counter force for the inward force and blackhole gets formed, by the way it is a time taking process. Now the question arises whether the same can happen with SUN as it is a star as well. So don't worry sun will not become a black hole rather it will be a white dwarf planet.

Till date there is one and only image of blackhole, that was taken by the telescope Event Horizon, SAGITTARIUS A (a supermassive black hole) present in the galactic centre of the Milky Way Galaxy.

Although black holes seem to be mysterious, and they are but still there is so much research left to be done.

Essential Black Hole Facts

By- Richa
B.Sc. Physical Science

CLOSEST:
The nearest known black hole, called Gaia BH1, is about1,500 light-years away.

FARTHEST:
The most distant black hole detected, at the center of a galaxy called QSO J0313-1806, is around 13 billion light-years away.

BIGGEST:
The most massive black hole observed, TON 618, tips the scales at 66 billion times the Sun's mass.

SMALLEST:
The lightest-known black hole is only 3.8 times the Sun's mass. It's paired up with a star.

SPAGHETTIFICATION:
A real term that describes what happens when matter gets too close to a black hole. It's squeezed horizontally and stretched vertically, resembling a noodle.

Spin:
All black holes spin. The fastest-known – named GRS1915+105 – clocks in at over 1,000 rotations per second.

PARTICLE ACCELERATORS:
Monster black holes at the centers of galaxies can launch particles to near lightspeed.

GRAVITY'S THE SAME:
If you replaced the Sun with a black hole of the same mass, the solar system would get a lot colder, but the planets would stay in their orbits.

STAR BOOMS:
One type of black hole is born when massive stars run out of fuel and explode in supernovae.

NOT SO RARE:
Most Milky Way-sized galaxies have monster black holes at their centers. Our is called Sagittarius A* (pronounced ey-star), and it's 4 million times the Sun's mass.

BEYOND THE HORIZON: THE ONGOING ODYSSEY OF SPACE EXPLORATION

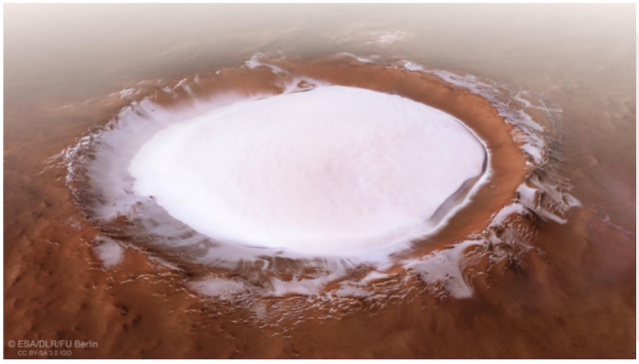
By: Mohd Zaid Khan
B.Sc.(H) Zoology

Throughout history, humanity's fascination with the stars has been an enduring theme, from ancient civilizations studying celestial patterns to today's ambitious space endeavors. The journey into space has always been characterized by wonder, exploration, and an unwavering determination to expand our understanding.

Space exploration reflects humanity's relentless pursuit of knowledge and willingness to confront the unknown, transcending borders and uniting diverse individuals in a shared quest to uncover the universe's secrets.

At the forefront of this exploration stands NASA, the foremost space agency of the United States, responsible for spearheading numerous groundbreaking missions. From the early days of Mercury and Apollo to contemporary collaborations on the International Space Station and robotic missions, NASA remains a driving force in humanity's ongoing exploration of the cosmos.

DISCOVERIES OF SPACE EXPLORATION

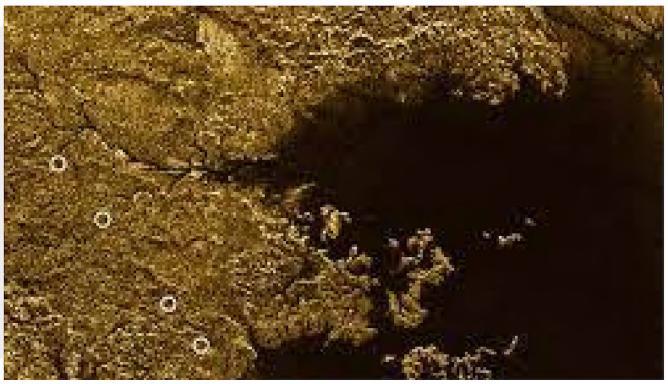


Ice deposits on Mars

The Martian poles contain abundant ice, primarily composed of water, although carbon dioxide, or dry ice, is also present. However, the extreme cold in these regions makes it inhospitable for astronauts or robots to endure for extended periods. This is where the Subsurface Water Ice Mapping project, funded by NASA, plays a crucial role

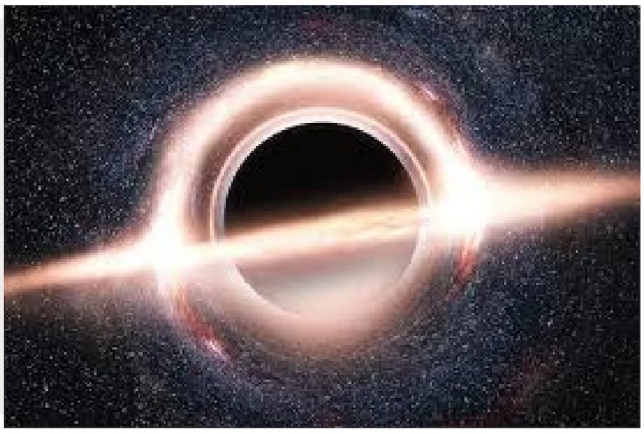
Liquid-filled canyons on Titan

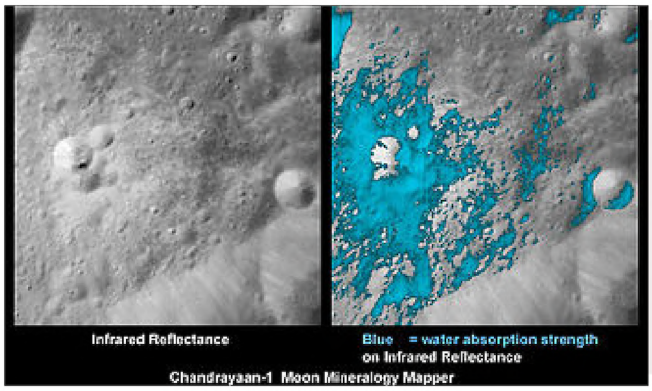
In 2013, NASA's Cassini probe made a groundbreaking discovery on Saturn's moon Titan: it identified expansive canyons resembling the Grand Canyon, each about half a mile wide. These formations were notable for being filled with liquid hydrocarbon, marking the first instance where scientists observed such channels and canyons carrying liquid on Titan.



Black Hole

In 1971, several independent researchers identified Cygnus X-1 as the first known black hole. These stellar-mass black holes form when massive stars collapse at the conclusion of their life cycle. Once formed, a black hole can increase in size by absorbing matter from its surroundings. The initial image of a black hole was captured by the Event Horizon Telescope (EHT) and depicts the one situated at the heart of the elliptical galaxy M87, approximately 55 million light-years away from Earth. This historic image was taken by FORS2 on the Very Large Telescope operated by the European Southern Observatory (ESO). (Science.nasa.gov)



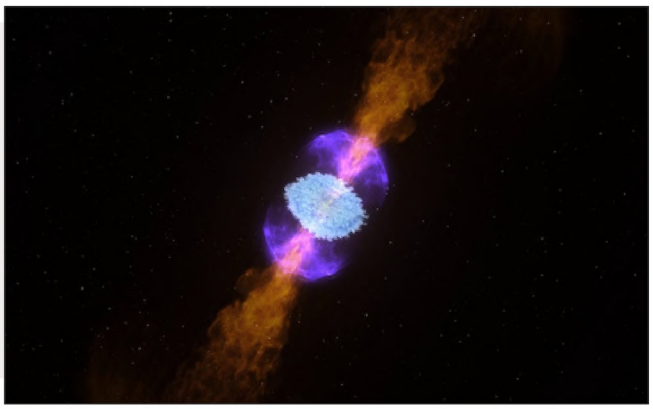


Water on Moon

Chandrayaan-1, launched in 2008 as part of India's Chandrayaan program, played a pivotal role in uncovering water molecules on the Moon. In 2020, data gathered by NASA's SOFIA mission corroborated the presence of water in sunlit areas of the lunar surface. This water exists as H2O molecules either embedded within or adhering to grains of lunar dust. Here's a concise overview of the sequence of discoveries that ultimately confirmed the existence of water on the Moon.

Collision of Neutron Stars

In 2017, researchers observed the collision of two neutron stars, a phenomenon where a star, depleted of energy, collapses inward, forming either a neutron star or a black hole. This event unveiled that such powerful collisions generate gravitational waves, causing distortions in space-time. Additionally, the discovery highlighted that these collisions also yield heavy elements like gold and platinum.



Potentially habitable planets

Kepler-452b, also known by its Kepler Object of Interest designation KOI-7016.01, is a super-Earth exoplanet orbiting within the inner edge of the habitable zone of the sun-like star Kepler-452. Based on its characteristics, it has been referred to as an Earth 2.0 or Earth's Cousin. Kepler is the only planet discovered in this system. It is situated in the constellation of Cygnus, some 1,400 light-years (430 pc) from Earth. Other planets are livable in the universe, like TRAPPIST-1f (41 light-years) and Proxima Centauri b (4.25 light-years).

Truly, the future of space exploration shines as brightly as the stars themselves. With technological advancements pushing boundaries, increased collaboration among nations, and a revitalized sense of purpose, humanity finds itself on the cusp of an extraordinary era of discovery and expedition. From the frozen satellites of Jupiter to the distant expanses of interstellar space, the universe calls upon us to embark on journeys of exploration, to discover new worlds, encounter novel civilizations, and expand our horizons.

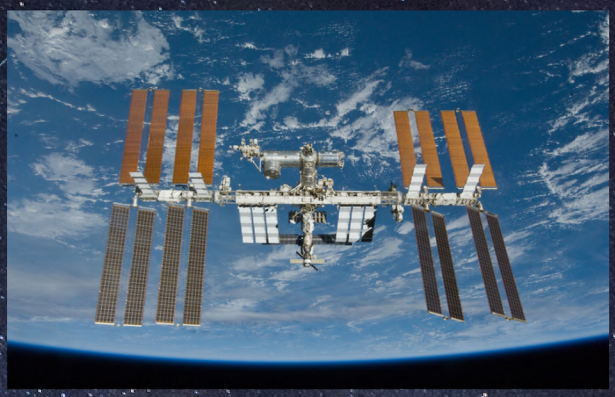
As we stand at the threshold of this grand odyssey, let us recall the timeless wisdom of Carl Sagan, who once remarked, "Somewhere, something incredible is waiting to be known." With every new mission, each fresh revelation, and every brave stride into the unknown, we edge closer to unraveling the mysteries of the cosmos and to realizing our destiny as intrepid explorers of the universe.

COSMIC CAPITALISM PIONEERING THE NEW SPACE FRONTIER

By- Tanmoi Saikia
B.Sc. (H) Electronics

The privatization of space isn't new. Since the 1960s, companies have participated in the space industry by manufacturing components and satellites for NASA and space organizations. However, gone are the days when the United States and the Soviet Union, the two superpowers of the world, engaged in the Space Race, to be the first country to land on the moon and thereby securing their spot as the leaders of the world in Space and Science. The United States did beat the Soviet Union by landing humans on the moon in 1969, accomplishing one of the greatest feats of human civilization. But with the booming economy and the emergence of many billionaires over the past half-century, privatization of space seems to be long overdue. The likes of Elon Musk's SpaceX and Jeff Bezos' Blue Origin, among many others, are now in a race of their own to make a fortune out of space. While on the face of it, billionaires like Elon Musk and Jeff Bezos claim to pursue these space endeavors for the sake of humanity, there is much profit to be made in space.

Over the past couple of decades, we have seen companies try their hands in space sectors, partnering with government agencies to achieve incredible feats. From reusable rockets to creating the world's most powerful rocket, the Starship (which is twice as powerful as the Saturn V, the rocket that landed humans on the Moon), SpaceX is achieving milestones after milestone. SpaceX's Starship is made with the intention of being able to land people on Mars, proving a private company to be the first entity to make humans an interplanetary species. Going interplanetary on capitalism!
Although skeptical at first, consistently successful missions have led Government organizations like NASA to enter into partnerships with these private companies



While many have raised concerns over this, it does help NASA by lifting some pressure to manage everything space-related and focus more on the research frontier, as NASA was originally intended to do.

Now, the International Space Station is to be decommissioned by 2030, and NASA is collaborating on developing a space station owned, built, and operated by a private company — either Axiom Space, Voyager Space, or Blue Origin, marking another huge step in the privatization of space.

From asteroid mining and space tourism to creating private colonies on the Moon and Mars, there is huge revenue potential in space. While it may seem like there's a long time before any of these ambitions become reality, similar skepticism existed for the ideas of creating private space stations and launching people into space for tourism. The Outer Space Treaty, signed in 1967 by multiple countries, stated that no country can claim sovereignty over any celestial body. However, since it did not anticipate the involvement of private companies, there aren't many rules for these companies to abide by.

Whether the privatization of space helps us leap further in space as a civilization or may cause the downfall of humanity as a whole remains to be seen, but what's for sure is that the private players in the space industry are here to play, and the rules of the game remain yet to be changed.

Shining Bright

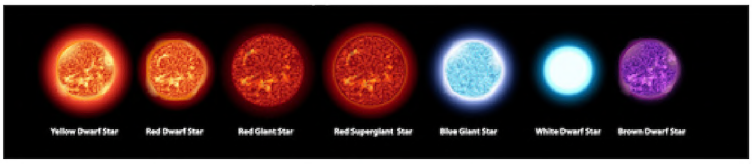
By: Shahbaz Ali
B.Sc. Physical Science

COLOURS AND SIZE OF STARS

A star's colour usually depends on its temperature. The coolest stars glow deep red while the hottest are blue-white. Most stars can be placed in one of seven 'spectral types' according to their colour. These range from type O-the hottest (over 30,000 'C) down to type M the coolest (3,200 to 2,100 -C}. in order the spectral types are O,B,A,F,G,K and M. The Sun is a type G star. More massive stars tend to have far hotter cores so the nuclear reactions occur a: a much faster rate and they use up their fuel far more quickly. Stars vary in Size and in the amount 0 mass t ey contain. The biggest star in the universe (that we know of) UY SCUfi is a variable hypergiant With a radius around 1700 times larger than the radius of the sun

TYPES OF STARS

Protostars Gravity causes matter in parts of a nebula cloud to pull together Shrinking In 5'26 bUt increasing density and heating up. The temperature and pressures build quickest at the centre or core. This generates more gravity and pulls in more matter. As the spinning core collapses in on Itself it heats up more and more it is now a baby star 3 protostar. Brown Dwarfs Not all 'wannabe' stars make it. Some don't possess enough mass a high enough temperature or enough pressure in their core to start off major nuclear fusion reactions. These bodies continue to exist in space but are very hard to see as their temperatures and their brightness is much less than stars that burn brightly are known as brown dwarfs.



Do you know how many stars there are in this universe ? If the truth be told astronomers don't know how many stars there are In total. In the distant past, people used to think there were around a thousand stars in total. As telescopes and other scientific instruments have advanced astronomers have been able to see much further into space and the estimated numbers of stars has gone up and up and up

LIFE OF THE STARS

Stars are born, live and die over life spans measured not in centuries but in millions or even billions of years. Earth's nearest star, the Sun, is approximately 4.6billion years old. Stars are huge spheres of hot gas held together by their own gravity. The hot gas and energy generated at the core of the star tries to push outwards while gravity tries to force the star to collapse in on itself. The two sets of forces stay balanced throughout much of a star's life. Most stars are born in enormous star nurseries called nebulae. A nebula is made of giant clouds of gas mostly hydrogen and helium as well as large amounts of dust. The Orion Nebula is the nearest giant star nursery to Earth.

THE BEGINNING OF THE END

The beginning of the End a star's fuel will run out eventually even if it takes billions of years. As fuel at its core starts to dwindle The size and mass of the star usually determines what its fate will be. A red dwarf star with low mass may just slowly fade away. When an average sized star like the sun uses up much of the hydrogen fuel at its core it starts to swell in size to become what is called a red giant. The red giant starts to burn helium in nuclear reactions at its core. Its outer layers still burning hydrogen expand and glow more brightly. The star ejects much of its outer layers which can form a nebula of gas clouds and dust matter . This is called a planetary nebula. This nebula drifts away leaving a cooling star core called a white dwarf. A white dwarf continues to shine for millions of years slowly sending all its heat energy into space before fading away. When more massive stars start to swell they become supergiant. As nuclear fusion runs out of fuel in a supergiant star's core the core shrinks rapidly and temperatures soar as gravity forces the star to collapse. This usually ends in a giant explosion called a supernova which blows most of the star's matter huge distances away and with great brightness. After some stars have been through a supernova their cores collapse in on themselves so much that they form a Single incredibly dense point in space called a singularity. The space immediately surrounding the singularity is called a black hole

The Illusion of Time

By: Sandeep Kumar Yadav
B.Sc. Physical Science

Time dilation, an intriguing phenomenon, arises when two observers encounter varying rates of time passage due to their relative motion or gravitational field. Time, like a flowing river shaping our existence, has captivated human imagination for centuries. The concept of time dilation, explained by Albert Einstein's theory of relativity, challenges the very bedrock of our understanding concerning time and space. In this discourse, we delve into the intricacies of time dilation, exploring its genesis, implications, and the enigmatic puzzles it unfurls.

Understanding Time Dilation: According to this idea, time isn't always the same but changes depending on where you are and how fast you're moving. Let's explain this with an example: imagine two people, one standing still and the other moving very fast. For the person standing still, time passes normally. But for the one moving quickly, time seems to slow down. This happens because of how space and time interact, as described by Einstein's theory of relativity. As you move faster, time stretches out, like what happens in the twin paradox.

GREAT MINDS, GREAT WORDS

"Somewhere, something incredible is waiting to be known." - Carl Sagan

"Science without religion is lame, religion without science is blind." - Albert Einstein

"The greatest enemy of knowledge is not ignorance, it is the illusion of knowledge." - Stephen Hawking

“Scientists are explorers, philosophers are tourists.’ - Richard Feynman

Think of two identical twins, Ram and Shyam. Ram stays on Earth while Shyam goes on a fast trip through space, almost as fast as light, and then comes back. Because of the rules of special relativity, Shyam's journey makes time pass slower for him compared to Ram. This idea of time dilation doesn't just stay in theory; it affects many things in the universe, from tiny particles to how satellites work.

In big science projects like the Large Hadron Collider (LHC), where particles are sent super fast, it's really important to think about how time dilation might change things. If we don't consider it, experiments might go wrong and give us the wrong answers about how things work. Similarly, the precision needed for GPS satellites, which help us navigate all over the world, is affected by both special and general relativity, including time dilation. Satellites flying around Earth experience less gravity and faster speeds than we do on the ground, so their clocks tick a bit faster. To make sure their timing stays right, we have to adjust them using Einstein's ideas.

In conclusion, in the world of physics, few ideas are as interesting and mysterious as time dilation. From its start in Einstein's theory to how it affects our technology today, time dilation keeps scientists and thinkers curious. As we explore the vast unknowns of space and time, time dilation reminds us how connected everything is. Whether we're studying tiny particles, using GPS, or thinking about the big questions of the universe, time dilation invites us on a journey to uncover the secrets of existence.

Into the Wild

Blooming Serenity: How Plants Nurture Mental Wellness

By- Anzar Shafi
B.Sc. (H) Botany

Plants, those tranquil emblems of nature, hold an enchanting power to nurture our mental and emotional equilibrium. Let's delve into the captivating ways they weave their magic:

Stress Alleviation: *Nature's verdant realms offer a sanctuary for weary minds, accelerating recovery from mental fatigue, alleviating anxiety, and gently slowing heart rates. The calming embrace of lush greenery provides a serene refuge for our souls.*

Easing Depression: *A simple stroll amidst natural beauty can work wonders for the spirit. Research reveals that immersing oneself in the splendor of nature leads to improved mood, heightened memory retention, and a notable reduction in depressive symptoms. In fact, the tranquil ambiance of an arboretum, reminiscent of a forest's embrace, has been shown to significantly alleviate symptoms of depression compared to clinical settings.*

Sharper Focus: *Wander through verdant landscapes and feel your focus sharpen. Studies demonstrate that individuals who meander through green spaces exhibit enhanced concentration and cognitive function, performing notably better on memory tests than their urban counterparts.*

Healing Retreats: *For those grappling with the aftermath of trauma, horticultural therapies and nature-based rehabilitation programs offer solace and renewal. Whether for veterans overcoming the scars of battle or survivors navigating the aftermath of natural disasters, these programs offer a pathway to healing and restoration, nurturing positive states of mind.*

Connection to Nature: *Cultivating a relationship with plants transcends mere horticulture; it becomes a transformative journey of self-discovery and spiritual enrichment.*

Mindful Presence: *Tending to plants draws us into the present moment with an unparalleled depth of focus and mindfulness. As we gently prune, water, and nurture our senses awaken to the subtle rhythms of growth and renewal, anchoring us in the beauty of the here and now.*

Therapeutic Respite: *Amidst the chaos of modern life, the gentle rhythm of caring for plants offers a sanctuary of tranquility and solace. Engaging in gardening activities has been shown to reduce stress, lower blood pressure, and elevate mood, providing a therapeutic escape from the hustle and bustle of daily life.*

Connection to the Natural World: *In cultivating a relationship with plants, we forge a deeper bond with the natural world that surrounds us. Through observing the intricate interplay of light and shadow, rain and sunshine, we gain a newfound appreciation for the awe-inspiring beauty and resilience of life in all its forms.*

Cyclical Wisdom: *The lifecycle of plants mirrors the cyclical rhythms of nature, offering profound insights into the ebb and flow of existence. As we observe the recurring patterns of flourishing, rest, and rejuvenation in nature, we are prompted to acknowledge the timeless cadences that guide every aspect of life on our planet, fostering a profound appreciation and respect for the interwoven tapestry of existence shared among all living entities.*

So, let's welcome these verdant companions into our lives, whether adorning our indoor spaces or flourishing in the great outdoors. Allow them to weave their calming magic, rejuvenating our spirits and enriching our mental well-being with their timeless allure.

The amazing underground world of Pitcher plant

By- Rishav Mangar
B.Sc. (H) Botany

Pitcher plants (Nepenthes pudica) are certain plants that modify their leaf into pitcher or pitfall traps. The pitcher is filled with some juices or digestive liquids, this is a typical feature of families such as Nepethaceae, Sarraceniaceae, Cephalotaceae and Bromeliaceae.

A group of scientists on their way to rainforests of North Kalimantan, Indonesia stumbled upon a foliage that looked like pitcher plants. The thing that deepened the mystery of these plants were deformed pitchers that were coming out of the ground. Another scientist tore off some moss just to find some handful of maroon pitchers. This led to the discovery of underground pitchers. Martin Duncak,a botanist at Palacký University in the Czech Republic said, "We were, of course, astonished as nobody would expect that a pitcher plant with underground traps could exist." It is believed that the major diet of N. pudica consists of underground insects and worms.

It is believed that underground pitchers might have developed due to seasonal dry ridge tops in its habitat. The Pudica in its epithet is derived from the latin term Pudica, ,meaning shy or modest, showing the capability of the plant to conceal itself. According to researchers the pitchers grow upto 4.5 inches long to nab its meal. As this pitcher grows underground the pitcher is sturdier than its above ground cousins. It is also special because it only grows in the Mentarang Hulu district of North Kalimantan at elevations of 3,600 to 4,265 feet above sea level, per the researchers.

"Its discovery underlines the natural richness of Borneo's rainforest and the necessity to preserve this important ecosystem with its enormous and still undiscovered biodiversity," the researchers write in the paper.

In summary, the discovery of underground pitchers in Nepenthes pudica, a species of pitcher plant found in the rainforests of North Kalimantan, Indonesia, has astonished scientists and deepened our understanding of plant adaptation and biodiversity.

BIRD WATCHING BLISS

By- Anjali Kaintura
B.Sc. (H) Zoology

Zoologist on the field

On February24, 2024, the students of Zoology and Aranya (the environmental society of Zakir Husain Delhi College) embarked on an educational trip to Sultanpur National Park . The trip was organized under the guidance of Dr. Ragesh P.R the convenor. The objective of the trip was to provide students with hands-on experience in bird observation and ecological study.

The day began with students gathering in the college premises at 7:30 am. After the attendance was taken, the group boarded a bus and set off for Sultanpur Bird Sanctuary. The journey took approximately two hours, during which students engaged in entertaining games to foster camaraderie among themselves

Exploring Sultanpur Bird Santuary

Upon reaching Sultanpur, Dr. Ragesh Pr and a group of students delved into the fascinating world of bird territories. With the assistance of a knowledgeable guide, students were introduced to a diverse array of bird species that inhabit the sanctuary. Some notable species found in Sultanpur Bird Sanctuary include the Painted Stork, White Ibis, Northern Shoveler,

Image: Second year zoology student with Dr.Ragesh

Indian Roller, and the Common Hoopoe. The sanctuary, situated in the Gurugram district of Haryana, boasts a rich avian population, making it an ideal location for bird enthusiasts and researchers.

In addition to on-field exploration, students visited the museum within the sanctuary premises. The museum provided valuable insights into various aspects of ornithology, displaying information about different types of bird feet and beaks, migration patterns, and the distinctive sounds of birds. One of the highlights of the museum visit was an exhibit on Dr. Salim, providing a brief overview of his contributions to the field of ornithology

Conclusion

At 2:00 pm, the group bid farewell to Sultanpur Bird Sanctuary and boarded the bus for the return journey to the college.

Image: Dr. Ragesh with his camera , exploring hybrid species of birds

The trip proved to be a delightful blend of education and recreation, igniting the zoologist within each student and fostering a deeper appreciation for the avian world.

In conclusion, the Sultanpur Bird Sanctuary excursion was a resounding success, thanks to the meticulous planning by Dr. Ragesh and the enthusiasm of the students. Such educational trips play a pivotal role in enhancing the practical understanding of subjects and fostering a love for nature and wildlife among students.

A VISIT TO WATER TECHNOLOGY CENTRE OF INDIAN AGRICULTURE RESEARCH INSTITUTE

By- Zoya Khan and Yuvraj Singh
B.Sc. (H) Botany

INTRODUCTION

The Indian Agricultural Research Institute (IARI), is the beacon of agricultural innovation and research excellence. Established in 1905, it has been the leading institute for agricultural research, education, and extension in India. IARI has played a pivotal role in transforming agricultural practices, fostering sustainable development, and ensuring food security for the nation.With a visit to this vast institute we got to more details in terms of the faculties operation, got exposure on their equipment and also learned about their new endeavors, we saw a huge comparison between local sewage treatment techniques and new techniques they developed.

RESEARCH AND INNOVATIONS

We were guided by our host Dr Vipin', who explained in detail about the water treatment. Research at IARI includes a wide range of areas, including crop improvement, agronomy, soil science, plant pathology, entomology, genetics, and biotechnology. Notable developments include the development of high-yielding crop varieties, drought and pest-resistant cultivars, and sustainable farming practices, horticulture, animal husbandry, agroforestry, and natural resource management. From precision farming techniques to remote sensing technologies, the institute uses cutting-edge tools and platforms to optimize resource use, increase productivity, and minimize environmental impact. It promotes sustainable agriculture practices that include environmental stewardship and resilience.Dr.Vipin showed us their laboratories and their high standard equipment,the machineries I've only heard about, saw there.

The institute also conducts research on agroecology, organic farming, and climate-smart agriculture, developing strategies to mitigate the impact of climate change, conserve natural resources, and promote biodiversity. We saw some interesting publications there, the one that piqued my interest was about an interesting plant Typha Latifolia (a wetland plant) and use of pebbles for straining water.

In a very interesting meeting with Dr. P.S. Bhramanand, Director at WTC, PUSA. We got know some exciting facts about the institute, During the last ten years, it has successfully commercialized 318 agricultural technologies, ranging from crop varieties, bio-fertilizers, post-harvest technologies, agri-chemicals, farm implements and diagnostic tools to 605 agro-based companies.

Wheat variety HD 3086 has been commercialized to 202 companies with revenue generation of more than one crore INR. This variety has increased the yield of wheat and overcome the problem of yellow rust in North India. With the help of Krishi Vigyan Kendras (KVKs) and field demonstrations, the institute spread research findings directly to farmers, enabling them to adopt innovative techniques and improve their livelihoods.

We ended the trip with a little stroll in the campus which is spread over an area of about 500 hectares, which is well kept and beautifully maintained.

CONCLUSION

Long term monitoring of the treatment capacity of the developed waste- water treatment plant of IARI has revealed its exceptional performance. IARI is the light of progress in India's agricultural landscape with its rich research, excellence, dedication to education and outreach, and commitment to innovation, IARI continues to lead the way in transforming Indian agriculture and shaping the future of global food security.

THE FUTURE OF AGRICULTURE

By- Jahnvi Singh
B.Sc. (H) Botany

The emergence of agriculture marked a pivotal moment in human history. It signified humanity's capacity to manipulate the environment, enabling the production of sufficient food to support burgeoning populations. This transition represented a fundamental shift in the interaction between fully-modern humans and their surroundings. Moreover, the introduction of agriculture catalyzed a multitude of advancements, spanning from the cultivation of crops and the mastery of fire to the innovation of automated machinery.

For the past 12,000 years, agriculture has propelled human progress forward. Nevertheless, we stand at a pivotal moment. With a projected global population of 9.7 billion by 2050, agricultural output must surge by a minimum of 70% from present levels to accommodate shifting dietary preferences and nutritional needs. The demand for more nourishing food is placing unprecedented strain on our planet's health, intensifying pressure on the agriculture industry to innovate sustainably.

Let's delve into how automated farming, also referred to as smart farming, revolutionizes agricultural practices through the integration of cutting-edge technologies.

VERTICAL FARMING AND CONTROLLED ENVIRONMENT AGRICULTURE

Embark on a journey into the vertical realm of farming, where crops flourish in stacked layers under artificial lighting, hydroponics, and aeroponics. Experience the allure of urban farming, where limited space is transformed into lush oases of year-round harvests, with reduced water usage and minimal reliance on pesticides. Join pioneering companies like AeroFarms, Plenty, and Bowery Farming as they redefine the very essence of agriculture.

ROBOT BEES FOR POLINATION

Witness the dawn of a new era in pollination as robotic bees, or "pollinator drones," take flight. Marvel at these tiny marvels as they dance among the blooms, ensuring the continuity of crop pollination in the face of declining natural bee populations.

BLOCKCHAIN IN AGRICULTURE

Uncover the power of transparency and traceability in agriculture through blockchain technology. Journey with farmers as they trace the journey of their produce from seed to table, ensuring authenticity, quality, and fairness every step of the way. Explore the innovative solutions of trailblazers like IBM Food Trust as they revolutionize the food supply chain.

SMART IRRIGATION SYSTEM

Embark on a quest to conquer water scarcity with smart irrigation systems. Witness the magic of sensors, weather data, and automation as they orchestrate the symphony of water usage, ensuring optimal hydration for crops while conserving precious resources.

AI POWEREDF CROP DISEASE DETECTION

Delve into the realm of artificial intelligence as it peers into the very heart of crop health. Experience the thrill of early detection as AI algorithms analyze crop images, enabling farmers to thwart diseases, pests, and nutrient deficiencies before they take hold.

ROBOTIC HARVESTING

Step into a world where robots reign supreme in the art of harvesting. Witness the grace and precision of robotic arms as they delicately pluck ripe fruits and vegetables, ushering in a new era of efficiency and quality in crop harvesting.

These captivating advancements not only promise increased productivity but also herald a new dawn of sustainability and resilience in agriculture. Join us as we embark on an exhilarating journey into the future of farming, where technology knows no bounds.

THPS: A new industrial biocide with low environmental toxicity

Innovation and Benefits: Albright & Wilson discovered the antimicrobial properties of THPS and developed it into a safer biocide that can be used to control the growth of bacteria and algae in industrial water systems. THPS offers many advantages over other, traditional biocides because, for example, it is significantly less toxic to non-target organisms, is effective at much lower concentrations, and is more biodegradable than other biocides.

Problem and its Solution: Conventional biocides used to control the growth of bacteria, algae, and fungi in industrial cooling systems, oil fields, and process applications are highly toxic to humans and aquatic life and often persist in the environment, leading to long-term damage. To address this problem, a new and relatively benign class of biocides, tetrakis(hydroxymethyl)phosphonium sulfate (THPS), has been discovered by Albright & Wilson Americas.

Green Aspects of using THPS

THPS rapidly breaks down in the environment through hydrolysis, oxidation, photo degradation, and biodegradation. In many cases, it has already substantially broken down before the treated water enters the environment.THPS does not bio accumulate and, therefore, offers a much reduced risk to higher life forms.THPS biocides are aqueous solutions and do not contain volatile organic compounds . Because THPS is halogen-free, it does not contribute to the formation of dioxin or absorbable organic halides.

By- Shivanshu B.Sc. (H) Chemistry

ARE WE DOING IT THE RIGHT WAY?

By- Anjali Kaintura
B.Sc. (H) Zoology

Planting trees, or "afforestation," is like a superhero move to fight climate change. But guess what? It's not as simple as just throwing seeds in the ground. why everyone's talking about planting trees to save the planet. Afforestation, the process of planting trees, has been hailed as a silver bullet solution to combat climate change. It's become the go-to strategy for governments, organizations, and individuals looking to offset carbon emissions. But is it really the perfect solution we've been led to believe?
Today, we're going beyond the surface to explore the unintended consequences of afforestation. While planting trees can indeed sequester carbon and mitigate climate change, the type of trees we plant and where we plant them matters immensely. Let's talk about invasive plant species. These are plants that are not native to a particular ecosystem and, when introduced, can wreak havoc on the local environment. Take, for example the common reed, Phragmites australis. Originally native to Europe and Asia, it was introduced to North America in the 19th century for ornamental and erosion control purposes. Today, it dominates wetlands across the continent, crowding out native plants and reducing biodiversity. And let's not forget about the Australian paperbark tree, Melaleuca quinquenervia. Introduced to Florida in the early 20th century to drain swamps and combat mosquitoes, it quickly spread, displacing native flora and fauna and drastically altering the landscape. How we can forget India ... Imagine this plant called Lantana camara. Originally brought in for ornamental purposes in the 19th century, . But guess what? It turned into a troublemaker. this colorful shrub has since become a major invasive species, spreading rapidly and outcompeting native plants.

Next up, meet the Eucalyptus tree. It was brought to India to make paper, However, the tree's water-intensive nature has posed significant challenges in water-stressed regions, impacting local water tables and exacerbating drought conditions . In places where water is already scarce, it caused more problems than it solved. It's like inviting a guest to your house, but they use up all your water! Now, the Prosopis juliflora, or the mesquite tree. It came to India to fight against desertification, but it got too excited. It spread everywhere, creating a messy thorny situation that local plants couldn't handle.These examples highlight the importance of considering the ecological context when implementing afforestation initiatives. So, what's the solution? It's not just about planting trees for the sake of it. We need to prioritize native species and carefully consider the ecological impact of our afforestation efforts. This means conducting thorough research, consulting with ecologists, and implementing strategies to control invasive species.

In conclusion, while afforestation is an important tool in the fight against climate change, we must approach it thoughtfully and responsibly. Let's not only focus on planting more trees but also on preserving and restoring native ecosystems. It's time to recognize that the path to a sustainable future lies not just in planting any tree but in safeguarding the delicate balance of our planet's biodiversity.

Deciphering the Regulatory Networks of Long Non-Coding RNAs

By: Anzar Shafi Magloo
B.Sc. (H) Botany

The Long Non-Coding RNA's (lncRNA's) are a class of RNA molecules that are longer than 200 nucleotides and not encode proteins. Due to their pivotal role in various cellular processes they have gained considerable attention in recent years these processes that include gene expression regulation, epigenetics modifications, and genome organization. The Long non coding RNA's (lncRNA's) are a class of regulators that are defined as endogenous transcribed RNA molecules In pancreatic cancer the biological and molecular mechanisms of lncRNA's are still unclear. Recent studies reported that many lncRNA's are dysregulated in pancreatic cancer and closely associated with tumorigenesis, diagnosis and prognosis. The knowledge of the role of lncRNA's can help to use them further as novel biomarkers for therapeutic aspects.

A substantial body of functional studies has unequivocally demonstrated the regulatory role of non-coding transcripts in finely tuning various biological processes. Surprisingly, while nearly 90% of the human genome is transcribed into RNA molecules, only a mere 1.2% of these transcripts are translated into protein molecules. In the early stages of research, these non-coding transcripts were often dismissed as mere byproducts of RNA processing machinery. However, the ENCODE consortium's pioneering work has redefined our understanding, revealing that a significant proportion, ranging from 62% to 75%, of the human genome is indeed covered by these transcripts.

Following the completion of the Human Genome Project, an exploration into the biology of these extensive non-coding RNA's (lncRNA's) commenced. This exploration uncovered their pivotal roles as important regulators of numerous physiological and cellular functions. These ncRNA's come in various sizes and are classified based on their length, including small non-coding transcripts such as microRNA's (mi-RNA's), small nuclear RNA's (snRNA's), piwi RNA's, and long non-coding RNA's (lncRNA's), which are transcripts longer than 200 nucleotides.While small ncRNA's, like miRNA's, have been extensively studied for their involvement in various complex diseases, the regulatory significance of lncRNA's has started to unfold, particularly in the context of development, progression, and manifestation of metabolic diseases.

Some notable features of lncRNA's include their relatively poor sequence conservation across evolutionary hierarchies and the tendency to have fewer exons compared to protein-coding genes. Additionally, lncRNA's may or may not be polyadenylated, with their function often reliant on their secondary structure. In terms of transcriptional regulation, lncRNA's are typically transcribed by RNA polymerase II, capped at the 5' end, spliced, and possess promoter regions. Most lncRNA's are also polyadenylated at the 3' end. LncRNA's exert their influence on gene expression in multiple ways, such as directly binding to DNA sequences to either inhibit or promote gene transcription. Depending on their mode of action, lncRNA's can be categorized as either cis-acting (influencing genes on the same chromosome) or trans-acting (influencing genes on different chromosomes). The heterogeneous nature of lncRNA's allows them to engage in multifaceted biological functions and interact with various proteins.

LncRNA's, based on their sub-cellular localization in either the nucleus or cytoplasm, can interfere with various aspects of transcriptional and post-transcriptional gene regulation. In the nucleus, they can mediate epigenetic gene modifications or play roles in transcriptional activation and silencing. In contrast, cytoplasmic lncRNA's often interact with miRNA's, enabling them to post-transcriptionally regulate gene expression or serve as molecular scaffolds for RNA-protein complexes.

THE HIDDEN ENEMY

EXPLORING THE RAVAGES OF MANGO MALFORMATION DISEASE

By- Priya Yadav
Ph.D.Student
Dept. of Botany

Mango malformation disease (MMD) is a significant global disease that affects vegetative and reproductive parts of mangoes (Mangifera indica L.). It can result in 50-80% of production losses, and the lack of understanding regarding the etiology of mango malformation makes it an even more complicated and devastating condition.

A skilled mango farmer from Bihar made the initial diagnosis of the disease in India. After that point, additional mango-producing nations (China, Pakistan, UAE, Bangladesh, Spain, Mexico, Australia, South Africa, Sudan, Brazil, etc.) have acknowledged this problem. Vegetative malformation usually affects young seedlings, especially when plants are at nurseries. At the seedling stage, common signs of this disease include axillary and vegetative buds sprouting at the internodes, as well as a loss of apical dominance. Seedlings that are diseased must be killed since they cannot be made to grow normally through vegetative means. Mature trees exhibit floral deformity during flowering, which causes an expanded florescence, increased development of panicles, and abortion of fruits. Since the disease is so mysterious, there has long been an intense debate on its etiology. It has been demonstrated that a number of Fusarium spp. within the Fusarium fujikuroi species complex cause MMD.

There has been another perspective for malformation in mango due to higher ethylene production. Fusarium mangiferae not only produces ethylene but also causes the overexpression of important genes that alter plant hormones balance and produce ethylene as a stress hormone. Additionally, it appears that the production of "Stress ethylene" is increased by the presumed causative agents of mango deformity, including high soil moisture, mite infestation, fungal infection, virus, herbicides, and other hazardous substances.

Also, the distinctive symptoms exhibited by deformed plants can be attributed to increased synthesis and accumulation of specific biochemical compounds. The signs and symptoms of deformed panicles bears a striking resemblance to the

Fig-Normal Flower Growth

Fig-Distorted flower panicle and dwarfed leaf growth

effects of ethylene, including leaf epinasty, irregular orientation of shoots and panicles, containment of apical dominance, hypertrophied cells, and increased gummosis in abnormal tissue. Plant growth and development are also negatively impacted by long-lasting, damaging effects of cyanide. Cyanide is an additional co-product of ethylene production and may aid in the deformity growth.

Under unfavourable circumstances, cyanide is typically not eliminated by the β-CAS enzyme in non-cyanogenic plants. Therefore, the accumulation of unmetabolized cyanide results in aberrant flower development, altered cell and rachis elongation, distortion of floral parts, necrosis, and ultimately it leads to cell death in severe case. Numerous genetic and molecular techniques, such as the vegetative compatibility group (VCG), random amplified polymorphic DNA (RAPD), amplified fragment length polymorphism (AFLP), multilocus DNA sequence data, and identification of mating-type idiomorphs based on PCR assays, have been used to differentiate and characterize the various Fusaria linked to MMD.

There was a high association found between AFLP clusters and VCG, and six VCG within F. tupiense in Brazil these analyses were done to establish the genetic diversity among the isolates. Finding out the genetic variability and identity of Fusarium spp. that cause MMD might help develop more effective prevention strategies by revealing information about the host range, source population, and subsequent dissemination.

While different mango-producing nations have varied MMD management strategies, it has been demonstrated that removing the affected terminal from trees is a successful treatment.

Alternatively, for effective control, cleanliness may occasionally need to be combined with other strategies, such as the application of fungicides.

BIOPLASTICS: A SAFER ALTERNATIVE

BY- Aditi Jain
B.Sc. (H) Botany

Over the years, the production of plastic has exceeded eight trillion kilograms, with an annual discharge of eight billion kilograms into the ocean. Plastic holds indispensable roles in various sectors such as transportation, food, healthcare, and energy. However, the intersection of population growth and escalating consumer demands has triggered a substantial increase in plastic output, resulting in massive volumes of plastic waste and environmental concerns, including greenhouse gas emissions. A mere 9% of the plastic waste generated undergoes recycling, leaving the majority to accumulate on land and in oceans, inflicting severe harm on ecosystems, plant and animal life, and posing health risks to humans.

To tackle these pressing challenges, it is imperative to explore and implement alternative sustainable methods that minimize the use of non-renewable resources and encourage material reuse and recycling. One promising avenue involves harnessing biomass as a renewable resource, leading to the production of bioplastics. The terms 'plant-based' and 'bio-based' are often used interchangeably to denote the source of plastic polymers, while 'bioplastic' encompasses plastics derived either wholly or partly from biomass, including biodegradable plastics or those manufactured via biological processes. Bioplastics offer sustainable alternatives to conventional plastics, sourced from renewable origins, biodegradable, or produced through biological means.

In essence, bioplastics denote plastics derived from plant or biological sources, representing a vital step toward mitigating plastic-related environmental issues and fostering a more sustainable future.

Types of Bioplastics

1. Polylactic Acid (PLA) Based Plastics:
Polylactic acid (PLA) is derived from sugars found in crops like corn, cassava, or sugarcane. This type of bioplastic offers several advantageous features, including ease of fabrication, biodegradability, and non-toxicity. During biodegradation, PLA releases CO2, water, and decomposed organic matter, which can be utilized by green plants. PLA finds common usage in green packaging for fresh food products and also has applications in construction, agriculture, transportation, electronics, household goods, and textiles.

2. Polyhydroxyalkanoates (PHA) Based Plastics:
Polyhydroxyalkanoates (PHA) represent a thermoplastic polyester produced from the polymerization of (R)-3-ydroxyalkanoic acid monomers. PHA boasts a broad spectrum of applications, particularly in biodegradable implants, drug delivery systems, tissue engineering, and treatments for cancer and bacterial infections. Given its biodegradability and harmlessness to living tissues, PHA is frequently utilized in medical applications and single-use food packaging.

3. Starch-Based Plastics:
Starch-based plastics represent the most commonly employed bioplastic type. Simple starch bioplastic film can be produced at home by gelatinizing starch and solution casting. While pure starch exhibits humidity absorption properties, making suitable for drug capsule production in the pharmaceutical sector, it is inherently brittle. Starch-based bioplastics are often blended with biodegradable polyesters to produce blends like starch/polylactic acid, starch/polycaprolactone, or starch/Ecoflex, suitable for industrial applications and compostable.

4. Cellulose-Based Plastics:
Cellulose bioplastics primarily encompass cellulose esters (including cellulose acetate and nitrocellulose) and their derivatives, like celluloid. Cellulose can acquire thermoplastic characteristics through extensive modification, exemplified by cellulose acetate. Though expensive and thus rarely used for packaging, cellulosic fibers added to starches can enhance mechanical properties, gas permeability, and water resistance, owing to their lower hydrophilicity compared to starch.

In conclusion, the proliferation of conventional petroleum-based plastics has resulted in significant environmental degradation, with detrimental effects on ecosystems and human health. The emergence of bioplastics offers a promising solution to mitigate these challenges and transition towards a more sustainable future.

DESIGNING GREENER CHEMICALS

By: Neha Pathak
B.Sc. (H) Chemistry

Green Chemistry is the design of chemical product and processes that reduces or eliminate the generation of hazardous substances.

Newlight Technologies' AirCarbon technology is an innovative and environment friendly approach to producing plastics. By capturing methane gas i.e., greenhouse gas.
Hazards of methane gas

- High level of methane can reduce the amount of oxygen breathed from the air.
- It is flammable, explosive and harmful gas also.

In conventional methods, Petroleum based plastic was synthesised. But petroleum and its products can be dangerous to human health because they contain toxic compound such as benzene, BPA, etc.
The main polycarbonate material is produced by reaction of bisphenol-A(BPA) and phosgene. Condensation occurs in presence of NaOH with the liberation of NaCl salt waste.

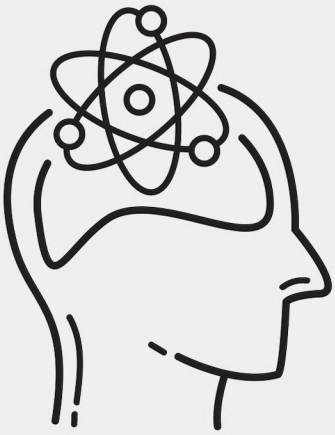
Drawbacks of Conventional Method

Bisphenol-A(BPA)
BPA are phenolic organic synthetic compound used as an additive or monomer in the production of polycarbonate plastic. It is having several harmful effects on our body. BPA adsorption into the body can results in the Development of metabolic disorder such as: Low Sex Neuro Development, Immunotoxicity and interference of cellular pathway.

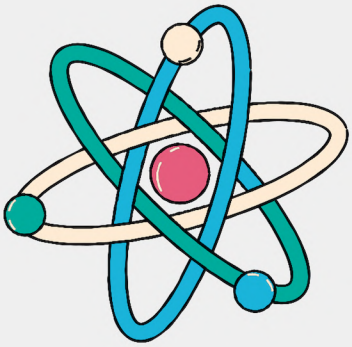
PHOSGENE GAS
Some green methods are also there but that new technology was more preferred because they reduce the emission of methane gas, not only reduce but also offer a sustainable alternative of petroleum waste plastic. This technology contributes to a more sustainable and carbon negative approach in the plastic industry.
In the new technology PHB (Polyhydroxy butyrate) was used as a green safer chemical. But PHB is made up of sugar and sugar is expensive. So, we used alternative method instead of directly using PHB.

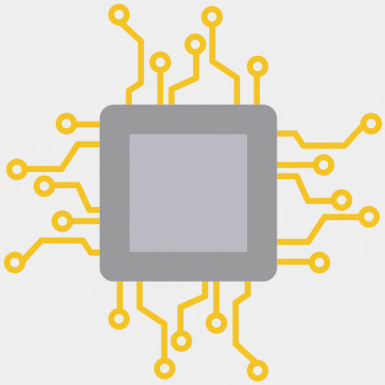
In this method we used methanotroph bacteria to convert methane into PHB which further converts to Biopolymers and these biopolymers forms Bioplastics. And this method is much more ecofriendly as it uses greenhouse gas to produce PHB.

सुVIGYAN 2024



Zakir Husain Delhi College orchestrated the First Science Fest combining all the Science Department, envisioned by Honorable Principal Sir, Prof. Narendra Singh on the 4th and 5th of April 2024, encompassing an array of both inter and intra-college events, which saw enthusiastic participation from students. Distinguished chief guests were graciously invited to both days of the event, which unfolded under the esteemed presence of Principal Narendra Singh.





Here, in these pages we try to capture an essence of the fest as we go over the various ceremonies and events of both days.

Day 1
4th April, 2024

The inaugural ceremony of the science fest commenced in the presence of Chief Guests Professor Surendra Singh and Professor A.K. Bhagi, as well as Principal Sir, Professor Narendra Singh, with a profound sense of solemnity and celebration. Prof. Babeeta C. Kaula and Prof. Devayani Muley were the coordinators and co-coordinator, orchestrated the proceedings of the event with meticulous attention to detail.

The auspicious beginning of the fest was marked by the ceremonial lighting of the Diya, symbolizing the illumination of knowledge and the spirit of unity. This traditional ritual, led by Principal Singh, imbued the atmosphere with a sense of reverence and auspiciousness.

Following this auspicious start, the audience was treated to a mesmerizing dance performance. Principal Singh then took the stage to deliver an impassioned address, emphasizing the importance of such celebrations.

Then insightful speeches were delivered by Principle Sir and the distinguished Chief Guests. Professor Surendra Singh and Professor A.K. Bhagi and shared their invaluable wisdom and experiences.

For the rest of Day 1, series of intra-college events, showcasing the diverse talents and passions of the student body. The inaugural ceremony of the festival served as a reminder of the power of science and culture to unite, inspire, and uplift. It laid the foundation for an enriching and memorable fest, filled with learning, laughter, and enjoyment.

The Intra College Events

• RANGOLI COMPETITION

Event Coordinators: Dr. Devayani Muley
Dr. Deepika Sharma
Student Coordinator: Ms. Himanshi, B.Sc.(H) Botany Semester IV
Judges: Dr. Ritu Mathur (Department of Chemistry)
Dr. Ranjeet Kumar Nirala (Department of Zoology)
Dr. Tanya Johri (Department of Psychology)
Winners
First Prize – Rahul Mallick (B.Sc. Electronics, Sem. VI)
Second Prize – Aanchal (B.Sc. Life Science, Sem. II)
Samridhi (B.Sc. Life Science, Sem. II)
Third Prize – Shashank Kumar (B.Sc. Physical Science, Sem. VI)
Prateek (B.Sc. Physical Science, Sem. VI)

• QUIZ COMPETITION

Event coordinators: Dr Parvesh (Department of Electronics)
Dr Sanjeev Kumar Mishra (Department of Chemistry)
Student Coordinators: Sania (Bsc Elec Science, 2nd year)
Ashish (Bsc Phy Science, 3rd year)

Judges: Dr Jyoti Tyagi , (Department of Chemistry)
Dr Prerna, (Department of Chemistry)
Dr Ritu Aggarwal, (Department of Psychology)
Winners
First Prize: Tanmoi Saikia and Aman Kumar (BSc Electronics 4th sem)
Second Prize: Abinav and Shivani (B.A. Psychology 2nd sem)
Third Prize: Amrajeet and Abhishek (BSc Prog Life Sciences 4th sem)

• GUESS THE FORBIDDEN

Event Coordinators: Dr Jyotsna Kumari
Dr Amitabh Mathur
Student Coordinators: Ms. Anjali Kaintura , B.Sc. (H) Zoology Semester IV
Ms. Arshita Kwatra , B.Sc. (H) Zoology Semester II
Judges : Dr Devender (Department of Environmental Science)
Dr Ragesh P.R (Department of Zoology)
Dr Shyodan Singh (Department of Psychology)
Winners
First Prize: Shihab, Kedar Jakhar, Zuhair Farooque (B.Sc. Zoology Hons , Semester VI)
Second Prize: Shreya Srivastav, Suraj Rana
Himanshi Chauhan (B.Sc. Life Sciences , Semester VI)
Third Prize: Satyam Mishra, Ashvani Singh
Priyanshu Rajput(B.Sc.Physical Sciences, Semester VI)

• JUST A MINUTE

Event Coordinators: Dr. Savindra Kumar (Department of Botany)
Dr. Zeeshan ur Rahman (Department of Botany)
Student Coordinator: Ms. Aisha Khan B.Sc. (H) Botany

Judges: Dr. Ranjeet from Department of Zoology
Dr. Lokesh from Department of Physics
Ms. Tanya From Department of Psychology
Winners:
First Prize: Lakshita (B.Sc. Life Science)
Second Prize: Nakul (B.Sc. (H) Botany)
Third Prize: Aakash (B.Sc.(H) Zoology)

• UPCYCLING

Event Coordinators: Dr. Vishnudyutya Kumar Punj
Dr. Grace Lalkhawngaihi
Student Coordinators: Ms. Saachi Rohtagi
Ms. Apoorva
Judges: Dr. Ruchi Vir (Department of Botany)
Dr. Ruby Bansal (Department of Chemistry)
Dr. D. Chao (Department of Psychology)
Winners:
First- Unnati Thakur (Bsc Life Science 2nd Semester)
Pranav Sharma(B.Sc. Life Science 2nd Semester)
Second – Shanvi Singh (Bsc Life Science 2nd Semester)
Third – Priyanshu Kumar Singh (B.A. Hons Psychology)

• SLOGAN WRITING

Event Coordinators: Dr. Parveen Gill
Dr. Valentina
Student Coordinator: Ms. Anjali Kaintura , B.Sc. (H) Zoology Semester IV
Judges: Dr. Lakshmi
Dr. Lokesh
Dr. Ritu
Winners:
First : Swarnika B.Sc. (H) Zoology
Second : Kanika B.Sc. (H) Zoology
Third: Khushi Singh Kumari B.Sc. (H) Chemistry

• SCI RUS

Event Coordinators: Dr. Anubha Sharma
Dr. Arvind
Student Coordinator: Ms. Yukti
Judges: Dr. Ruby Bansal (Department of Chemistry)
Dr. Jyotsana (Department of Zoology)
Winners:
First : Akhya Sinha B.Sc. (H) Chemistry
Second : Yukti Singh B.Sc. (H) Chemistry
Third: Aryan Gautam B.Sc. (H) Botany

Day 2
5th April, 2024

The vibrant atmosphere of the festival's second day came to life as the esteemed Chief Guest, Professor Manmohan, and Professor Balram Pani graced the event, their presence further dignified by the company of the respected Principal. Professor Anshu Rastogi extended a warm welcome to our chief guest by presenting a plant as a token of appreciation. Following a captivating Bharatnatyam performance, the Chief Guests delivered an inspiring and insightful speech, sharing their wisdom and insights, leaving the audience inspired and enlightened by their profound words.

Subsequently, Prof Devyani delivered the opening address, highlighting the significance of Principal Sir's tenure, coinciding with the milestone of 2 year at the college. Professor P.K. Shishodia then offered words of appreciation, reflecting on the various administrative and academic advancements achieved under Principal Narendra Singh's leadership.

Additionally, the Psychology department inaugurated a counseling cell for students.

Principal Sir took the podium thereafter, sharing his gratifying experiences as Principal and expressing his aspirations for elevating the college to greater heights. With his remarks, the events of the second day commenced.

INTER COLLEGE COMPETITION

1. PAPER PRESENTATION

Event Coordinators: Dr Tabassum Jehan (Department of Botany)
Dr .Mohammad Wahid Ansari (Department of Botany)
Student Coordinator: Ms. Jahnvi Singh B.Sc. (H) Botany
Judges:Dr Malti Gupta (Department of Botany)
Dr Ravikant (Department of Chemistry)

Winners
First- Mr. Avinash Department of Computer Science, Ramlal Anand College
Second - Satiyam Mishra Department of Physical Science, Zakir Husain Delhi College

2. POSTER MAKING

Event Coordinators: Ms. Tanya Johri
Mr. Abhinav Singh
Student Coordinator: Bhumika Bhattacharya
Judges: Dr. Grace (Department of Psychology)
Dr. Parvesh (Department of Electronics)
Dr. Tabassum (Department of Botany)

Winners
First Prize -Karan Kishan (Life Sciences)
Second Prize- Ashish & Prateek (B.Sc. Physical Sciences)
Third Prize -Samridhi Misra (Life Sciences)

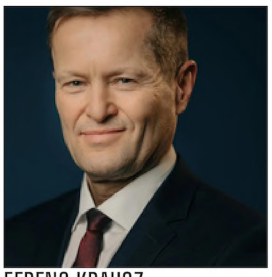
SAGES OF SCIENCE

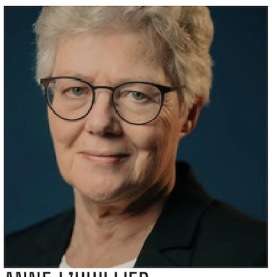
NOBEL PRIZES 2023

THE NOBEL PRIZE IN PHYSICS 2023

The three Nobel Prize laureates in physics 2023 are being recognised for their experiments, which have given humanity new tools for exploring the world of electrons inside atoms and molecules. They have demonstrated a way to create extremely short pulses of light that can be used to measure the rapid processes in which electrons move or change energy.


PIERRE AGOSTINI


FERENC KRAUSZ


ANNE L'HUILLIER

THE NOBEL PRIZE IN CHEMISTRY 2023

Moungi G. Bawendi, Louis E. Brus and Aleksey Yekimov are awarded the Nobel Prize in Chemistry 2023 for the discovery and development of quantum dots. These tiny particles have unique properties and now spread their light from television screens and LED lamps. They catalyse chemical reactions and their clear light can illuminate tumour tissue for a surgeon.


MOUNGI G. BAWENDI


LOUIS E. BRUS


ALEKSEY YEKIMOV

THE NOBEL PRIZE IN PHYSIOLOGY OR MEDICINE 2023

The discoveries by the two Nobel Prize laureates were critical for developing effective mRNA vaccines against COVID-19 during the pandemic that began in early 2020. Through their groundbreaking findings, which have fundamentally changed our understanding of how mRNA interacts with our immune system, the laureates contributed to the unprecedented rate of vaccine development during one of the greatest threats to human health in modern times.


KATALIN KARIKÓ

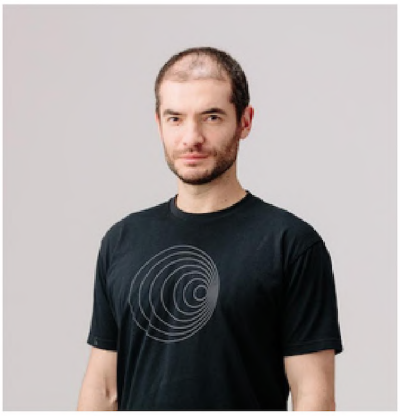

DREW WEISSMAN

By- Debankur Kalita
B.Sc.(H) Electronics

SHAPING THE AI LANDSCAPE

By: Aman Kumar
B.Sc. (H) Electronics

This article provides an in-depth exploration of the life and accomplishments of Llya Sutskever, a prominent figure within the realm of Artificial Intelligence, shedding light on his contributions, concerns about AI's future, and his unique approach to research and innovation



WHO IS LLAY SUTSKEVER?

Llya Sutskever is a renowned computer scientist and researcher in the field of artificial intelligence (AI). He is best known for his contributions to deep learning, a subset of AI that focuses on training artificial neural networks to learn and perform tasks with data. Sutskever has made significant advancements in areas such as natural language processing, image recognition, and machine translation.

EARLY LIFE AND EDUCATION

Bllya Sutskever's educational journey and early life are integral parts of his remarkable trajectory in the field of artificial intelligence. Born in Russia in 1984, Sutskever's passion for computer programming ignited at a young age, shaping his path towards academic excellence. His educational pursuits led him to the University of Toronto, where he delved into computer science and mathematics. Under the mentorship of Geoffrey Hinton, a prominent figure in deep learning and neural networks, Sutskever excelled as a standout student, laying a solid foundation for his future contributions to AI research.Transitioning from his early years to higher education, Sutskever completed his bachelor's degree in 2006 and followed it with a master's degree in 2008. This educational journey not only equipped him with the necessary knowledge and skills but also instilled in him a deep understanding of the complexities of artificial intelligence. His collaboration with Geoffrey Hinton played a pivotal role in honing his expertise and innovative approach to AI research.Sutskever's early life experiences and educational background set the stage for his groundbreaking work in the field of artificial intelligence. His journey from a curious student to a pioneering AI luminary exemplifies the transformative power of education and dedication in shaping one's future. These formative years laid the groundwork for his future endeavors, propelling him towards becoming a key architect of the AI revolution and leaving an indelible mark on the landscape of artificial intelligence research.

HIS LIFE AT OPENAI

After a successful stint at Google, where he showcased the power of deep learning in language processing, Sutskever co-founded OpenAI in 2014. As the Chief Scientist and co-founder of OpenAI, Sutskever played a pivotal role in establishing the institute as a powerhouse of AI innovation, developing Artificial General Intelligence (AGI), a vision that set ambitious goals for the future of AI. Despite challenges and controversies within OpenAI, Sutskever remained focused on advancing AI responsibly and ensuring its alignment with human values.

CONTRIBUTIONS IN AI

Sutskever's research contributions have been groundbreaking and transformative. His work on neural networks and deep learning has pushed the boundaries of what is achievable in AI. Notable among his achievements is the development of the Sequence to Sequence Learning architecture, which significantly enhanced machine translation and natural language processing capabilities. His research has delved into areas such as recurrent neural networks, unsupervised learning, and reinforcement learning, contributing to more effective and efficient training of deep neural networks.

RECOGNITION AND INFLUENCE

Sutskever's innovative work and influential contributions have garnered recognition within the AI community and beyond. He has received several awards and honors for his contributions to machine learning and AI research. His work at OpenAI and his research breakthroughs have not only pushed the boundaries of deep learning but have also sparked important conversations about the ethical implications and societal impact of AI. As AI continues to evolve, Sutskever's legacy as a pioneering figure in the field remains at the forefront of innovation and progress in artificial intelligence.

HIS VISION

In reflecting on the monumental impact of AI advancements and the risks associated with superhuman AIs, Sutskever shared a profound insight: "It's going to be monumental, earth-shattering. There will be a before and an after." This quote encapsulates his vision for the transformative potential of AI while acknowledging the profound implications it may have on society.

Women in Science

"Science knows no gender. It's the brilliance of the mind that propels discovery forward, not the gender of the scientist." - Neil deGrasse Tyson

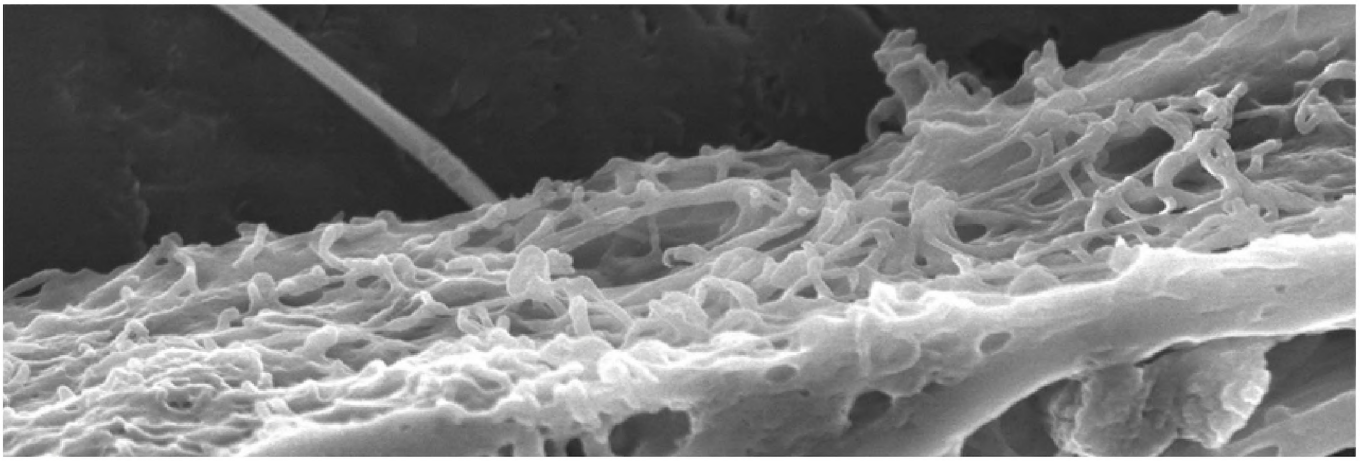
By Harshita Tripathi
B.Sc. (H) Botany

Katalin Karikó, born on January 17, 1955, in Kisújszállás, Hungary, is a distinguished biochemist celebrated for her pioneering benefactions to RNA curatives, specially in the field of mRNA vaccine advancement. Her disquisition of mRNA nucleosides during the 2021 COVID- 19 epidemic was vital in stimulating vulnerable responses against specific pathogens, climaxing in the commencement of the first mRNA vaccines. In 2023, Karikó and her coworker Drew Weissman were awarded the Nobel Prize in Physiology or Medicine for their revolutionary exploration on mRNA nucleosides, which laid the essential root for the development of COVID- 19 mRNA vaccines.

Growing up in a small Hungarian vill, Karikó developed a keen interest in the natural world and bettered in her wisdom studies. After earning her doctorate from the University of Szeged, she began working at the Biological Research Centre(BRC) in Szeged in 1978. At the BRC, she embarked on exploration into modified nucleosides, a type of synthetic mRNA characterized by altered or substituted nucleosides, frequently involving synthetic or naturally modified variants. also, she excavated into the antiviral parcels of short RNA parts.

In 1985, due to inadequate backing for her exploration at the BRC, Karikó moved to the United States and took up a postdoctoral position at Temple University in Philadelphia. Four times latterly, she transitioned to the University of Pennsylvania(Penn). uniting with American cardiologist Elliot Barnathan, she demonstrated the capacity of mRNA to prompt protein product upon its preface into cells. This advance propelled her into the realm of mRNA- grounded gene remedy exploration. mRNA exploration In the late 1990s, Karikó and Weissman banded at the University of Pennsylvania, introducing mRNA technology for vulnerable stimulation against viral pathogens. Their examinations revealed that mRNA could spark potent vulnerable responses, which posed challenges. They discovered that modifying nucleosides could palliate this issue, performing in the development ofnon-immunogenic, nucleoside- modified RNA. This advance led to the establishment of RNARx, a company that certified their technology to Moderna and BioNTech. In 2013, Karikó joined BioNTech as elderly vice chairman. Although multitudinous RNA rectifiers passed clinical trials without success, the COVID-19 epidemic saw the rapid-fire emergence of mRNA vaccines, exercising synthetic technologies without contagion patches. Awards In addition to the Nobel Prize, Karikó was recognized with multiple awards feting her benefactions to RNA rectifiers. These include the LewisS. Rosenstiel Award for Distinguished Work in Basic Medical Research(2020), the Lasker- DeBakey Clinical Medical Research Award(2021), and the Louisa Gross Horwitz Prize(2021), all of which she participated with Weissman.


HELLO,
FUTURE
Future Ready



A DIVE INTO NANOTECHNOLOGY

By: Hussain Ashrafi
B.Sc.(H) Electronics

PRECISION AT THE ATOMIC SCALE

Nanotechnology, the science of manipulating matter at the atomic and molecular level, has emerged as a revolutionary field with boundless potential to transform industries and redefine the boundaries of scientific exploration. At the heart of nanotechnology lies the ability to engineer materials and devices with unprecedented precision, opening doors to a myriad of applications across diverse sectors ranging from healthcare to electronics.

THE NANOSCALE REVOLUTION

Imagine a world where materials can be tailored atom by atom, where electronics can be miniaturized to the point of being virtually invisible, and where medical treatments can target individual cells with pinpoint accuracy. This is the promise of nanotechnology. By working at the nanoscale—typically defined as one billionth of a meter—scientists can harness unique properties that emerge at this tiny dimension, enabling breakthroughs that were once considered science fiction.

APPLICATIONS ACROSS INDUSTRIES

One of the most exciting areas of nanotechnology is in medicine, where nanoparticles are being developed for targeted drug delivery, imaging, and diagnostics. These tiny particles can navigate through the body, seeking out diseased cells while leaving healthy tissue unharmed, revolutionizing the way we treat diseases such as cancer. Similarly, in electronics, nanotechnology has led to the development of smaller, faster, and more efficient devices, paving the way for the next generation of computing and communication technologies.

ENVIRONMENTAL IMPACT

Nanotechnology also holds promise for addressing some of the most pressing environmental challenges of our time. From water purification to energy storage and renewable energy generation, nanomaterials are being developed to provide sustainable solutions that minimize our ecological footprint and mitigate the effects of climate change.

CHALLENGES AND CONSIDERATIONS

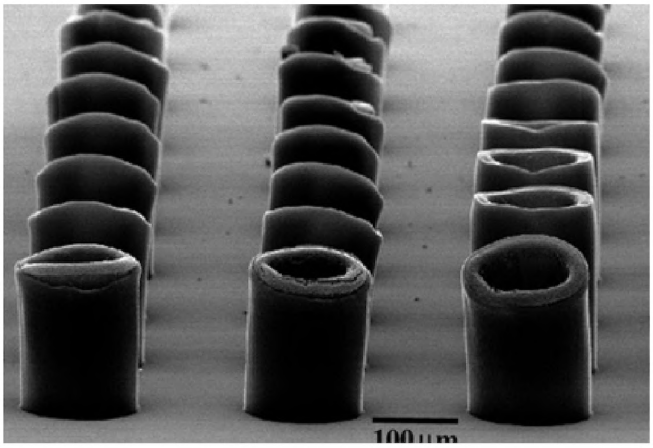
However, with great potential comes great responsibility. As with any emerging technology, there are ethical, environmental, and safety concerns associated with the widespread adoption of nanotechnology. Questions about the long-term effects of exposure to nanoparticles, their impact on the environment, and the potential for misuse or unintended consequences must be carefully considered as we continue to explore the frontiers of this field.

LOOKING TO THE FUTURE

Despite these challenges, the future of nanotechnology is undeniably bright. As researchers continue to push the boundaries of what is possible at the nanoscale, we can expect to see even more groundbreaking innovations that will shape the way we live, work, and interact with the world around us. From personalized medicine to quantum computing, the possibilities are limited only by our imagination.

UNIQUE USES

Nanotechnology allowed scientists and engineers to create the nanotubes on which this ladybug is walking. Carbon nanotubes are stronger than steel and more flexible than rubber.



Carbon nanotubes are hollow, atom-thick tubes of a form of carbon called graphene. The strength and flexibility of carbon nanotubes are useful for making things like bicycles or tennis raquets stronger and lighter, satellites less prone to "light pollution," and solar cells thinner and more flexible.

Nanotechnology can help medical tools and procedures be more personalized, portable, cheaper, safer, and easier to administer. Silver nanoparticles incorporated into bandages, for example, smother and kill harmful microbes.

CONCLUSION

In conclusion, nanotechnology represents a paradigm shift in our understanding of materials and their properties, offering unprecedented control at the atomic and molecular level. As we continue to unlock the mysteries of the nanoscale, we are poised to usher in a new era of innovation and discovery that will undoubtedly transform the way we experience the world.

Revolutionizing Home Entertainment: Smart TVs Future

By- Aashika
B.Sc. (H) Electronics

In an era where technology is constantly evolving, the landscape of home entertainment is undergoing a monumental transformation. Smart TVs have emerged as the centerpiece of modern living rooms, offering unparalleled connectivity, stunning visuals, and immersive audio experiences. As we delve into the intricacies of these cutting-edge devices, it becomes evident that the future of home entertainment is brighter than ever before.

THE ANATOMY OF A SMART TV

Behind the sleek exterior of every smart TV lies a complex network of hardware and software components working in harmony to deliver an unparalleled viewing experience. From powerful processors and high-resolution displays to sophisticated operating systems and AI-driven algorithms, every aspect of a smart TV is meticulously designed to captivate and engage audiences.

EVOLUTION OF TVS

From bulky CRT televisions to sleek, ultra-thin displays, the journey of television technology has been nothing short of remarkable. Smart TVs represent the pinnacle of this evolution, integrating advanced features such as internet connectivity, app support, and voice control. With the rise of streaming services like Netflix, Hulu, and Disney+, smart TVs have become indispensable hubs for accessing a vast array of digital content.

CHALLENGES AND OPPORTUNITIES

While the future of smart TVs is undoubtedly promising, it is not without its challenges. Privacy concerns, cybersecurity risks, and compatibility issues are just a few of the obstacles that manufacturers navigate in order to realize the full potential of these devices. However, with innovation and ingenuity, these challenges can be overcome, paving the way for a future where smart TVs seamlessly integrate into every aspect of our lives.

As technology continues to advance at a rapid pace, the future of smart TVs holds limitless possibilities. From seamless integration with smart home devices to the advent of augmented reality (AR) and virtual reality (VR) experiences, smart TVs are poised to redefine the way we interact with digital content. Furthermore, advancements in display technology, such as MicroLED and OLED, promise to elevate picture quality to new heights, creating truly immersive viewing environments.

CONCLUSION

In conclusion, smart TVs represent the vanguard of home entertainment, offering a glimpse into the future of how we consume and interact with digital media. With their blend of cutting-edge technology and intuitive design, smart TVs are poised to revolutionize the way we experience television, bringing us closer to the ultimate goal of a fully connected and immersive entertainment ecosystem. As we embark on this journey into the future, one thing is certain: the possibilities are endless.

Artificial Intelligence in Healthcare

By: Satyendra Kumar
B.Sc. (H) Electronics

What is Artificial Intelligence?

Artificial intelligence refers to the technical capability that enables machines to learn and solve problems autonomously, without human intervention. Its applications in healthcare encompass disease diagnosis, treatment planning, and disease prognosis.

Use of Artificial Intelligence in Healthcare:

1. Disease Diagnosis:
AI systems play a crucial role in rapidly and accurately diagnosing various diseases through pattern recognition and data analysis.

2. Treatment Planning:
AI experts assist in formulating personalized treatment plans tailored to individual patients, based on comprehensive analysis of their conditions.

3. Disease Prediction:
AI facilitates the prediction of diseases, empowering healthcare professionals to anticipate and manage upcoming health issues proactively.

Advantages:

1. Quick and Accurate Diagnosis:
AI-driven diagnosis ensures swift and precise identification of diseases, enhancing the efficiency and effectiveness of healthcare services.
2. Personalized Treatment:
Utilizing AI, healthcare providers can devise specialized treatment plans for each patient, leading to targeted and effective interventions.

Conclusion:

The integration of artificial intelligence marks a significant revolution in healthcare, improving disease diagnosis, treatment, and prognosis. By enabling personalized care and strategic disease management, AI is ushering in a new era of healthcare, offering patients enhanced access to superior and expedited treatment.


A BIT
DIFFERENT
A BIT
SPECIAL

TURNING PLASTIC BOTTLES INTO VANILLA FLAVORING

By- KANDA SWAMI
B.Sc.(H) Chemistry

Vanilla, a beloved and widely used flavor, is traditionally derived from vanilla beans. However, researchers are pushing the boundaries of sustainable practices by exploring unconventional sources for this coveted flavor. The intricate process involves breaking down the plastic polymers into their basic components and strategically modifying them to produce the key compounds responsible for vanilla's distinctive taste and aroma.

The problem of the disposal of objects made from plastic is one of the biggest challenges of the present time. The whole world is struggling to develop effective methods to reduce the amount of pollution that devastates our environment.

One of the most interesting solutions turned out to originate from scientists at the University of Edinburgh, who transformed plastic bottles into vanilla flavoring. The research involved mutating the enzymes responsible for the decomposition of polyethylene terephthalate (the polymer from which the bottles are made). The decomposition reaction produced terephthalic acid (TA), which was then converted into vanillin. This compound carries most of the taste and smell of vanilla and is often used in the food, pharmaceutical and cosmetics industries.

85% of vanillin is currently synthesised from chemicals derived from fossil fuels. However, the demand for vanillin continues to rise. Therefore, this is an important discovery both because of the increase in demand, but more importantly for the sake of a solution with environmental benefits.

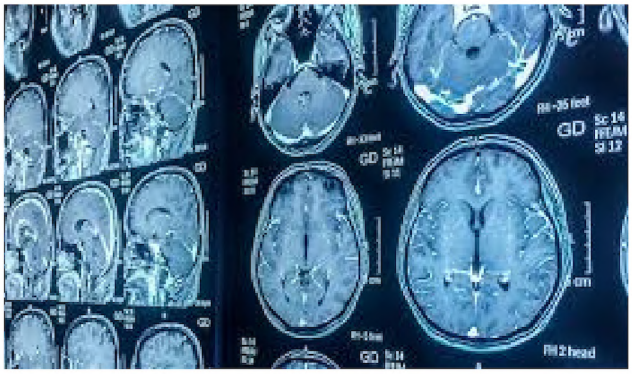
As we navigate the complexities of waste management and seek alternatives to conventional practices, the prospect of turning plastic bottles into vanilla flavoring exemplifies the ingenuity of scientists striving for a more sustainable future. This innovative solution encourages us to rethink our approach to waste, highlighting the potential for unexpected and delightful outcomes in the intersection of science, sustainability, and flavor.

HEALING WITHOUT HARM

The Green Evolution of Medical Imaging with Imation's DryView Imaging Systems

By- Deepak Sati
B.Sc. (H) Chemistry

Imation's DryView Imaging Systems mark a revolutionary advancement in medical imaging technology, utilizing a novel photographic film that relies on heat instead of hazardous developer chemicals. By the end of 1996, Imation had distributed over 1,500 DryView Imaging Systems globally. These systems alone have a profound environmental impact, eliminating the annual disposal of over half a million gallons of developer chemicals and 54.5 million gallons of contaminated water, while also significantly reducing workers' exposure to harmful chemicals.



The problem

Traditional medical imaging processes involve the use of silver halide photographic films that require immersion in chemical developers, fix solutions, washing with clean water, and subsequent drying. These chemicals, including hydroquinone, silver, and acetic acid, pose significant environmental risks. The resulting liquid waste, containing toxic compounds, contributes to billions of gallons of waste discharged annually.

The Solution

Imation's DryView Imaging Systems employ photo thermography, a cutting-edge imaging technology that utilizes thermal energy to process latent images created by exposing sensitized emulsions to light energy. Unlike conventional methods, DryView Imaging Systems require no wet chemistry, produce no liquid waste, and eliminate the need for additional drying steps. By passing the exposed film over a heat roll operating at 250 °F, diagnostic-quality images are achieved in approximately 15 seconds.

Conclusion

These advancements in photo thermography technology ensure that DryView Imaging Systems not only meet but also exceed the standards set by silver halide technology. In 1996 alone, Imation installed more than 1,500 DryView medical laser imagers worldwide, constituting 6 percent of the global installed base. The environmental benefits of these systems are staggering, eliminating the annual disposal of 192,000 gallons of developer, 330,000 gallons of fixer, and 54.5 million gallons of contaminated water into the waste stream.

By embracing Imation's DryView Imaging Systems, healthcare facilities can not only enhance diagnostic capabilities but also significantly reduce their environmental footprint. These systems epitomize the marriage of innovation and sustainability, heralding a new era in medical imaging technology.

THE SPICE MÉLANGE

JUST A FICTIONAL DRUG OR REALITY?

By- Akshit Yadav
B.Sc.(H) Chemistry

In Frank Herbert's Dune (A series of science fiction novels), one encounters a potent psychedelic drug revered throughout the known universe for its mind-altering effects, its ability to distort time perception, and its extreme rarity. This substance, known as the spice mélange (ma-lanj) or simply "spice," serves as the central focus of the initial novel. Within the series, it represents the most crucial and coveted commodity, endowing users with extended lifespans, heightened vitality, and increased awareness. Notably, for certain individuals, the spice can unlock prescience—a genetic-based form of precognition facilitated by higher doses of the drug. This prescience is instrumental in enabling safe and accurate interstellar travel, among other functions. However, mélange is also highly addictive, with withdrawal proving to be fatal. Prolonged usage of the drug results in the distinctive discoloration of the user's eyes to a deep shade of blue, referred to as "blue-in-blue."

In the opening sequence of Dune (Set up in the year 10,191), Princess Irulan (Daughter of Padishah Emperor Shaddam IV—the ruler of the known universe) explains the importance of spice. She says "The spice extends life. The spice expands consciousness. The spice is vital to space travel and the spacing guild and its navigators use spice gas/vapor (similar to smoking) which gives them the ability to fold space-time and travel to any part of the universe.

Image: The Sandworm whose excretion results in formation of Spice.

Image: The Spice

The spice originated on the planet Arrakis aka Dune, where it was produced deep beneath the sands. It was created in a process whereby the fungal excretions of sandtrout (the larva form of sandworm) would mix with water to form a pre-spice mass. This mass would then be brought to the surface of the desert through an explosion of pressure, and under the intense heat and air of Arrakis, mélange would form. More details about the spice mélange is mentioned in The Dune Encyclopedia which is a collection of essays written by Willis E. McNelly and multiple other contributors as a companion to Frank Herbert's Dune series of science fiction novels.

What Dune Encyclopedia has to say about the structure of the spice mélange?

"A complex bio-polymer originating only on Arrakis. Its several biological activities include interaction with various centers of the central nervous system (CNS), interaction with the immune system, and deposition within the sclera of the eyes. To date the structure of the biologically active portion of spice has not been isolated, although it is known that other portions of the molecule contain Glycoprotein, a cupric heme and cinnamic acid. Reports of the molecular weight of mélange have varied from 100 x 106 to 2 x 1012, depending upon the method of determination. This has led to speculations that mélange is a heterogeneous mixture of polymers of various sizes. The substance is hydrophilic, readily dissolved in aqueous solutions but not in organic solvents. To our best knowledge the polymer is composed of subunits of Proteoglycan-heme derivatives of Cinnamic acid."

What the chemist in me has to say about this molecule?

Although this molecule is a made up thing but at first glance this molecule may appear real even to the undergrad chemists like me, owing to the depth of thought invested in its construction. Let me break it down in simple terms for you. This molecule comprises three main components: a peptidoglycan-like structure at the top, a porphyrin ring at the bottom housing two copper molecules (this will prove to be helpful in proving the hypotheticality of this molecule later on), and a cinnamic acid moiety linking the two structures. Interestingly, its mentioned in "Dune" that mélange has an odor like cinnamon, so the presence of cinnamic acid in it indicates how deeply the creator of this "fictional structure" must have thought.

Image: A character from "DUNE" with blue eyes due to excessive consumption of the spice mélange

Image: A blue blooded lobster for comparison

Now I've called it a fictional structure just here because of the placement of two copper atoms within the cavity of the porphyrin ring which seems physiologically implausible. The size of the porphyrin ring's cavity typically accommodates those metal ions which forms bonds of ~200 picometers with each of its four nitrogens, if it makes bonds longer than 200 picometer then it remains outside the cavity. Myoglobin for instance (Supplies oxygen to muscle cells), contains a single Fe2+ion within its porphyrin ring but extends beyond the cavity due to its longer bond length (~205 picometer).

In contrast, mélange features two copper atoms within the same cavity and its almost impossible to stay in this type of arrangement. As far as I know, Hemocyanin is a protein which contains 2 copper atoms but it does not contain any kind of porphyrin ring. Hemocyanin is a blue colored protein found in organisms like lobsters and crabs and works as an oxygen transporter. "Dune" also has a mention that excessive consumption of mélange causes the consumer's eyes to turn blue, perhaps this is where the idea of using 2 copper atoms in this fictional structure must have been thought of. Another aspect rendering mélange fictional is its portrayal in "Dune" as being consumed in gas or vapor form by the Spacing Guild and its navigators. However, volatilizing a molecule of such considerable molecular weight would prove unfeasible in reality.

Dune is frequently described as the best-selling science fiction novel in history. It won the inaugural Nebula Award for Best Novel and the Hugo Award in 1966 and was later adapted into a 1984 film, a 2000 television miniseries, and a two-part film series with the first film in 2021 and a sequel in 2024.

In conclusion, I would like to appreciate the author of this book and his team as they've put so much thought into creating the molecular structure of this fictional drug to make it look as real as possible and that for once it can force even young chemists like us to think whether this thing really exists or not. But now I hope that after reading this article you might have got the insights about this psychedelic drug and whether it is real or not.

Revolutionizing Cosmetics

By- Mayank Dhaiya
B.Sc. (H) Chemistry

In the fast-paced world of cosmetics, where innovation is key and consumer demand for sustainable products is on the rise, the synthesis of ingredients plays a crucial role. Butylene Glycol is a popular ingredient in skincare products, due to its versatile properties as a humectant, solvent, and emollient. However, the conventional method of synthesizing it from fossil fuels using acetaldehyde raised environmental and health concerns, as it is carcinogenic and requires heavy metal catalysts. Additionally, the process generated a significant amount of waste and resulted in a mixture of enantiomers, making manufacturing and purity concerns more complicated.

Recognizing these challenges, Genomatica, a leader in bio-engineering, devised a greener method for producing Butylene Glycol, branded as Brontide. This innovative process utilizes fermentation by E. coli bacteria, converting renewable sugars into Butylene Glycol in a single step. Not only does this method eliminate the need for carcinogenic chemicals and heavy metal catalysts, but it also significantly reduces greenhouse gas emissions and fossil fuel use. The impact of Genomatica's green chemistry breakthrough is far-reaching. Not only does it provide a sustainable alternative for Butylene Glycol in cosmetics, but it also sets a precedent for green innovation in the industry. By which Brontide paves the way for a more sustainable future in skincare.

In recognition of its pioneering efforts, Genomatica has received prestigious awards, including the EPA 2020 Green Chemistry Challenge Award and the ICIS Innovation Award. These accolades underscore the significance of green chemistry in driving positive change and fostering sustainability in the cosmetics industry.

The benefits of Brontide extend beyond environmental sustainability. Its higher purity and exclusive production of the desired enantiomer open new possibilities for applications in human performance enhancement. Moreover, Genomatica's commercial-scale production of Brontide demonstrates the feasibility and scalability of this green synthesis method.

As consumers increasingly prioritize eco-conscious products, the success of Brontide highlights the importance of innovation and collaboration in achieving a greener, healthier future. With Genomatica's groundbreaking approach, Butylene Glycol synthesis has entered a new era of sustainability, promising brighter prospects for both skincare and the environment.

IS PURPLE GOLD WORTH IT?

By- Yukti Singh
B.Sc. (H) Chemistry

We've all heard the saying that not everything which is yellow is gold. Gold is a well-known metal that is both malleable and ductile. Because of these properties, it is widely used in ornamentation. It doesn't just shine yellow; it has an aesthetic appeal that attracts its customers, who are generally women. But what if I told you there's a whole new version of gold that is even more beautiful and aesthetically appealing, and it's purple in color?

This new type of gold isn't the result of dye or coloring. Rather, it's an alloy of gold and aluminum that is available in the market. Makers have stated that its manufacturing process isn't as straightforward, as it can be brittle. However, many studies have shown that if the ratio is just right, the resulting alloy is perfectly fine and not brittle.

Overall, the emergence of purple gold represents not only a triumph of metallurgical innovation but also a testament to humanity's ongoing quest to explore new frontiers of beauty and creativity. It's a captivating blend of tradition and modernity, offering a fresh perspective on the timeless allure of precious metals.y gives us an idea of how science never fails to amaze us with its huge applications and purposes.

So, is it worth it? Well, that's something only customers can tell, but it certainly gives us an idea of how science never fails to amaze us with its huge applications and purposes.

Atmospheric Brown Carbon: A Global Environmental Concern

Saurabh Sonwani and Shubham Gupta
1] Department of Environmental Studies, Zakir Husain Delhi College, University of Delhi, New Delhi, India
2] Department of Psychology, Zakir Husain Delhi College, University of Delhi, New Delhi, India
Corresponding Email: sonwani.s19@gmail.com

Abstract

The present review highlighted the global concern of rising atmospheric brown carbon (BrC) as it affects the climate and environmental health. There are very few studies have been conducted that define the BrC characteristics, source identification and chemical properties of the BrC in different atmospheric environments. It highlighted the BrC sources, global distribution, physico-chemical nature, impacts on climate and environmental health. In terms of the geographic distribution, several studies have been carried out in several parts of Asia, Europe, America and Amazonia but still the information on the spatial distribution of BrC in Arctic, Antarctica, Himalayas, and Tibetan Plateau region is still lacking. The review also highlights, the strong radiation absorptive ability of BrC has several adverse effects on global climate and environment. Several BrC properties such as its morphological analysis, mixing state, aging processes and hygroscopicity needs more research at local, regional and global level. A large set of experimental data is also required to develop scientific understanding to validate future models. Overall, the climate and environmental consequence of BrC needs more investigation to get a precise assessment of its effects.

Key words: Brown Carbon, Sources, Global distribution, Climate & Environmental Impact

Introduction

Atmospheric aerosols, consisting of tiny particles, significantly impact climate by reflecting or absorbing sunlight. They can be organic or inorganic, with carbonaceous aerosols emitted by several natural and anthropogenic sources such volcanic eruption, burning of fossil fuel and biomass. The carbonaceous aerosols are the important components of the atmospheric aerosol that plays a significant role in climate change, human health, and air quality. These carbonaceous aerosols are characterized as elemental carbon and organic carbon. Brown carbon (BrC) is another category of light-absorbing carbonaceous particles (Zhang et al., 2011). Unlike black carbon (BC), brown carbon is a fraction of organic carbon with high absorbance rates in UV and blue light. The resonating ring-like structure and low bond energy of conjugated bonds distinguish BrC from other aerosols, and its absorption angstrom exponent is greater than soot. Therefore, it is crucial to distinguish BrC from other aerosol components. BrC is produced by the partial burning of

hydrocarbons/tar material (smoldering) and sunlight-induced oxidation of biogenic material. It comprises various organic compounds, including humic-like substances (HULIS), polycyclic aromatic hydrocarbons (PAHs), and lignin. From a thermo-chemical viewpoint, BrC is a refractory aerosol and does not evaporate up to 400°C under inert atmospheric conditions.

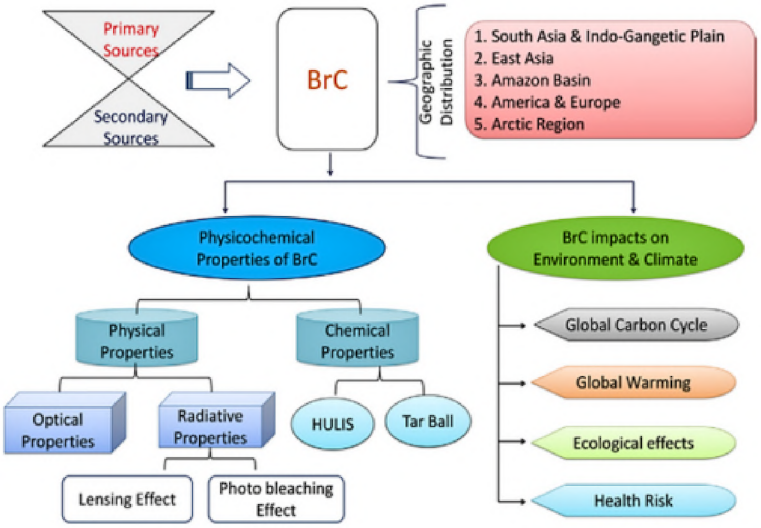


Fig 1 Brown carbon sources, distribution and its environmental impacts (Adapted from Sonwani et al., 2021).

In summary, the schematic diagram in Fig. 1 illustrates BrC sources, global distribution, and environmental effects. BrC can be sourced from biological sources and biomass-burning of substances like coal, forest fires, fungi plan residue, etc (Primary) or through atmospheric transformation reactions involving gas phase, particulate phase, and cloud micro droplet components (Secondary).

Level and Geographical Distribution

Limited studies report atmospheric brown carbon (BrC) in South Asia, particularly the Indo-Gangetic Plain (IGP). BrC concentrations range from 2.0 to 4.4 µgCm-3 at high-altitude sites and 1-70 µgCm-3 in the Indo-Gangetic plain (IGP). Water-soluble organic carbon (WSOC) suggests water-soluble BrC, contributing 10%-23% to PM2.5. Varied WSOC values and absorption properties, notably higher in Delhi during winter, indicate regional differences. Relationships between mass absorption coefficient, WSOC, and Angstrom exponent highlight biomass burning as a significant BrC source in the South Asian-IGP region. While limited, studies in South Asia reveal significant Brown Carbon (BrC) presence, with concentrations varying across regions and seasons. Biomass burning appears to be a major source, particularly in the Indo-Gangetic Plain, where water-soluble BrC contributes up to 23% of PM2.5. This aligns with East Asian findings, where fossil fuels and biomass burning contribute significantly to BrC, with complex regional variations in light absorption properties. Beyond South Asia, the Amazon basin and the Arctic also face challenges from BrC. In the Amazon, biomass burning emits BrC, impacting regional air quality and interacting with black carbon. In the Arctic, BrC deposition on snow and ice alters albedo and accelerates melting, highlighting its role in climate impacts. However, research on BrC's optical properties in the Arctic remains incomplete. These findings emphasize the need for further research on BrC in diverse regions, considering its sources, composition, and impact on atmospheric processes and climate. Understanding these complexities is crucial for developing effective mitigation strategies to address the growing concern of BrC pollution. Atmospheric Brown Carbon (BrC) is a type of organic matter that absorbs light in the atmosphere, contributing to climate change by warming the atmosphere. Scientists measure BrC's light absorption efficiency using parameters like the Mass Absorption Efficiency (MAE), which shows how much light BrC absorbs per unit mass. The MAE of BrC decreases as the wavelength of light increases, indicating stronger absorption at shorter wavelengths.

Physico-chemical properties, Climate and Environmental Impact

Black carbon (BC) and organic carbon (OC) emitted from various sources enhance overall absorption when they co-exist (Poschl and Shiraiwa, 2015) During aging, BC mixes with non-BC species, including BrC, forming a coating that persists for days, enhancing absorption and creating a "Lensing effect." This effect, supported by theoretical calculations and experiments, significantly impacts the absorption properties of BC and BrC, affecting climate models and highlighting the importance of considering BrC's lensing effect in global climate assessments. Photobleaching causes significant changes in the light-absorbing properties of Brown Carbon (BrC), impacting the Earth's radiative balance in the atmosphere (Feng et al., 2013; Bond et al., 2006). Studies suggest that high molecular weight (HMW) BrC, formed after rapid photobleaching, absorbs more radiation compared to low molecular weight (LMW) BrC, making it a major contributor to radiative forcing. Laboratory experiments show that various factors like solvent, pH, and exposure time influence the optical properties of BrC, highlighting the complexity of understanding BrC behavior in real-world conditions. HULIS, or Humic-Like Substances, are organic compounds found in aerosols, fog, and cloud water that resemble humic substances found in terrestrial and aquatic environments (Graber et al., 2006). These substances are naturally occurring, biogenic, and have a complex chemical structure with yellow to black coloration, high molecular weight, and resistance to degradation. HULIS contain aromatic and aliphatic hydrocarbon structures with reactive functional groups like hydroxyl, carbonyl, carboxyl, and organosulfate, as observed in various studies (Chakrabarty et al., 2010). Tar balls are spherical particles ranging from 30 to 500 nm in diameter, considered a significant type of Brown Carbon (BrC) due to their unique properties. Unlike soot particles, tar balls do not aggregate and are commonly found in the lower atmosphere, especially in regions impacted by biomass burning. Their light absorption capabilities are comparable to or even greater than soot particles, contributing significantly to radiative forcing and making them important subjects of study in atmospheric chemistry and physics. Several studies have highlighted the global importance of Brown Carbon (BrC) due to its impact on the carbon cycle and its deposition in various environments like soil, rivers, and glaciers through wet and dry processes. Unlike Black Carbon (BC), BrC can transform into secondary BrC through aging, increasing its ability to be deposited through precipitation. journey through the Earth system, from emission to deposition, impacts the carbon cycle, acidifies rain, and melts glaciers. Unlike its black cousin, BrC transforms mid-air, amplifying its ability to settle in soil, rivers, and snow, leaving an indelible mark on diverse ecosystems. Ignoring BrC is like ignoring half the story - its global impact demands urgent investigation and mitigation strategies to protect our planet's delicate balance.

References

Sonwani, S., Yadav, A., & Saxena, P. (2021). Atmospheric brown carbon: a global emerging concern for climate and environmental health. Management of contaminants of emerging concern (CEC) in environment, 1, 225-247.

Pöschl, U., Shiraiwa, M., 2015. Multiphase chemistry at the atmosphere-biosphere interface influencing climate and public health in the anthropocene. Chem. Rev. 115 (10), 4440-4475.

Zhang, X., Lin, Y.H., Surratt, J.D., Zotter, P., Prévôt, A.S., Weber, R.J., 2011. Light-absorbing soluble organic aerosol in Los Angeles and Atlanta: A contrast in secondary organic aerosol. Geophys. Res. Lett. 38 (21).

Feng, Y., Ramanathan, V., Kotamarthi, V.R., 2013. Brown carbon: a significant atmospheric absorber of solar radiation? Atmos. Chem. Phys. Discuss. 13 (1).

Bond, T.C., Habib, G., Bergstrom, R.W., 2006. Limitations in the enhancement of visible light absorption due to mixing state. J. Geophys. Res. 111, D20.

Graber, E.R., Rudich, Y., 2006. Atmospheric HULIS: How humic-like are they? A comprehensive and critical review. Atmospheric Chem. Phys. 6 (3), 729-753.

Chakrabarty, R.K., Moosmuller, H., Chen, L.W., Lewis, K., Arnott, W.P., Mazzoleni, C., Dubey, M.K., Wold, C.E., Hao, W.M., Kreidenweis, S.M., 2010. Brown carbon in tar balls from smoldering biomass combustion. Atmos. Chem. Phys. 10, 6363-6370.

GAMETIME

BRAIN TWISTER QUESTIONS

By-Richa Kumari

1. What comes once in a minute, twice in a moment, but never in a thousand years?

2. The more you take, the more you leave behind. What am I?

3. I am taken from a mine, and shut up in a wooden case, from which I am never released, and yet I am used by almost every person. What am I?

4. I have keys but open no locks. I have space but no room. You can enter, but you can't go inside. What am I?

5. I speak without a mouth and hear without ears. I have nobody, but I come alive with the wind. What am I?

6. What has an endless supply of letters but starts empty?

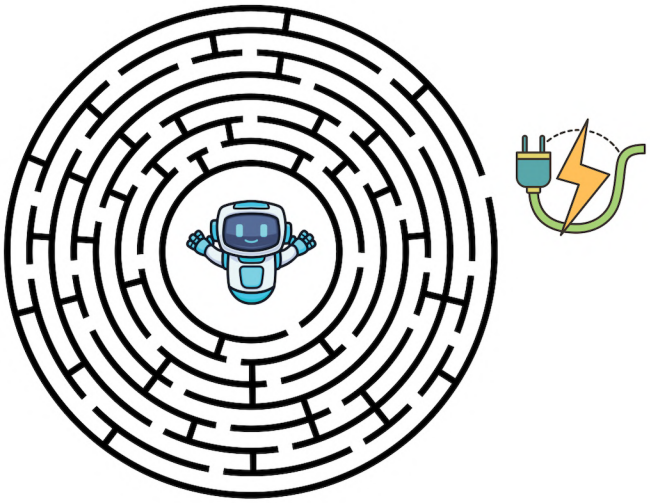
7. The person who makes it, sells it. The person who buys it never uses it. What is it?

8. I can be cracked, made, told, and played. What am I?

9. The more you take, the more you leave behind. What am I?

10. What has a heart that doesn't beat?

Help Robi-the-Robot get to his charger

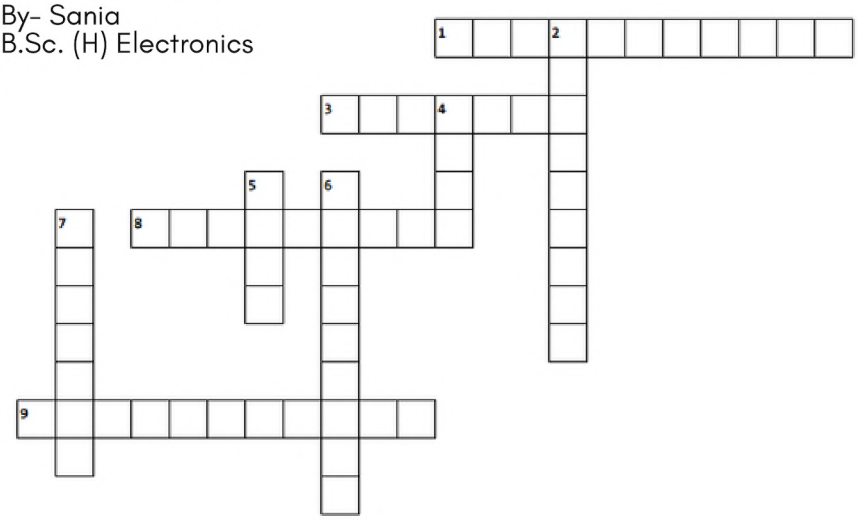


ANSWERS:

1. The letter "M."
2. Footsteps.
3. Pencil lead/graphite.
4. A keyboard.
5. An echo.
6. A mailbox.
7. A coffin.
8. A joke.
9. A riddle.
10. An artichoke.

Cross Word

By- Sania
B.Sc. (H) Electronics



Across

1. Man-made objects in orbit around earth that no longer serve a useful purpose.

3. Known as light quanta

8. Evolving digital merging virtual and physical realities.

9. A supermassive black hole at the centre of the Milky Way, was captured by the Event Horizon Telescope.

Down

2. Branch of astronomy concerned with the studies of the origin and evolution of the universe

4. The progression of events from the past to the present into the future

5. Matter invisible cosmic substance.

6. Brain-computer interface

7. It walks on the moon, comes from Sanskrit origin.

SCAN & LEARN

SWAYAM:
Provides Massive Open Online Courses with 140 universities approved credit transfer features. Students enrolled in Jan-20 & in total are 26 Lakhs & 1.57 Cr respectably. Total 1900+ courses covering school & higher education.

SWAYAMPRABHA:
provides high quality educational programs 24*7 through 32 DTH channels. Around 56,000 total videos have been telecasted covering school & higher education. It has 3+ crores total views on Youtube since inception.

e-Yantra:
provides hands-on experience on embedded systems. It has about 380 Lab and made2300+ colleges benefited.

SAKSHAT:
It is one Stop Education Portal for addressing all the education and learning related needs of students, scholars, teachers and lifelong learners.

Virtuallab:
Has developed Web-enabled curriculum based experiments designed for remote – operation. Its 275 labs with 2200+ experiments made 18+ Lakhs students benefited.

Spoken Tutorial:
is a Tutorial in IT application which provides self-training in IT fields.

A MAGAZINE BY

SCIENCE DEPARTMENT

SPECTRUM

2024