SCIENCE

2022-23

Swamy Vivekananda Vidya Samsthe (R)

KUMADVATHI COLLEGE OF EDUCATION

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ಸ್ವಾಮಿ ವಿವೇಕಾನಂದ ವಿದ್ಯಾಸಂಸ್ಥೆ (ರಿ)

ಕುಮದ್ವತಿ ಶಿಕ್ಷಣ ಮಹಾವಿದ್ಯಾಲಯ

ಅನುದಾನಿತ, ಕುವೆಂಪು ವಿಶ್ವವಿದ್ಯಾನಿಲಯಕ್ಕೆ ಶಾಶ್ವತ ಸಂಯೋಜಿತ, ಎನ್.ಸಿ.ಟಿ.ಇ
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CASGEVY THERAPY

The UK Drug Regulator sanctioned a gene therapy called Casgevy heralded as a significant breakthrough for treating sickle cell disease and thalassemia. Notably, this marks the world's inaugural licensed therapy leveraging the CRISPR-Cas9 gene editing technology that earned its innovators a Nobel Prize in Chemistry 2020.

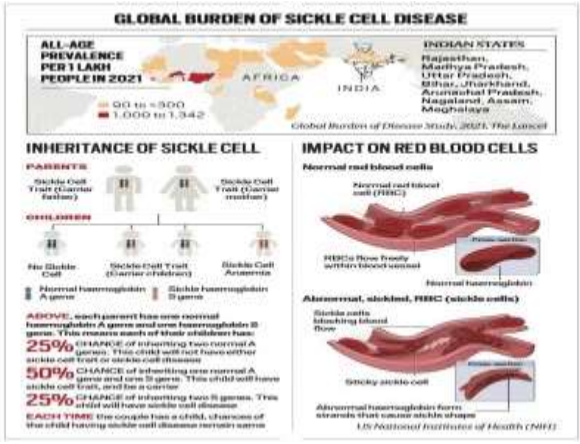
Working of Casgevy Therapy

Both sickle cell disease and thalassemia are caused by errors in the gene for hemoglobin(Hb), a protein in the red blood cells that carry oxygen to organs and tissues.The therapy uses the patient's own blood stem cells, which are precisely edited using CRISPR-Cas9.A gene called BCL11A, which is crucial for switching from fetal to adult hemoglobin, is targeted by the therapy.Foetal hemoglobin, which is naturally present in everyone at birth, does not carry the same abnormalities as adult hemoglobin's therapy uses the body's own mechanisms to start producing more of this fetal hemoglobin, alleviating the symptoms of the two conditions.Casgevy involves a single treatment wherein blood stem cells are extracted via apheresis and then edited over approximately six months before being reintroduced into the patient. Apheresis is a medical procedure that involves removing specific components from blood and returning the rest to the body.

Sickle Cell Disease and Thalassemia

Sickle Cell Disease:

Sickle cell disease is a genetic blood disorder characterized by an abnormality in hemoglobin, the protein responsible for carrying oxygen in red blood cells. It causes red blood cells to adopt a sickle or crescent shape, hindering their movement through vessels, leading to potential complications like severe pain, infections, anemia, and strokes.



In India alone, an estimated 30,000-40,000 children are born with sickle cell disease annually.

Types: It encompasses various types, each dependent on the inherited genes from parents, all encoding abnormal hemoglobin. The most prevalent forms of SCD include: HbSS (Sickle Cell Anemia): Individuals inherit two "S" genes, one from each parent, resulting in abnormal hemoglobin "S." This type often leads to severe manifestations characterized by rigid, sickle-shaped red blood cells.

HbSC: Inheriting an "S" gene from one parent and a different abnormal hemoglobin, "C," from the other, leads to this milder variant of SCD.HbS Beta Thalassemia: This form arises from inheriting an "S" gene from one parent and a beta thalassemia gene from the other. The severity varies based on the type of beta thalassemia inherited either "zero" (HbS beta) or "plus" (HbS beta+), with the former typically resulting in a severe form and the latter in a milder manifestation.

Thalassemia: Similar to sickle cell disease, individuals with thalassemia experience severe anemia due to low hemoglobin levels, necessitating lifelong blood transfusions and chelation therapy to manage iron accumulation. Major symptoms include fatigue, paleness or jaundice, shortness of breath, delayed growth, facial bone deformities (in severe cases) among others.

Implications High Prevalence: 30,000 to 40,000 children are born with sickle cell disease annually in India, mostly in tribal areas

Government Initiatives: India aims to eliminate the SCA by 2047 through a national program, National Sickle Cell Anemia Elimination Programme, ICMR and NRHM implement outreach programs for disease management and control. Universal screening, awareness, and counselling funded under the National Health Mission.

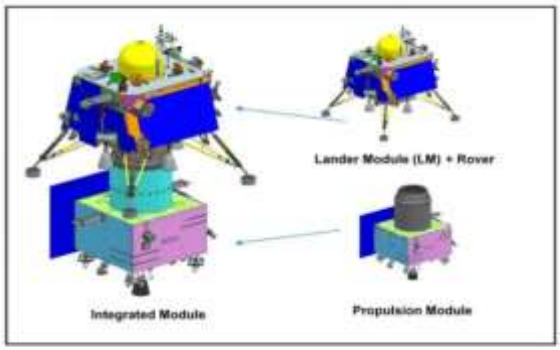
The approval of Casgevy in the UK represents a momentous leap in the treatment of sickle cell disease and thalassemia, offering a potentially curative approach through gene editing technology. However, the high cost and accessibility issues underscore the need for ongoing research, development of local manufacturing facilities, and efforts to make such revolutionary treatments more affordable and globally accessible.

Pavithra Kumari
I Year Student Teacher

CHANDRAYANA-3

Chandrayaan-3 is a follow-on mission to Chandrayaan-2 to demonstrate end-to-end capability in safe landing and roving on the lunar surface. It consists of Lander and Rover configuration. It will be launched by LVM3 from SDSC SHAR, Sriharikota. The propulsion module will carry the lander and rover configuration till 100 km lunar orbit. The propulsion module has Spector-polarimetry of Habitable Planet Earth (SHAPE) payload to study the spectral and Polari metric measurements of Earth from the lunar orbit.

Lander payloads: Chandra's Surface Thermochemical Experiment (ChaSTE) to measure the thermal conductivity and temperature; Instrument for Lunar Seismic Activity (ILSA) for measuring the seismicity around the landing site; Langmuir Probe (LP) to estimate the plasma density and its variations. A passive Laser Retroreflector Array from NASA is accommodated for lunar laser ranging studies.



Chandrayaan-3 – Elements

Rover payloads: Alpha Particle X-ray Spectrometer (APXS) and Laser Induced Breakdown Spectroscope (LIBS) for deriving the elemental composition in the vicinity of landing site.

Chandrayaan-3 consists of an indigenous Lander module (LM), Propulsion module (PM) and a Rover with an objective of developing and demonstrating new technologies required for Inter planetary missions. The Lander will have the capability to soft land at a specified lunar site and deploy the Rover which will carry out in-situ chemical analysis of the lunar surface during the course of its mobility. The Lander and the Rover have scientific payloads to carry out experiments on the lunar surface. The main function of PM is to carry the LM from launch vehicle injection till final lunar 100 km circular polar orbit and separate the LM from PM. Apart from this, the Propulsion Module also has one scientific payload as a value addition which will be operated post separation of Lander Module. The launcher identified for Chandrayaan-3 is LVM3 M4 which will place the integrated module in an Elliptic Parking Orbit (EPO) of size ~170 x 36500 km.

The mission objectives of Chandrayaan-3 are:

1. To demonstrate Safe and Soft Landing on Lunar Surface
2. To demonstrate Rover roving on the moon and
3. To conduct in-situ scientific experiments.

To achieve the mission objectives, several advanced technologies are present in Lander such as,

Altimeters: Laser & RF based Altimeters

Velocimetry: Laser Doppler Velocimetry & Lander Horizontal Velocity Camera

Inertial Measurement: Laser Gyro based Inertial referencing and Accelerometer package

Propulsion System: 800N ThrottleAble Liquid Engines, 58N attitude thrusters & Throttleable Engine Control Electronics. Navigation, Guidance & Control (NGC): Powered Descent Trajectory design and associate software elements

Hazard Detection and Avoidance: Lander Hazard Detection & Avoidance Camera and Processing Algorithm

Landing Leg Mechanism.: To demonstrate the above said advanced technologies in earth condition, several Lander special tests have been planned and carried out successfully viz.

Integrated Cold Test - For the demonstration of Integrated Sensors & Navigation performance test using helicopter as test platform

Integrated Hot test – For the demonstration of closed loop performance test with sensors, actuators and NGC using Tower crane as test platform

Lander Leg mechanism performance test on a lunar simulant test bed simulating different touch down conditions

The Chandrayaan-3 mission, India's first successful space mission to the moon's surface, concluded recently after its lander and rover could not be revived from the cold lunar darkness. Despite this outcome, the mission accomplished its goals and provided valuable scientific insights.

Suma G
I Year Student Teacher

3D PRINTED ARTIFICIAL CORAL REEF

An artificial reef (AR) is a human-created freshwater or marine benthic structure. Artificial reefs are a common restoration technique. Providing spaces for coral to latch onto and grow helps foster reef development and 3D printing has emerged as a promising method for creating these anchor points. Here's a closer look at the state of 3D printing reef restoration and where it could go from here.

Benefits of 3D Printing Artificial Reefs

Creating artificial reefs to encourage coral growth is nothing new, but traditional approaches aren't perfect. While sinking old ships and placing concrete underwater can work, these structures may not mimic local coral species' ideal shelters. 3D printing allows conservationists to design artificial reefs with shapes and textures identical to natural underwater landscapes. This customizability can also help meet varying needs between different geographies. The reefs in coastal lagoons — which account for more than 10% of land-sea interfaces — may not look like those in deeper areas. With 3D printing, organizations can create different artificial reef designs to match each ecosystem's natural environment.

3D printing also has cost and efficiency advantages. Additive manufacturing is famously more resource-efficient and less time-consuming than conventional production methods. As a result, 3D-printed artificial reefs could lower the end costs and project timelines for reef restoration initiatives.

Current 3D Printing Reef Initiatives

Many organizations have already realized and started to act on these benefits. The largest artificial reef in the Maldives relied on 3D printing to produce moulds for concrete components.

The world's largest artificial reef, made from concrete elements cast from 3D printed moulds.

3D printing, unlike other manufacturing processes, being an additive process has emerged as a viable technology for the production of engineering components. The aspects associated with 3D printing such as less material wastage, ease of manufacturing, less human involvement, very less post processing and energy efficiency makes the process sustainable for industrial use. The paper discusses numerous 3D printing processes, their advantages and disadvantages. A comprehensive description of different materials compatible for each type of 3D printing process is presented. The paper also presents the various application areas of each type of process. A dedicated section on industry 4.0 has also been included. The literature studied revealed that although the field of 3D printing has evolved to a great extent, there are still issues that need to be addressed such as material incompatibility and the cost of the materials. Future research could be undertaken to develop and modify the processes to suit a broad range of materials. To broaden the range of applications for 3D printed parts, more focus needs to be laid on developing cost effective printer technologies and materials compatible for these printer

Nisha B
I Year Student Teacher

NEW TRENDS BETWEEN ARTIFICIAL INTELLIGENCE AND EDUCATION

Along with technological advances, artificial intelligence (AI) is positioning itself as an innovative ally for learners and teachers. Is AI used in education nowadays? This article will explore what AI is, examples of its implementation, and aspects

to consider for its responsible use. Thinking about intelligence assumes that a lot of abstract and very complex neuronal processes take place in one's brain. Intelligence allows people to make decisions, learn, reflect, discuss, disagree, and respond to different circumstances in a rational way. But in the past years, the term "artificial intelligence" has gained space in scientific discussions, raising questions regarding the capacity of humans and machines.

Artificial Intelligence – generally abbreviated as AI – is a wide concept used to describe the process of using machines and computers to complete a task by imitating human-thinking patterns. The term itself was used for the first time in 1956, to describe the science and engineering process for the development of intelligent machines and computer programs.

Basic Types of Artificial Intelligence (AI)

Over time, technological advances have made AI evolve and become a complex area with multiple practical applications. Two initial classifications to understand how AI works can be Classical and the Machine Learning – although we will see that these technologies are interestingly complex in their scope.. If you have used different functions in Microsoft Excel, you might remember the "If" function, and all its possible variants. Well, Classical AI follows a similar approach. By writing several sequences of "If-then" commands and other rules of conditional logic, this form of AI makes a device complete a task. Given this feature, classical AI is also known as "rule-based AI".

Machine Learning (ML) is also part of the AI spectrum, but it deals with higher levels of complexities and advances still being researched up till now. Beyond logical rules, ML makes use of large amounts of data to find, recognize and analyse data, and build algorithmic models which, later, predict values. Its name follows the premise that, with ML, machines are not pre-programmed, but are "learning" how to build algorithms and behaviours.

Different applications of Machine Learning (ML)

Within ML techniques, there are plenty of AI techniques widely used nowadays. Some examples are the following:

Artificial Neural Networks (ANN): These techniques are complex, and are inspired by the neurological structure of brains and neurons. To operate, ANNs organize their commands and algorithms into three "layers" or artificial neurons: one for data input, another for intermediary processing, and the last one for the information output.

Deep Learning (DL): DL is actually a higher-level way to use ANNs. In basic terms, DL allows the use of multiple intermediary processing algorithms to generate different outputs or to allow the flow of data in multiple directions to make data processing more efficient for the user of the device.

Natural Language Processing (NLP): These techniques allow devices to interpret texts (seen in, for example, translation websites and apps) or even generate them. An example of NLP can also be seen when smartphones or banking services perform speech recognition of the user's voice or identity.

AI for learning process: innovation and challenges

With the emergence of the Fourth Industrial Revolution, education has evolved in the past decades, and new challenges emerge – especially with the urgency of the goals defined by the 2030 Agenda for Sustainable Development. In its 4th goal, the Agenda aims to ensure access to high-quality education for all until the end of the decade. In this regard, AI has become an interesting ally to support the efforts of teachers and learners. One interesting application of AI in the learning process is the use of Intelligent Tutoring Systems (ITS). These computer systems aim to personalize instruction and feedback through digital devices without the physical presence of a human teacher. ITSs are an example of how deep learning algorithms can allow teachers to program and design the learning experience so that students can learn in a one-on-one format virtually as if it was a "virtual tutor". These types of technologies, according to Carnegie Mellon University's research, have shown the potential to increase learning outcomes when either used alone or as a complementary approach.

Even though the use of ITS sounds interesting and innovative, its use implies several challenges. One of them is that its programming demands quite a time and specific know-how of how deep learning works. But from a different point of view, AI can actually be very helpful to support learners' progress and outcomes over time, even from home. For example, parents who support teenagers with subjects such as algebra or statistics could benefit a lot if their kids had access to ITSs on their laptops or tablets, and had a "virtual tutor" to reinforce those topics.

Its implementation in the general education system would require strong investment in technological devices and in training educators and students on how to use ITS. In developed countries, its use is already visible. But the opposite happens in developing nations, as

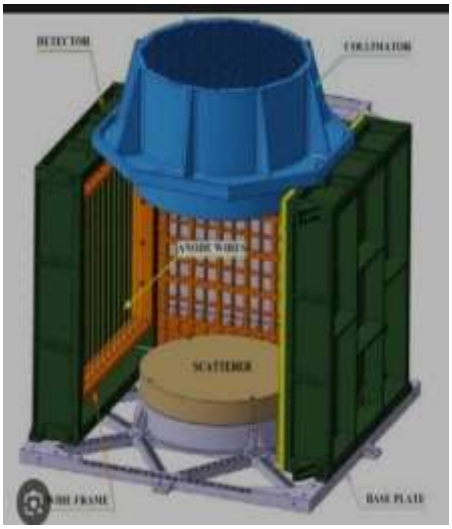
meaningful portions of their populations have limited or null access to advanced technologies. In this case, its implementation would expand an already-existing learning gap. This is why responsible use is necessary. In this sense, UNESCO has developed certain recommendations for policymakers to keep into account to ensure that AI fosters the achievement of the SDG4 of the 2030 Agenda.

To end, the use of AI in education has a strong potential for improving education and strengthening the learning experience of every student. Its complexity and its quick advances make it an innovative approach that, with a responsible and critical look, can become a powerful ally for teachers and caretakers.

Deepika M
I Year Student Teacher

ISRO X-RAY POLARI METER SATELLITE (XPOSAT)

XPoSat is a dedicated Indian polarimetry mission to study various dynamics of astronomical sources in extreme conditions. It works in medium energy band and long duration spectroscopic observation in soft energy X-ray band. The mission will help to understand the emission mechanism from a variety of X-ray sources. The spacecraft will carry two scientific payloads in a low earth orbit with preference for a low inclination orbit. The primary payload POLIX (Polari meter Instrument in X-rays) will measure the polarimetry parameters (degree and angle of polarization) of astronomical sources in medium X-ray energy of 8-30 Kev photons.



The XSPECT (X-ray Spectroscopy and Timing) payload will give spectroscopic information of soft X-rays in the energy range of 0.8-15 Kev. Polari metric observations of accreting Galactic Black Hole systems are also very interesting because they provide unique opportunity to test some of the predictions of general relativity which are inaccessible by any other means. Another set of interesting targets for polarization observations are the cosmic acceleration sites such as supernovae remnants and jets in Active Galactic Nuclei (AGN) or micro-quasars. Polarization

observations of these sites will provide direct information about the geometry of the shocked sites as well as the structure and intensity of magnetic fields therein.

X-ray polarization measurements can give valuable insights about

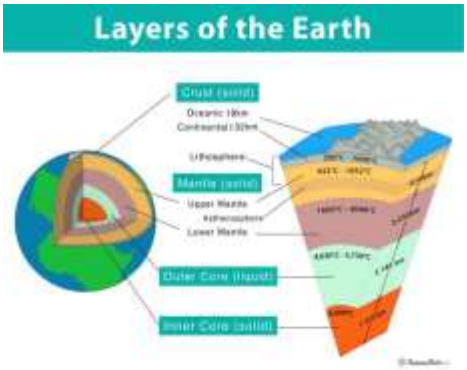
- The strength and the distribution of magnetic field in the sources
- Geometric anisotropies in the sources
- Their alignment with respect to the line of sight
- The nature of the accelerator responsible for energizing the electrons taking part in radiation.

Anusha M P
I Year Student Teacher

E PRIME LAYER-NEW LAYER OF EARTH'S CORE

A new study has found that the E Prime layer, Earth's core's new layer formed due to surface water dividing deep.

About the new layer-



- According to the new study, prolonged chemical exchanges between the core and mantle contributed to the formation of this layer.
- The E-prime layer is more than 100 KM thick, relatively slim compared to other sections of Earth's interior, and located around 2900km beneath Earth's surface.
- Researchers said that for years it was believed that a material exchange between the core and mantle is small.
- However, the experiments revealed that when water reaches the core-mantle boundary, it reacts with silicon in the core leading to the formation of silica.
- According to researchers, the tectonic plates carrying surface water have transported it deep into the Earth over billions of years.
- After reaching 1800 miles of core-mantle boundary, this water initiates significant chemical changes, influencing the core's structure.

E Prime layer-new layer of Earth's core

In news- A new study has found that the E Prime layer, Earth's core's new layer formed due to surface water dividing deep.

About the new layer-

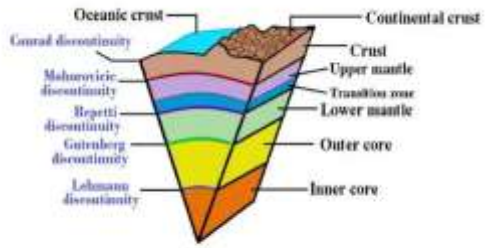


Fig: Structure of Earth

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- The E-prime layer is more than 100 KM thick, relatively slim compared to other sections of Earth's interior, and located around 2900km beneath Earth's surface.
- Researchers said that for years it was believed that a material exchange between the core and mantle is small.
- However, the experiments revealed that when water reaches the core-mantle boundary, it reacts with silicon in the core leading to the formation of silica.
- According to researchers, the tectonic plates carrying surface water have transported it deep into the Earth over billions of years.
- After reaching 1800 miles of core-mantle boundary, this water initiates significant chemical changes, influencing the core's structure.
- The sub ducted water reacts chemically with core materials under high pressure.
- The same reaction led to the formation of a hydrogen-rich, silicon-depleted layer at the outer core, resembling a film-like structure.
- The silicon crystal generated by the water reaction ascends and blends into the mantle and impacts the overall composition of the layer.
- The changes in the liquid metallic layer could potentially result in reduced density and altered seismic characteristics.

Primary layers of Earth-

Four primary layers of Earth are an inner core at the center, surrounded by the outer core, mantle, and crust.

- Chemical composition of Crust– Oxygen represents 46.6 percent, silicon 27.7 percent, aluminum 8.13 percent, and iron 5 percent are major elements of the crust.
- Basic composition of mantle- magnesium, aluminum, silicon, and oxygen silicates.
- Basic composition core- It is made up of Iron (85%), nickel (5%) and other elements oxygen, silicon and sulfur (10%).

Methods used in the research-

- In their study, the geoscientists utilized sophisticated experimental methods at the Advanced Photon Source of Argonne National Lab and PETRA III of Deutsches Elektronen-Synchrotron in Germany.
- Laser-heated diamond-anvil cells were used to stimulate the rigorous conditions at the core-mantle boundary.

Significance of the discovery-

- The discovery would enhance the comprehension of Earth's internal mechanisms, indicating a broader and more intricate global water cycle.
- The new layer holds major implications for the interconnected geochemical processes linking surface water cycles with the metallic core.
- The findings challenge conventional knowledge, indicating that material exchange between the core and mantle is more dynamic than previously assumed.

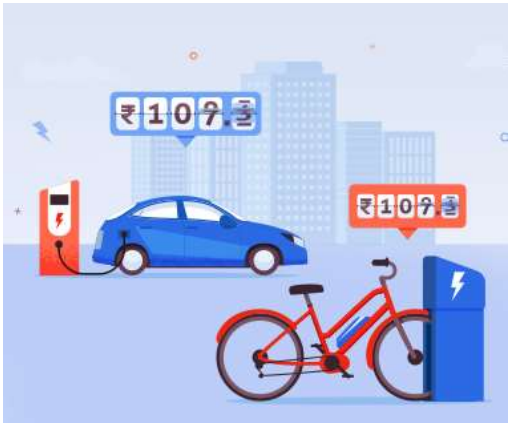
Gayithra N Kerakanavar
I Year Student Teacher

E VEHICLES

Electric vehicles (EVs) are a promising technology for achieving a sustainable transport sector in the future, due to their very low to zero-carbon emissions, low noise, and high efficiency. Nonetheless, the large penetration of EVs is expected to affect the existing power grids, due to high loads. Uncontrolled charging of plug-in electric vehicles represents a challenge for the energy system. The controlled charging of EVs—within the concept of smart city—can have a significant impact on the power grid load, voltage, frequency, and power losses. In this direction, smart charging has been proposed, in order to avoid grid congestion

and to integrate renewable energy. This chapter elaborates the transition to a new age of mobility and the challenges of charging mechanisms within the concept of the smart city.

BENEFITS OF ELECTRIC VEHICLES



Transport is a fundamental requirement of modern life, but the traditional combustion engine is quickly becoming outdated. Petrol or diesel vehicles are highly polluting and are being quickly replaced by fully electric vehicles. Fully electric vehicles (EV) have zero tailpipe emissions and are much better for the environment. The electric vehicle revolution is here, and you can be part of it. Will your next vehicle be an electric one?

Lower running costs

The running cost of an electric vehicle is much lower than an equivalent petrol or diesel vehicle. Electric vehicles use electricity to charge their batteries instead of using fossil fuels like petrol or diesel. Electric vehicles are more efficient, and that combined with the electricity cost means that charging an electric vehicle is cheaper than filling petrol or diesel for your travel requirements. Using renewable energy sources can make the use of electric vehicles eco-friendlier. The electricity cost can be reduced further if charging is done with the help of renewable energy sources installed at home, such as solar panels.

Low maintenance cost

Electric vehicles have very low maintenance costs because they don't have as many moving parts as an internal combustion vehicle. The servicing requirements for electric vehicles are lesser than the conventional petrol or diesel vehicles. Therefore, the yearly cost of running an electric vehicle is significantly low.

Zero Tailpipe Emissions

Driving an electric vehicle can help you reduce your carbon footprint because there will be zero tailpipe emissions. You can reduce the environmental impact of charging your vehicle further by choosing renewable energy options for home electricity.

Tax and financial benefits

Registration fees and road tax on purchasing electric vehicles are lesser than petrol or diesel vehicles. There are multiple policies and incentives offered by the government depending on which state you are in. To find out more about electric vehicle incentives,

Petrol and diesel use is destroying our planet

The availability of fossil fuels is limited, and their use is destroying our planet. Toxic emissions from petrol and diesel vehicles lead to long-term, adverse effects on public health. The emissions impact of electric vehicles is much lower than petrol or diesel vehicles. From an efficiency perspective, electric vehicles can covert around 60% of the electrical energy from the grid to power the wheels, but petrol or diesel cars can only convert 17%-21% of the energy stored in the fuel to the wheels. That is a waste of around 80%. Fully electric vehicles have zero tailpipe emissions, but even when electricity production is taken into account, petrol or diesel vehicles emit almost 3 times more carbon dioxide than the average EV. To reduce the impact of charging electric vehicles, India is ambitious to achieve about 40 percent cumulative electric power installed capacity from non-fossil fuel-based energy resources by the year 2030. Therefore, electric vehicles are the way forward for Indian transport, and we must switch to them now.

Electric Vehicles are easy to drive and quiet

Electric vehicles don’t have gears and are very convenient to drive. There are no complicated controls, just accelerate, brake, and steer. When you want to charge your vehicle, just plug it in to a home or public charger. Electric vehicles are also quiet, so they reduce noise pollution that traditional vehicles contribute to.

Convenience of charging at home

Imagine being at a busy fuel station during peak hours, and you are getting late to reach your workplace. These problems can easily be overcome with an electric vehicle. Simply plug your vehicle in at your home charger for 4-5 hours before you plan to go. If you are able to get a charger where you park at home, it is very convenient to plan your journeys in advance. What if you forget to plug in your machine someday? Then you can easily take the help of fast chargers or even battery swapping services if you are on a two-wheeler on the road.

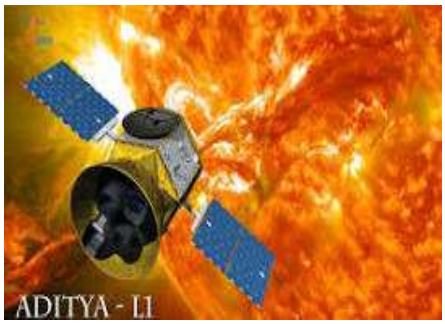
No noise pollution

Electric vehicles have the silent functioning capability as there is no engine under the hood. No engine means no noise. The electric motor functions so silently that you need to peek into your instrument panel to check if it is ON. Electric vehicles are so silent that manufacturers have to add false sounds in order to make them safe for pedestrians.

Demand for EVs has grown markedly over the past decade thanks to heightened environmental concerns, greater availability of models, increased cost competitiveness with conventional gas vehicles, and improved vehicle ranges. These factors are expected to continue to drive increased adoption over the 2021–31 decade, with the wide availability of tax incentives and other government programs supporting this trend further. The EV transition will require a wide range of occupations, with this article focusing on three key areas where they will be involved.

Jayashankara R Angadi
I Year Student Teacher

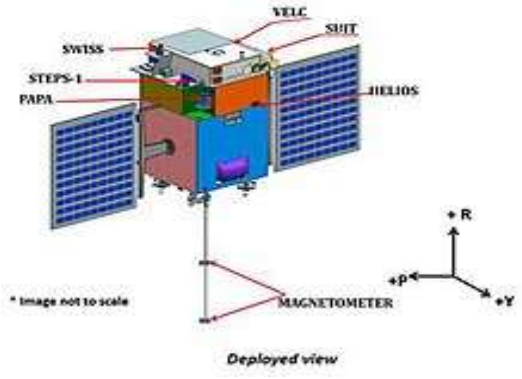
EXPLORING THE ADITHYA L1 MISSION: UNVEILING THE SECRETS OF THE SUN



The Adithya L1 mission marks a significant leap in solar exploration, aiming to unravel the mysteries of our closest star, the Sun. Launched with the goal of advancing our understanding of solar dynamics, this mission promises to provide invaluable insights into the Sun's behaviour and its impact on the solar system.

Mission Objectives:

1. **<u>Studying Solar Atmosphere</u>:** Aditya L1 aims to examine the Sun's outer atmosphere, known as the corona, to comprehend its composition, temperature, and dynamics. This information is crucial for understanding solar phenomena such as solar flares and coronal mass ejections.



2. **<u>Solar Wind Investigation</u>:** The mission seeks to investigate the solar wind – a stream of charged particles emanating from the Sun. By studying the solar wind, scientists hope to gain insights into its origin, acceleration mechanisms, and its influence on the Earth and other celestial bodies.

3. **<u>Unravelling Solar Magnetic Fields</u>:** Aditya L1 is equipped with instruments to measure and analyse the Sun's magnetic fields. This is vital for understanding the Sun's magnetic activity, which plays a key role in solar phenomena and has implications for space weather.

Key Instruments:

a. **Visible Emission Line Coronagraph** (VELC): This instrument captures images of the solar corona in the visible range, aiding in the study of its structure and dynamics.

b. **Aditya Solar Wind Particle Experiment** (ASPEX): ASPEX is designed to measure the properties of solar wind particles, providing critical data for understanding the Sun's influence on the solar system.

c. **Magnetometer:** The mission's magnetometer helps measure the strength and direction of the Sun's magnetic field, contributing to our understanding of solar magnetic activity.

International Collaboration:

The Adithya L1 mission is a collaborative effort, with contributions from Indian Space Research Organisation (ISRO), NASA, and other international partners. This collaboration enhances the mission's scientific capabilities and fosters global cooperation in space exploration.

Significance of the Mission:

1. Space Weather Prediction: Data from Adithya L1 will contribute to better predictions of space weather events, safeguarding satellites, spacecraft, and communication systems from the adverse effects of solar activity.

2. Advancing Solar Physics: The mission's findings will deepen our understanding of fundamental solar processes, paving the way for advancements in solar physics and astrophysics.

The Adithya L1 mission stands as a testament to humanity's pursuit of knowledge and exploration. By delving into the intricacies of the Sun, this mission not only expands our understanding of our celestial neighbour but also has practical implications for space-based technologies and our ability to navigate the challenges posed by space weather. As Adithya L1 continues its journey, scientists and space enthusiasts eagerly await the wealth of discoveries it promises to unveil.

Bharath M L
I Year Student Teacher

GAMMA A I (ARTIFICIAL INTELLIGENCE)

Gamma AI is a powerful cloud-based data loss prevention (DLP) tool that helps organizations to protect their sensitive data from unauthorized access, use, disclosure, modification, or destruction. Gamma AI uses AI and machine learning to identify and classify sensitive data, and to generate alerts and take action when sensitive data is at risk.

Gamma is a versatile tool that can be used to protect a wide range of data types, including:

Personal identifiable information (PII): Gamma AI can identify and classify PII, such as names, addresses, Social Security numbers, and credit card numbers.

Intellectual property: Gamma AI can identify and classify intellectual property, such as trade secrets, customer lists, and product formulas.

Financial data: Gamma AI can identify and classify financial data, such as bank account numbers, credit card numbers, and investment information.

Healthcare data: Gamma AI can identify and classify healthcare data, such as patient records and medical images.

Gamma AI can be deployed on-premises or in the cloud. It is easy to use and configure, and it can be integrated with a variety of security tools and systems.

Features: Gamma offers a number of features that make it a powerful and versatile DLP tool

AI-powered classification: Gamma AI uses AI and machine learning to identify and classify sensitive data. This allows Gamma AI to accurately identify sensitive data, even if it is hidden in unstructured data, such as documents and emails.

Real-time monitoring: Gamma AI monitors data in real time for unauthorized access, use, disclosure, modification, or destruction. This allows Gamma AI to detect and respond to data breaches quickly and effectively.

Automated remediation: Gamma AI can automatically take action when sensitive data is at risk. For example, Gamma AI can block access to sensitive data, encrypt sensitive data, or delete sensitive data.

Comprehensive reporting: Gamma AI provides comprehensive reporting on the status of sensitive data within an organization. This reporting can be used to identify and mitigate risks, and to comply with data protection regulations.

Benefits:

There are a number of benefits to using Gamma AI, including;

Improved data security: Gamma AI can help organizations to improve their data security by identifying and protecting sensitive data. This can help to prevent data breaches and other data security incidents.

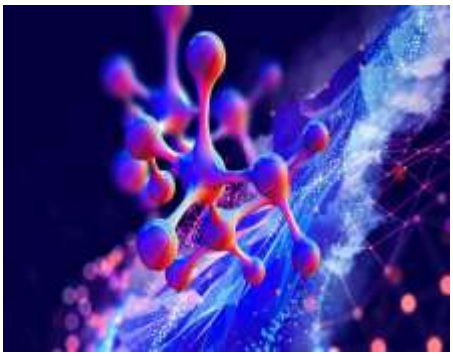
Reduced compliance risk: Gamma AI can help organizations to comply with data protection regulations by identifying and protecting sensitive data. This can help to avoid fines and other penalties.

Increased operational efficiency: Gamma AI can help organizations to increase their operational efficiency by automating the process of identifying and protecting sensitive data. This can free up staff to focus on other tasks.

Gamma AI is a powerful and versatile DLP tool that can help organizations to improve their data security, reduce their compliance risk, and increase their operational efficiency. Gamma AI is easy to use and configure, and it can be integrated with a variety of security tools and systems.

Priyadarshini K S
I Year Student Teacher

NANOMATERIALS: UNLOCKING THE POTENTIALS ACROSS INDUSTRIES



In the intricate realm of materials science, nanomaterials have emerged as revolutionary entities, captivating scientists and engineers alike. These materials, typically ranging from 1 to 100 nanometers in size, exhibit unique properties and behaviors that defy conventional understanding. This article delves into the fascinating world of nanomaterials, shedding light on their characteristics, applications, and the transformative impact they promise across diverse industries.

Nanomaterials, at the nanoscale, exhibit distinctive features. Quantum effects become prominent, altering properties like conductivity, strength, and reactivity. This size-driven metamorphosis opens avenues for tailoring materials with unprecedented precision, unlocking a plethora of possibilities in various fields.The family of nanomaterials encompasses nanoparticles, nanotubes, nanocomposites, and more. Each type boasts specific attributes, making them suitable for diverse applications. Carbon nanotubes, for instance, excel in strength and conductivity, while nanoparticles find utility in drug delivery and catalysis due to their enhanced surface area.

Applications of Nanomaterials:

1. **Medicine:** Nanomaterials have revolutionized medicine by enabling targeted drug delivery. Nanoparticles, designed to carry therapeutic agents, can navigate through the body to specific

cells or tissues, minimizing side effects and improving treatment efficacy. Additionally, nanomaterials contribute to advanced imaging techniques for precise diagnostics.

2. **Electronics**: In the realm of electronics, nanomaterials are catalysts for innovation. Carbon nanotubes and graphene, with their exceptional electrical properties, contribute to the development of smaller and more efficient electronic components. Nanomaterials play a crucial role in enhancing the performance of transistors and memory devices, paving the way for next-generation electronics.

3. **Energy Sector**: Nanomaterials play a vital role in addressing energy challenges. They enhance catalytic processes, improving the efficiency of energy conversion and storage systems. In solar energy, nanostructured materials boost the performance of solar cells, capturing and converting sunlight into electricity more effectively.

4. **Catalysis and Chemical Industry**: The increased surface area and reactivity of Nanocatalysts make them indispensable in the chemical industry. Nanomaterials catalyze reactions more efficiently, leading to improved production processes and reduced environmental impact. This has implications for the development of cleaner and more sustainable industrial practices.

5. **Materials Reinforcement**: Nanomaterials contribute to the creation of stronger and lighter materials. Incorporating nanoparticles, such as carbon nanotubes, into composites enhances their mechanical properties. This has applications in aerospace, automotive, and construction industries, where materials need to withstand extreme conditions.

6. Environmental Applications: Nanomaterials offer solutions to environmental challenges. Nanoparticles can be employed in water purification processes, efficiently removing pollutants and contaminants. Additionally, nanomaterial-based sensors enable real-time monitoring of environmental parameters, aiding in pollution detection and prevention.

7. **Textiles and Fabrics**: Nanomaterials transform textiles, providing fabrics with enhanced properties. Nano coatings make textiles resistant to stains and water, while nanoparticles impart antibacterial features. This innovation finds applications in sportswear, medical textiles, and everyday clothing, improving functionality and durability.

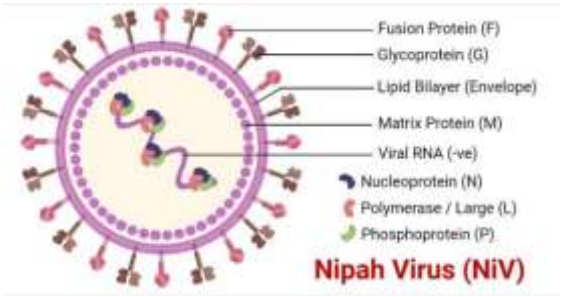
8. **Food and Agriculture**: In the food industry, nanomaterials contribute to food packaging that extends shelf life and ensures food safety. In agriculture, Nano-agrochemicals enable

precise delivery of nutrients and pesticides to plants, optimizing crop yield and minimizing environmental impact.

As nanomaterials continue to evolve, their applications across diverse sectors hold the promise of addressing complex challenges and driving advancements that shape the future of technology, healthcare, and sustainability.

Akash A
I Year Student Teacher

NIPAH VIRUS



Nipah virus is a zoonotic virus that can be transmitted from animals to humans. First identified in 1999 during an outbreak in Malaysia, it is associated with respiratory and neurological symptoms. Fruit bats, commonly found in Southeast Asia, are considered natural hosts. Human transmission can occur through direct contact with infected animals or consumption of contaminated food. Nipah virus outbreaks have primarily occurred in South and Southeast Asia, leading to severe respiratory illness and encephalitis with high mortality rates. Ongoing research aims to understand and control this potentially deadly virus.

The latest outbreak of the Nipah virus occurred in Kerala's Kozhikode district. It was the fourth such outbreak in five years and the third in Kozhikode. The latest outbreak of the Nipah virus occurred in Kerala's Kozhikode district. It was the fourth such outbreak in five years and the third in Kozhikode.

Symptoms:

Fever, Headache, Cough, Sorethroat, Difficulty breathing, Vomiting.

Treatment:

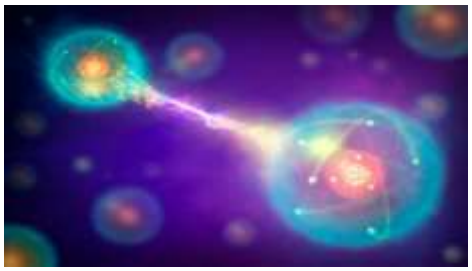
Treatment is limited to supportive care, including rest, hydration, and treatment of symptoms as they occur. There are, however, immunotherapeutic treatments (monoclonal

antibody therapies) that are currently under development and evaluation for treatment of NiV infections.

In conclusion, Nipah virus is a zoonotic pathogen with the potential for severe human infections. Understanding its transmission dynamics, early detection, and effective containment measures are crucial in preventing outbreaks and safeguarding public health. Ongoing research and global collaboration are essential for developing vaccines and treatments to mitigate the impact of Nipah virus on both human and animal populations.

Vinodha M S
I Year Student Teacher

QUANTUM ENTANGLEMENT: A DANCE OF PARTICLES BEYOND OUR INTUITIVE GRASP



Quantum entanglement, a phenomenon first famously described by Albert Einstein, Boris Podolsky, and Nathan Rosen in their 1935 paper, challenges our fundamental understanding of the nature of reality. At the heart of quantum mechanics, entanglement reveals a bizarre and counterintuitive connection between particles, transcending the classical boundaries of physics. This article explores the intriguing world of quantum entanglement, its foundational principles, and its potential applications in the realm of cutting-edge technologies

Understanding Quantum Entanglement

Quantum entanglement occurs when two or more particles become interconnected in such a way that the state of one particle instantly influences the state of the other, regardless of the distance between them. This connection persists even if the particles are light-years apart, suggesting an instantaneous form of communication that challenges our classical understanding of space and time

The phenomenon is often illustrated through the example of entangled particles with opposite spins. According to the principles of quantum mechanics, until one of the entangled

particles is measured, the state of each particle exists in a superposition of all possible states. However, once the state of one particle is measured, the state of the other particle is immediately determined, irrespective of the physical distance between them.

Einstein famously referred to this as "spooky action at a distance," highlighting the perplexing nature of quantum entanglement that seems to defy classical notions of cause and effect.

Quantum Entanglement and Bell's Theorem

Physicist John Bell expanded on the work of Einstein, Podolsky, and Rosen by formulating Bell's Theorem in the 1960s. Bell's inequalities provide a way to test the predictions of classical physics against those of quantum mechanics. Experiments testing Bell's inequalities consistently support the predictions of quantum mechanics, suggesting that entanglement is a real and intrinsic aspect of the quantum world.

Applications and Quantum Technologies

While the profound implications of quantum entanglement continue to perplex physicists, researchers are exploring practical applications for this phenomenon. One promising area is quantum computing, where entangled particles can be harnessed to perform complex computations at speeds unimaginable with classical computers

Quantum communication is another area of interest, with the development of quantum key distribution (QKD) protocols that leverage the secure transmission of quantum information through entangled particles. This could revolutionize secure communication by creating unbreakable quantum encryption.

Entanglement also plays a role in the emerging field of quantum teleportation, where the quantum state of a particle can be transmitted from one location to another without physical movement. While this is not the teleportation of objects seen in science fiction, it represents a groundbreaking development in the field of quantum information.

Challenges and Future Directions:

Despite the exciting prospects, quantum entanglement poses numerous challenges. Maintaining and controlling entangled states over long distances requires overcoming issues related to environmental interference and decoherence.

Additionally, the philosophical implications of entanglement continue to spark debates about the nature of reality, the role of observation, and the limits of human comprehension in understanding the quantum world.

Quantum entanglement remains one of the most intriguing and mystifying aspects of quantum mechanics. As researchers delve deeper into its principles and explore its applications, the world of quantum entanglement promises to unlock new frontiers in technology and challenge our understanding of the very fabric of the universe. As we continue to navigate the intricate dance of entangled particles, we inch closer to harnessing the full potential of quantum phenomena for the benefit of science and society.

Sudeep T C
I Year Student Teacher

INVESTIGATING AGRICULTURAL TRADE'S IMPACT ON GLOBAL WATER RESOURCES

Variations in the level of market globalization can greatly affect the amount of water required to meet future global demand for agricultural commodities.

Growing crops for food and other necessities consumes water at their point of origin, but some of these crops get traded elsewhere. The consumed water is embedded in the traded crop commodities through a concept known as virtual water. Researchers used a multisector long-term global model, the Global Change Analysis Model (GCAM), to explore the potential effects of agriculture trade on virtual water trade and total water consumption. They found that across a set of increasing and decreasing future global trade scenarios, the amount of water virtually traded changes by +400% and -20%, respectively. Additionally, they found that the global demand for water for agriculture may vary by up to the volume of Lake Michigan from 2020 – 2100.

The Impact

This work highlights the need for integrated water management strategies around the world in the face of future multi-sector uncertainties. Recent literature has started to quantify future virtual water trade patterns, but this study takes the analysis a step further by

introducing uncertainty into global trade. This research will enable the identification of regions that may be relied upon for agricultural trade and its associated water demand in differing futures. Future research projects can expand upon the studied scenarios and understand how sensitive water resources are to global agricultural trade evolution.

The rate of globalization associated with agricultural markets can drastically alter the areas where crop commodities are grown and traded from. As uncertainties surround future socioeconomic growth, energy transitions, and the resulting demand for agricultural commodities, meeting this changing demand will affect energy, water, and land around the world. Previous studies largely focused on the water implications of removing trade barriers or solely examined historical timeframes. The results show that enhancing global agricultural trade saves nearly 6,000 km3 through the end of the century, whereas declining trade may result in more than 6,000 km3 of additional irrigation water withdrawals required to meet demand. Over 65% of these changes occur via non-renewable groundwater extraction to produce crops in dry regions. This study highlights the need to increase scientific understanding of how trade integration may evolve in the future and potential responses of water resources to maintain food security and limit additional water stress.

Shantha K
I Year Student Teacher

ULTRA SOUND SCAN

Professor Cameron and Professor Donald and Tom Brown then designed the Diasonograph in 1965, the first ultrasound scanner to be produced commercially. It was widely successful and won the Design Council Award in 1973

Ultrasound can push vaccines into the body without needle. Vaccinations could be made less painful by treating skin with a vaccine-laden liquid and using ultrasound to push it into the body. Vaccines can be delivered through the skin using ultrasound. This method doesn't damage the skin and eliminates the need for painful needles.

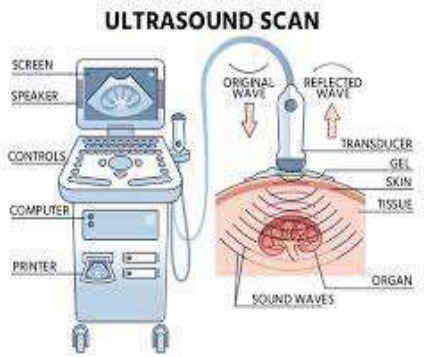
The term “ultrasound” refers to sound with a frequency that humans cannot hear. For diagnostic uses, the ultrasound is usually between 2 and 18 megahertz (MHz). Higher frequencies provide better quality images but are more readily absorbed by the skin and other tissue, so they cannot penetrate as deeply as lower frequencies. Lower frequencies penetrate deeper, but the image quality is inferior.

To create a needle-free vaccine, Darcy Dunn-Lawless at the University of Oxford and his colleagues mixed vaccine molecules with tiny, cup-shaped proteins. They then applied liquid mixture to the skin of mice and exposed it to ultrasound – like that used for sonograms – for about a minute and a half.

At first, the ultrasound pushed the mixture into the upper layers of skin, where the shape of the proteins caused vaccine-filled bubbles to form. As ultrasound kept hitting the skin, those bubbles burst and released the vaccine. As the experiment went on, the action of the bubbles breaking also cleared some dead skin cells, making the skin more permeable and allowing more and more vaccine molecules make it through.

A needle pushes vaccine molecules all the way into the muscles beneath the skin, while the ultrasound technique just delivers the vaccine to the upper layers of skin. But this shallower process is sufficient for immunization.

Uses of ultrasound scan



An ultrasound scan uses high-frequency sound waves to make an image of a person's internal body structures. Doctors commonly use ultrasound to study a developing fetus (unborn baby), a person's abdominal and pelvic organs, muscles and tendons, or their heart and blood vessels.

Cardiovascular issues: ultrasounds can detect a variety of cardiovascular problems, such as narrowed blood vessels, blockages, heart defects and heart disease. Uterine fibroids: if you are suffering from pelvic pain or abnormal periods, an ultrasound can be used to find the source of the problem.

Ultrasound will travel through blood in the heart chamber, for example, but if it hits a heart valve, it will echo, or bounce back .It will travel straight through the gallbladder if

there are no gallstones, but if there are stones, it will bounce back from them .The denser the object the ultrasound hits, the more of the ultrasound bounces back .This bouncing back, or echo, gives the ultrasound image its features. Varying shades of gray reflect different densities.

Ultrasound is commonly used for diagnosis, for treatment, and for guidance during procedures such as biopsies. It can be used to examine internal organs such as the liver and kidneys, the pancreas, the thyroid gland, the testes and the ovaries, and others. An ultrasound scan can reveal whether a lump is a cancer. This could be cancerous, or a fluid-filled cyst. It can help diagnose problems with soft tissues, muscles, blood vessels, tendons, and joints. It is used to investigate a frozen shoulder, tennis elbow, carpal tunnel syndrome, and others.

Chandana H R
I Year Student Teacher

INDIAN SPACE RESEARCH ORGANISATION (ISRO)

Indian Space Research Organisation (ISRO) is the space agency of India. The organisation is involved in science, engineering and technology to harvest the benefits of outer space for India and the mankind. ISRO is a major constituent of the Department of Space (DOS), Government of India. The department executes the Indian Space Programme primarily through various Centres or units within ISRO.ISRO was previously the Indian National Committee for Space Research (INCOSPAR), set up by the Government of India in 1962, as envisioned by Dr. VikramA Sarabhai. ISRO was formed on August 15, 1969 and superseded INCOSPAR with an expanded role to harness space technology. DOS was set up and ISRO was brought under DOS in 1972.

The prime objective of ISRO/DOS is the development and application of space technology for various national needs. To fulfil this objective, ISRO has established major space systems for communication, television broadcasting and meteorological services;

resources monitoring and management; space-based navigation services. ISRO has developed satellite launch vehicles, PSLV and GSLV, to place the satellites in the required orbits.

Alongside its technological advancement, ISRO contributes to science and science education in the country. Various dedicated research centres and autonomous institutions for remote sensing, astronomy and astrophysics, atmospheric sciences and space sciences in general function under the aegis of Department of Space. ISRO's own Lunar and interplanetary missions along with other scientific projects encourage and promote science education, apart from providing valuable data to the scientific community which in turn enriches science.

ISRO has its headquarters in Bengaluru. Its activities are spread across various centres and units. Launch Vehicles are built at VikramSarabhai Space Centre (VSSC), Thiruvananthapuram; Satellites are designed and developed at U R Rao Satellite Centre (URSC), Bengaluru; Integration and launching of satellites and launch vehicles are carried out from Satish Dhawan Space Centre (SDSC), Sriharikota; Development of liquid stages including cryogenic stage is carried out at Liquid Propulsion Systems Centre (LPSC), Valiamala & Bengaluru; Sensors for Communication and Remote Sensing satellites and application aspects of the space technology are taken up at Space Applications Centre (SAC), Ahmedabad and Remote Sensing satellite data reception processing and dissemination is entrusted to National Remote Sensing Centre (NRSC), Hyderabad.

The activities of ISRO are guided by its Chairman, who would also be the secretary of DOS and Chairman of Space commission – the apex body that formulates the policies and overseas the implementation of the Indian Space Programme.

Vision

Harness, sustain and augment space technology for national development, while pursuing space science research and planetary exploration.

Mission

- Design and development of launch vehicles and related technologies for providing access to space.
- Design and development of satellites and related technologies for earth observation, communication, navigation, meteorology and space science.

- Communication programme for meeting telecommunication, television broadcasting and developmental applications.
- Satellite-based Remote Sensing programme for management of natural resources and monitoring of environment using space based imagery.
- Space based navigation system
- Space based Applications for Societal development.
- Research and Development in space science and planetary exploration.
- Promote and authorise private firms to play key role in global Space market

Objectives

- Operational flights of Polar Satellite Launch Vehicle (PSLV), Geo-synchronous Satellite Launch Vehicle (GSLV) and Small Satellite Launch Vehicle (SSLV)
- Design and development of New Space Transportation solutions
- Design, Development and Realization of Communication Satellite
- Design, Development and Realization of Earth Observation Satellites.
- Development of Navigation Satellite System
- Development of satellites for Space Science and Planetary Exploration
- Earth Observation Applications
- Space based systems for Societal Applications
- Advanced Technologies and newer initiatives
- Training, Capacity building and Education
- Promotion of Space technology
- Infrastructure / Facility Development for space research
- International Cooperation
- Commercial utilization of the products and services emanating from the Indian space programme.

- Promotion & Authorisation of Indian private firms in Space sector

ISRO's programmes have played a significant role in the socio-economic development of India and have supported both civilian and military domains in various aspects including disaster management, telemedicine and navigation and reconnaissance missions. ISRO's spin-off technologies also have founded many crucial innovations for India's engineering and medical industries.

Gowri B
I Year Student Teacher

DEVELOPING RENEWABLE ENERGY SOURCES

Renewable energy is energy derived from natural sources that are replenished at a higher rate than they are consumed. Sunlight and wind, for example, are such sources that are constantly being replenished. Renewable energy sources are plentiful and all around us. Renewable energy is energy produced from sources like the sun and wind that are naturally replenished and do not run out. Renewable energy can be used for electricity generation, space and water heating and cooling, and transportation.

Fossil fuels – coal, oil and gas – the other hand, are non-renewable resources that take hundreds of millions of years to form. Fossil fuels, when burned to produce energy, cause harmful greenhouse gas emissions, such as carbon dioxide.

SOLAR ENERGY- Solar energy is the most abundant of all energy resources and can even be harnessed in cloudy weather. The rate at which solar energy is intercepted by the Earth is about 10,000 times greater than the rate at which humankind consumes energy.

WIND ENERGY -Wind energy harnesses the kinetic energy of moving air by using large wind turbines located on land (onshore) or in sea- or freshwater (offshore). Wind energy has been used for millennia, but onshore and offshore wind energy technologies have evolved over

the last few years to maximize the electricity produced – with taller turbines and larger rotor diameters.

GEOTHERMAL ENERGY -Geothermal energy utilizes the accessible thermal energy from the Earth's interior. Heat is extracted from geothermal reservoirs using wells or other means.

HYDROPOWER -Hydropower reservoirs often have multiple uses – providing drinking water, water for irrigation, flood and drought control, navigation services, as well as energy supply.

OCEAN ENERGY-Ocean energy derives from technologies that use the kinetic and thermal energy of seawater – waves or currents for instance - to produce electricity or heat.

Benefits of Renewable Energy

The advantages of renewable energy are numerous and affect the economy, environment, national security, and human health. Here are some of the benefits of using renewable energy in the United States:

- Enhanced reliability, security, and resilience of the nation's power grid
- Job creation throughout renewable energy industries
- Reduced carbon emissions and air pollution from energy production
- Increased U.S. energy independence
- Increased affordability, as many types of renewable energy are cost-competitive with traditional energy sources
- Expanded clean energy access for non-grid-connected or remote, coastal, or islanded communities.

Five critical actions the world needs to prioritize now to transform our energy systems and speed up the shift to renewable energy - "because without renewables, there can be no future."

Make renewable energy technology a global public good

For renewable energy technology to be a global public good - meaning available to all, and not just to the wealthy - it will be essential to remove roadblocks to knowledge sharing and technological transfer, including intellectual property rights barriers. Essential

technologies such as battery storage systems allow energy from renewables, like solar and wind, to be stored and released when people, communities and businesses need power. They help to increase energy system flexibility due to their unique capability to quickly absorb, hold and re-inject electricity, says the International Renewable Energy Agency. Moreover, when paired with renewable generators, battery storage technologies can provide reliable and cheaper electricity in isolated grids and to off-grid communities in remote locations.

Improve global access to components and raw materials

A robust supply of renewable energy components and raw materials is essential. More widespread access to all the key components and materials - from the minerals needed to produce wind turbines and electricity networks, to electric vehicles - will be key.It will take significant international coordination to expand and diversify manufacturing capacity globally. Moreover, greater investments are needed to ensure a just transition - including in people's skills training, research and innovation, and incentives to build supply chains through sustainable practices that protect ecosystems and cultures.

Level the playing field for renewable energy technologies

While global cooperation and coordination is critical, domestic policy frameworks must urgently be reformed to streamline and fast-track renewable energy projects and catalyze private sector investments. Technology, capacity and funds for renewable energy transition exist, but there needs to be policies and processes in place to reduce market risk and enable and incentivize investments - including through streamlining the planning, permitting and regulatory processes, and preventing bottlenecks and red tape. This could include allocating space to enable large-scale build-outs in special Renewable Energy Zones.

Shift energy subsidies from fossil fuels to renewable energy

Fossil-fuel subsidies are one of the biggest financial barriers hampering the world's shift to renewable energy. The International Monetary Fund (IMF) says that about $5.9 trillion was spent on subsidizing the fossil fuel industry in 2020 alone, including through explicit subsidies, tax breaks, and health and environmental damages that were not priced into the cost of fossil fuels. That's roughly $11 billion a day.Fossil fuel subsidies are both inefficient and inequitable. Across developing countries, about half of the public resources spent to support fossil fuel consumption benefits the richest 20 percent of the population, according to the

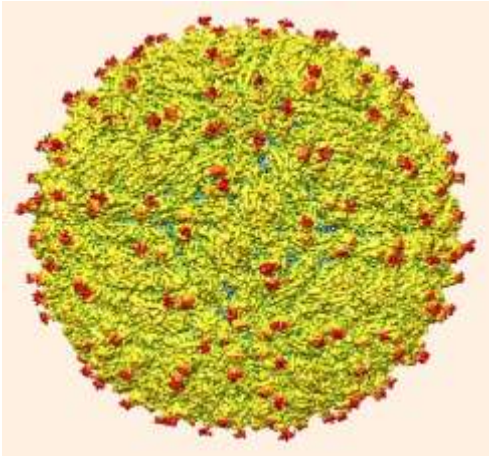
IMF..Shifting subsidies from fossil fuels to renewable energy not only cuts emissions, it also contributes to the sustainable economic growth, job creation, better public health and more equality, particularly for the poor and most vulnerable communities around the world.

Triple investments in renewables

At least $4 trillion a year needs to be invested in renewable energy until 2030 – including investments in technology and infrastructure – to allow us to reach net-zero emissions by 2050.Not nearly as high as yearly fossil fuel subsidies, this investment will pay off. The reduction of pollution and climate impact alone could save the world up to $4.2 trillion per year by 2030.The funding is there - what is needed is commitment and accountability, particularly from the global financial systems, including multilateral development banks and other public and private financial institutions, that must align their lending portfolios towards accelerating the renewable energy transition. **"**Renewables are the only path to real energy security, stable power prices and sustainable employment opportunities."

Sangeetha MB
I Year Student Teacher

ZIKA VIRUS



Zika virus is a mosquito-borne virus first identified in Uganda in 1947 in a Rhesus macaque monkey followed by evidence of infection and disease in humans in other African countries in the 1950s.From the 1960s to 1980s, sporadic human infections were detected across Africa and Asia. However, since 2007 outbreaks of Zika virus disease have been recorded in Africa, the Americas, Asia and the Pacific.

Transmission

Zika virus is primarily transmitted by infected mosquitoes of the Aedes (Stegomyia) genus, mainly Aedes aegypti, in tropical and subtropical regions. Aides mosquitoes usually

bite during the day. These mosquitoes also transmit dengue, chikungunya and urban yellow fever. It is also transmitted from mother to fetus during pregnancy, as well as through sexual contact, transfusion of blood and blood products, and possibly through organ transplantation.

Symptoms

Most people infected with Zika virus do not develop symptoms. Among those who do, they typically start 3–14 days after infection, are generally mild including rash, fever, conjunctivitis, muscle and joint pain, malaise and headache, and usually last for 2–7 days. These symptoms are common to other arboviral and non-arboviral diseases; thus, the diagnosis of Zika virus infection requires laboratory confirmation.

Prevention

No vaccine is yet available for the prevention or treatment of Zika virus infection. Development of a Zika vaccine remains an active area of research.

Treatment

There is no specific treatment available for Zika virus infection or disease.People with symptoms such as rash, fever or joint pain should get plenty of rest, drink fluids, and treat symptoms with antipyretics and/or analgesics. Nonsteroidal anti-inflammatory drugs should be avoided until dengue virus infections are ruled out because of bleeding risk. If symptoms worsen, patients should seek medical care and advice.

Diagnosis

Infection with Zika virus may be suspected based on symptoms of persons living in or visiting areas with Zika virus transmission and/or Aedes mosquito vectors. A diagnosis of Zika virus infection can only be confirmed by laboratory tests of blood or other body fluids, and it must be differentiated from cross-reactive related filoviruses such as dengue virus, to which the patient may have been exposed or previously vaccinated.

Treatment

There is no specific treatment available for Zika virus infection or disease. People with symptoms such as rash, fever or joint pain should get plenty of rest, drink fluids, and treat symptoms with antipyretics and/or analgesics. Nonsteroidal anti-inflammatory drugs should be

avoided until dengue virus infections are ruled out because of bleeding risk. If symptoms worsen, patients should seek medical care and advice.

Zika virus disease is generally mild, and severe disease requiring hospitalization and deaths are uncommon. Zika infection during pregnancy can cause serious birth defects and is associated with other pregnancy problems.

Preethi M H
I Year Student Teacher

ORNITHOLOGY

Ornithology is the scientific study of birds. It includes all types of birds—from tiny hummingbirds to large, flightless ostriches. This field encompasses bird ecology, evolution, physiology, and bird's preferred habitats, among other specializations. People who study birds are called ornithologists. Ornithology is a science. The word "ornithology" comes from the Latin word "ornithologia" which means "scientific study or knowledge of birds." It involves a systematic methodology based on evidence to better understand bird ecology, evolution, bird physiology, and all matters related to birds.

What do ornithologists do?

An ornithologist is a person who studies birds. Their work includes surveying, gathering data, and reporting information on bird activities. Some

of the specific activities they do are as follows:

- researching migration routes and habitat needs
- monitoring and assessing the status of a particular bird population
- capturing and tracking birds to monitor their movements;
- conducting wildlife impact assessments for development projects
- analyzing collected data and creating reports.

Some ornithologists may specialize in a specific bird species or group, but others may study a wide range of bird families or species. In most cases, studying birds is only one component of their main role, as in the case of wildlife biologists, paleontologists, ecologists, environmental educators, etc.

A Brief History of Ornithology

Humans have been fascinated with the birds living around them since ancient times. Cave drawings and archaeological sites all indicate humans' interest in birds, both observationally and domestically. Evidence for early humans consuming avian, or bird, proteins can be found dating back to Stone Age times. In more modern times, birds continue to not only be a food source but also a fascinating field of scientific study. New technology has allowed us to band and track birds across thousands of miles, remotely observe their nesting behaviors and monitoring for environmental and habitat concerns.

And unlike many branches of science, which are often impractical for non-scientists to become involved with, anyone with access to the outside world can potentially be a first-hand observer of all things avian in their neighborhood.

Types of Ornithology Study

The field of ornithology is vast, but almost all aspects of its study can be broken down into one of three fields: collection, field- based research, and laboratory-based research.Collection refers to the more traditional biological approach to the study of birds, through the collection of both live and deceased specimens. The specimens are analyzed in terms of their body systems, anatomy, physiology, and even their DNA.

Field-based research involves scientists working out in the field, noting population counts, taking bird song recordings, and sometimes collecting (either permanently or temporarily) live specimens for more direct observation.

Field-based ornithologists also make indirect observations, which include studying the nesting locations, nesting materials, or food resources available to the birds living in a particular location. They aren't direct observations of a bird, but instead are observations of conditions or settings that a bird would live in or interact with.

Laboratory-based research can include analyzing the results of field-based studies or analyzing live birds for studies relating to animal intelligence, bird-to-bird and bird-to-human interactions, and medical treatments. It is also not unusual for multiple branches of ornithology to overlap over the course of a single research project and for ornithologists to collaborate. A field-based ornithologist might study a hooded merganser, like this one, in its native habitat.

Role of ornithology: The study of Ornithology as a subject helps us to understand the environment of birds, have an idea regarding the endangered species of the birds, and also gives a brief idea regarding the human past.

Need of ornithology: Bird conservation requires specialized knowledge in aspects of biology and ecology, and may require the use of very location-specific approaches. Ornithologists contribute to conservation biology by studying the ecology of birds in the wild and identifying the key threats and ways of enhancing the survival of species.

Chandana M C
I Year Student Teacher

UNDERSTANDING VIRTUAL REALITY AND AUGMENTED REALITY

We spend a lot of time looking at screens these days. Computers, smartphones, and televisions have all become a big part of our lives; they're how we get a lot of our news, use social media, watch movies, and much more. Virtual reality (VR) and augmented reality (AR) are two technologies that are changing the way we use screens, creating new and exciting interactive experiences.

Virtual reality uses a headset to place you in a computer-generated world that you can explore. Augmented reality, on the other hand, is a bit different. Instead of transporting you to a virtual world, it takes digital images and layers them the real world around you through the use. of either a clear visor or smartphone

Virtual reality

Virtual reality immerses you in a virtual world through the use of a headset with some type of screen displaying a virtual environment These headsets also use a, technology called head tracking which allows you to look around the environment by physically moving your head. The display will follow whichever direction you move, giving you a 360-degree view of the virtual environment

Types of VR devices

At the moment, there are two major types of headsets. The first type has a screen built in to the headset. These devices connect to a computer and require a pretty powerful system to operate smoothly They have great graphics and perform well, but they're also pretty expensive. A few popular examples of these include the Oculus Rift, the Vive, and the PlayStation VR, which connects to the PlayStation 4 game. console. Some of these devices come with handheld controllers that track your hands' movements as well, providing for a more interactive experience

The other type of headset houses your phone and uses its screen as the display. These don't require a computer and run completely off of apps on your smartphone. The graphics and performance levels on these headsets aren't quite as good as those with a built-in screen, but. they do tend to be much cheaper Some popular examples include Google Cardboard and the Gear VR

Augmented reality

It allows you to augmented reality the world around you with digital images layered on top of it. There are currently a couple of AR headsets available, including the Microsoft.. HoloLens and the Magic Leap However, they are currently more expensive than VR headsets, and are marketed primarily to. businesses Augmented reality can also be used on devices like smartphones and laptops

without the use of a headset There are a variety of apps that use AR, including some that allow you to translate text using your camera identify stars in the sky and even see how your garden would look with different plants. You may have even previously used AR without realizing it, while playing a game like Pokemon Go or using filters on. Snapchat

Sameena banu
I Year Student Teacher

MILLETS – BENEFITS, TYPES, RECIPES & WEIGHT LOSS

Millets are a powerhouse of nutrients. They boost your health and improve weight loss, besides being gluten-free. Millets are available in a variety of types, and each has its own health benefits. Consuming millet as part of your daily diet is an age-old concept. The population of central and southern India consumed millet daily until the Green Revolution made rice and wheat more accessible. With the boom of rice and wheat production, millets took a back seat for some years. However, they have now reclaimed their position in the kitchen and heart of health conscious individuals.

Millets are coarse grains with a high nutritional value. They are rich in protein, vitamins, minerals, and fibres. Unlike other cereals, millets require little water and ground fertility. The sheer affordability of millets also tags them as 'poor man's food grain'. The world is now noticing millets for their enormous potential.

You can divide Millets into two broad categories:

1**. Naked grains**

Naked grains refer to the millets devoid of the tough, indigestible husk, such as Ragi, Jowar, and Bajra. These millets don't require processing after their harvest. They can be consumed right after cleaning. These millets are therefore significantly cultivated today.

2**. Husked grains**

Foxtail millets, Little millets, and Kodo millets belong to this second type. These types consist of an indigestible seed coat that has to be removed before consumption. The processing of these millets is one of the reasons for making them less popular. Millets contain a host of micronutrients such as iron, calcium, and phosphorus. Also, they take time to digest, which doesn't cause the blood sugar spike associated with easily digestible food. So introducing millet into your diet can help control diabetes.

5 Types of Millets

Millets come in different shapes and sizes. The two broad categories discussed above contain numerous kinds of millets. We will take a look at some of these different types below:

1. Foxtail Millet

Foxtail millet, or indigenously called Kakum/Kangni. It contains blood sugar balancing healthy carbohydrates. The iron and calcium content present in it also helps strengthen immunity. In addition, foxtail millets help regulate your blood cholesterol and increase HDL cholesterol levels in your body.

2**. Finger Millet/Ragi**

Ragi is a more common name for finger millet. It is used as a healthier cereal substitute for rice and wheat. Ragi is gluten-free and rich in protein and aids brain development in growing children.

3. **Pearl Millet/Bajra**

Bajra is incredibly nutrient-dense. It contains minerals such as calcium and magnesium, protein, fibre, and iron. Practice regular consumption of pearl millet to fight against type II diabetes and aid weight loss.

4. Buckwheat

Go for buckwheat if your primary concern is to lose weight. It makes for a healthy food option for diabetes, helps lower blood pressure, and improves cardiovascular health. Buckwheat also fights against diseases such as gallstones, childhood asthma, and breast cancer.

5. Little Millet

Little millet is also an excellent option for those looking to lose weight. You can eat it as a rice replacement. It is high in fibre and filled with numerous minerals such as potassium, zinc, iron, and calcium. It is also packed with the health benefits of vitamin B and works as an antioxidant for your body.

7 Proven Health Benefits of Millets

1. Aid Weight Loss

Millet are rich in protein and fiber, two essential nutrients for weight loss. They help to keep the stomach fuller for a longer duration of time and reduce the unhealthy snacking habit between meals. This helps in shedding the extra kilos without compromising on nutrition.

2. Keep Your Blood Sugar Levels Low

According to a meta-analysis, millet consumption lowers the incidence of blood sugar fluctuations. Millets have a low glycaemic index. Therefore, consumption of millets regularly lowers the risk of developing diabetes. It also helps to stabilise the blood sugar levels in diabetics.

3. Boost Immunity

Research states that millet consumption, both major and minor are beneficial for building immunity. Protein intake is responsible for building the body's immunity.

Millets being a great source of protein can help develop and strengthen our immunity. Stronger immunity means fewer chances of you catching diseases.

4**. Reduce Cardiovascular Risks**

Millets contain essential fats, which provide our bodies with good fats. This prevents excess fat storage as well as effectively lowers the risk of high cholesterol, strokes, and other heart complications as stated by this study. The potassium content in millets regulates your blood pressure and optimises your circulatory system.

5. Prevents Asthma

The magnesium content in millets can reduce how frequently you experience migraines. It can also bring down the severity of your asthma complaints. The reason is, unlike wheat, they do not contain the allergens that lead to asthma and wheezing.

6. Aids Digestion

Millets are a rich fibre source that benefits digestion by alleviating bloating, gas, cramping, and constipation. In addition, good digestion keeps issues like gastric/colon cancer and kidney/liver ailments away.

7. Acts as an Antioxidant

Millets help your body detox because of their antioxidant properties; Quercetin, curcumin, ellagic acid, and other valuable catechins flush out toxins from your body and neutralise the enzymatic actions of your organs.

Millets are rich in several beneficial nutrients, such as phosphorus, magnesium, copper, and manganese. Incorporating them into one's diet can have various health benefits such as improved immunity and digestive health. It also protects against heart conditions and other complications like asthma. Millet consumption is known to aid weight loss and detoxify the body. It also regulates blood sugar levels which helps in the prevention of diabetes or better management of the condition.

Rekha S
I Year Student Teacher

GENETIC ENGINEERING

Genetic engineering involves manipulating an organism's DNA, allowing scientists to modify genetic traits or transfer genes between different species. This technology has numerous applications across various fields.

1. **Medical Advancements**: Gene therapy, a branch of genetic engineering, aims to treat genetic disorders by replacing, modifying, or supplementing faulty genes. This holds promise for conditions like cystic fibrosis, sickle cell disease, and certain types of cancer.
2. **Agricultural Innovation:** Genetic engineering in agriculture has led to the creation of genetically modified organisms (GMOs). These crops are engineered to possess desirable traits such as resistance to pests, tolerance to herbicides, or enhanced nutritional content. However, the use of GMOs has been a subject of debate regarding potential environmental and health impacts.
3. **Research and Biotechnology**: Techniques like CRISPR-Cas9 have revolutionized genetic editing, offering precise and efficient ways to

modify DNA. This has accelerated research in various fields, from creating disease models to understanding fundamental biological processes.

4. **Ethical and Social Implications:** The ethical considerations of genetic engineering are vast. Questions regarding the moral implications of altering the genetic makeup of organisms, potential unintended consequences, and the equitable distribution of benefits and risks are critical aspects of this technology.

5. **Future Directions:** Continued advancements in genetic engineering hold promise for personalized medicine, where treatments are tailored to an individual's genetic makeup. Additionally, ongoing research explores using genetic engineering to address global challenges such as climate change and food security.

6. **Evolution of CRISPR Technology**: CRISPR-Cas9, often dubbed "molecular scissors," allows precise editing of DNA sequences. Its versatility and ease of use have revolutionized genetic research, making it accessible across various scientific disciplines. Ongoing advancements in CRISPR technology, such as base editing and prime editing, continue to expand its applications and accuracy.

7. **Regulatory Frameworks and Safety Measures**: Many countries have established regulatory bodies to oversee the ethical and safe use of genetic engineering technologies. These measures aim to balance innovation with ensuring the responsible and controlled application genetic modifications in research and commercial endeavor.

Aishwarya R S
II Year Student Teacher

NANOBOTS

Nanobots are robots that carry out a very specific function and are 50–100 nm wide. They can be used very effectively for drug delivery. Normally, drugs work through the entire body before they reach the disease-affected area. Using nanotechnology, the drug can be targeted to a precise location which would make the drug much more effective and reduce the chances of possible side effects. shows a device that uses nanobots to monitor the sugar level in the blood.

Special sensor nanobots can be inserted into the blood under the skin where microchips, coated with human molecules and designed to emit an electrical impulse signal, monitor the sugar level in the blood.

The drug carriers have walls that are just 5–10 atoms thick and the inner drug-filled cell is usually 50–100 nm wide. When they detect signs of the disease, thin wires in their walls emit an electrical pulse which causes the walls to dissolve and the drug to be released. A great advantage of using nanobots for drug delivery is that the amount and time of drug release can be easily controlled by controlling the electrical pulse Furthermore, the walls dissolve easily and are therefore harmless to the body. Elan Pharmaceuticals has already started using this technology in their drugs Merck's Emend and Wyeth's Rapamune. Nanomedicine could make use of these nanorobots (e.g., Computational Genes), introduced into the body, to repair or detect damages and

infections. Using nanotechnology, the drug can be targeted to a precise location which would make the drug much more effective and reduce the chances of possible side effects. In the future, these nanorobots could actually be programmed to repair specific diseased cells, functioning in a similar way to antibodies in our natural healing processes.

Medicinal Nano devices are a responsive particle is already capable of information processing and is, therefore, a device. Particles combining the ability to concentrate themselves at a target with delivery of an appropriate therapeutic agent actually combine diagnostics with therapy, a combination that is sometimes called theranostics. This particular technological development has, however, met with some opposition because in traditional medicine, after a diagnosis is made a discussion between the physician and the patient usually ensues in order to decide whether to proceed with therapy and if so what kind, whereas a theranostic device acts autonomously without the explicit authorization of the patient.

The ultimate in sophistication of the Nano-object device is the nanoscale robot or "nanobot". Microscopic or nanoscopic robots are an extension of existing ingestible devices that can move through the gastrointestinal tract and gather information (mainly images) during their passage. As pointed out by Hogg minimal capabilities of such devices are: (chemical) sensing; communication (receiving information from, and transmitting information to, outside the body, and communication with other nanobots); locomotion – operating at very low Reynolds numbers (around 10−3), implying that viscosity dominates inertia; computation (e.g. recognizing a biomarker would typically involve comparing sensor output to some preset threshold value; due to the tiny volumes available, highly miniaturized would be required for constructing on-board logic circuits of

practically useful data processing power); and of course power – it is estimated that Pico watts would be necessary for propelling a nanobot at a speed of around 1 mm/s. Such nanobots could also incorporate one or more drug reservoirs, or miniature devices for synthesizing therapeutic substances using materials found in their environment. It is very likely that to be effective, these nanobots would have to operate in large swarms of billions or trillions.

Amrutha C R
II Year Student Teacher

SCIENCE POEM

The world is ruled by Science,

This truth will be known by these lines;

By the law of gravity, we walk on ground,

The human ear can't hear ultrasound.

The science of spectacles is known all,

The plant cells are guarded by cell wall,

what can be a better example than the food we eat,

With a number of reactions, the meal does greet.

Sodium is a reactive metal,

Poisonous chloride was used in battle;

But these elements form sodium chloride,

Its explanation is out of my mind.

The nuclear weapons were made by Science;

They are harmful to nature were explained by Science.

Now I can't get any more lines,

On this already complex Science.

Aishwarya R
II Year Student Teacher

SCIENCE TEACHER

A teacher plays a very important role in our lives. A teacher will have the required academic qualifications and experience in teaching. These are essential for a person to get into that job. But a good teacher will have some additional qualifications like love for children, good character and behavior, expression skills and emotional stability. A teacher with all the above traits will be attracted by many students and he will become a role model to some students. Some teachers will go beyond the subject and train the students in many ways so that they will become more efficient. But some teachers in addition to this, will go a little more distance and teaches the students about life and the importance of values and virtues in their lives. Some teachers may follow all such values and virtues and guide their students in such a way that they always follow the ethics and values of their lives. Such teachers will leave a very good impression on the minds of the students. I am lucky to have one such teacher who taught me and mentored my life on the right path.

I joined the high school in our village for 6th Standard. The science teacher of that school was very famous. He used to take a special interest in

guiding students on the right path. A very good teacher with excellent teaching skills. He taught me science and used to take a special interest to teach me. When I joined freshly in the school, I was very nervous and never used to talk in the classroom. I was even hesitating to ask the doubts. He recognized my weakness and every time he used to make me get up from the seat and talk about something. This made me talk freely. But still, I was not getting out of that syndrome completely. Meanwhile, the August 15th celebrations came. Elocution competitions were there. He called me and told me I should participate. He encouraged me and gave me many tips. I used to go to him and talk before him on the subject given for the competition. Finally, I participated in the competition and got 3rd prize. From then onwards I never hesitated to talk in the classroom. I participated in many competitions from then onwards. Later on, this aspect helped me a lot in my life. He was our class teacher also. He used to come to our class whenever any other subject teacher was on leave and used to tell us stories with morals and values. At the end of the story, he used to explain what the story conveys to us. He was very humble and honest. He loves students and he even used to spend his money for helping poor students. His narration of stories was very good to hear and we used to hear it with a lot of interest. I used to meet him in the teacher's room to get my doubts cleared. I learned many good points from his teachings. Even after getting out of school and joining college, I used to meet him in his house. He taught me how we have to conduct ourselves in our lives. His teaching made me understand the subjects easily and I performed well throughout my studies. I was facing and he used to give some good advice.

A man of ethics and principles. He never took money from any student for teaching in his house during evenings and mornings. He used to welcome any student coming to him for clearing his doubts. Till recently he was alive and I used to meet him whenever I go to my native village. He taught us what he followed. He spent a simple life and never asked for any help from any of his

students. He retired as a gazette headmaster and settled in our village only Unfortunately, we lost him this year during the second wave of COVID 19. He died of a heart attack. Even in such a pandemic, many students gathered to see his dead body and paid their rich respects to their most respected teacher. I was also there and supported his two sons during the time of difficulties.

We may be seeing many teachers. But I have never seen a teacher like my science teacher who helped many students to become responsible citizens of the country. He used to tell me that he was very glad as many of his students are in very good positions and doing good service to the nation. I feel he will be there always with me and guide me on the right path as long as I will be here on this earth. A great teacher and above all a good human being.

Chaitra H R
II Year Student Teacher

THE ART OF INSPIRING MINDS: QUALITIES OF A GOOD SCIENCE TEACHER

In the intricate tapestry of education, a good science teacher stands as a beacon of inspiration, illuminating the path to understanding and discovery. Beyond disseminating facts, a truly exceptional science teacher possesses qualities that go beyond the textbooks, creating an environment where scientific curiosity flourishes. Let's explore the key attributes that define a good science teacher.

Passion for the Subject:

A good science teacher is fueled by an unbridled passion for their subject. This enthusiasm is contagious, creating an atmosphere where students can't help but be drawn into the captivating world of science. Their eyes light up as they explain complex concepts, making even the most intricate ideas accessible and intriguing.

Effective Communication Skills:

The ability to communicate complex ideas in a clear and engaging manner is a hallmark of a good science teacher. They break down barriers between students and scientific concepts, ensuring that every learner, regardless of their background, can grasp the wonders of the subject.

Dedication to Student Success:

A good science teacher goes beyond the call of duty to ensure student success. They are invested in the progress and well-being of each learner, providing additional support when needed and fostering an environment where questions are encouraged and valued

Embracing Creativity and Innovation:

Science is inherently creative, and a good science teacher nurtures this creativity in their students. They encourage innovative thinking, creating a classroom where hypotheses are celebrated, and experiments are not just about outcomes but about the journey of exploration

In conclusion, a good science teacher is not merely an educator; they are cultivators of curiosity, architects of inspiration, and mentors for the future generation of scientists. The impact of such teachers extends far beyond the classroom, leaving an indelible mark on the scientific journeys of their students. As we celebrate the qualities that make a science teacher exceptional, let us recognize and appreciate the profound influence they have on shaping young minds and fostering a lifelong love for scientific exploration.

Lava M K
II Year Student Teacher

NUTRITION

Carbon, hydrogen, and oxygen too,

Building blocks for life, they'll get you through.

Nitrogen, essential for proteins grand,

Phosphorus, DNA's helping hand.

Calcium and iron, keep your body strong,

Vitamins and minerals, they all belong.

Nutrients, nutrients, they're what we need,

To fuel our bodies and help us succeed.

From fruits and veggies to grains and meat,

Science tells us what makes us complete.

Fatty acids, omega-3's and more,

Keep your brain sharp, that's for sure.

Zinc and magnesium, they play their part,

In enzyme reactions, they're super smart.

Iodine, for a healthy thyroid gland,

Science and nutrition go hand in hand.

Nutrients, nutrients, they're what we need,

To fuel our bodies and help us succeed.

From fruits and veggies to grains and meat,

Science tells us what makes us complete.

So eat a balanced diet, each and every day,

To keep your health in the best possible way.

Science teaches us the power of food,

Nutrients and knowledge, our well-being renewed.

Nutrients, nutrients, they're what we need,

To fuel our bodies and help us succeed.

From fruits and veggies to grains and meat,

Science tells us what makes us complete.

So let's celebrate the wonders of nutrition,

With science and song, a winning combination.

For nutrients are the key to a vibrant life,

So eat well, stay healthy, and thrive.

M G Chandan
II Year Student Teacher

DISCOVERY OF VACCINE

The word “vaccine” is derived from the Latin word “vaccines” which means “from the cows”. A vaccine is a substance that is used for the production of antidotes in the body and provides immunity against one or a few diseases. In biological terms, a vaccine is defined as s biological terms, a vaccine is defined as a biological and formulated preparation to provide acquired immunity for a particular disease.

Vaccines are the suspension of killed microbes which provides immunity towards a specific disease. Vaccine builds our immunity which helps to fight the microbial attack. The body creates antibodies to attack them when vaccines are ingested or injected into the patient's body. Generally, a vaccine is an agent which contains a weakened or killed from of the disease causing agent, its surface, or its toxins. When this solution is introduced to the human body, the immune system is able to identify the threat and destroy it. The process of implementing the vaccine is called vaccination.

The practice of immunization of the body dates back hundreds of years, but the first official vaccination was developed by Edward Jenner who is considered the founder of vaccinology. In 1796, be injected a 13-year-old-boy with cowpox (vaccinia virus) and established immunity to smallpox. In 1798, the very first smallpox was developed. During the 18^{th} and 19^{th} centuries, systematic

implementation of mass smallpox immunization culminated in its global establishment in 1979.

Types of vaccines

- Based on a number of factors, scientists decide which type of vaccine they will make. There are several types of vaccines, including:
  - Inactivated vaccines
  - Live-attenuated vaccines
  - Messenger RNA (mRNA) vaccines
  - Subunit, recombinant, polysaccharide, and conjugate vaccines
  - Toxoid vaccines
  - Viral vector vaccines

Uses of vaccine:

Vaccines are very important because they protect us from infectious diseases. In some areas or populations, infectious diseases are endemic. For example: cholera, polio, hepatitis B and COVID-19. Example: COVAXIN, COVIESHIELD, MMR etc.,

Meghana H M
II Year Student Teacher

WONDERS OF SPACE EXPLORATION

In the silence of the stars, science hums its tune,

Through the microscope's eye or the reach of the moon.

In equations and theories, it crafts its art,

Unlocking the secrets that linger in the heart.

From atoms to galaxies, it weaves a story,

A tapestry woven with experiments' glory.

With hypotheses tested and knowledge amassed,

Science reveals the wonders that forever will last.

In laboratories' chambers and fields open wide,

Curiosity's flame, it continues to guide.

In the dance of discovery, it takes its part,

Unraveling mysteries, igniting the heart.

Oh, the beauty of science, in its quest for truth,

A journey of wonder from the days of youth.

In every discovery, in every stride,

Science stands as humanity's guide.

Aishwarya R S
II Year Student Teacher

SCIENCE PUZZLE

Topic: - Cell

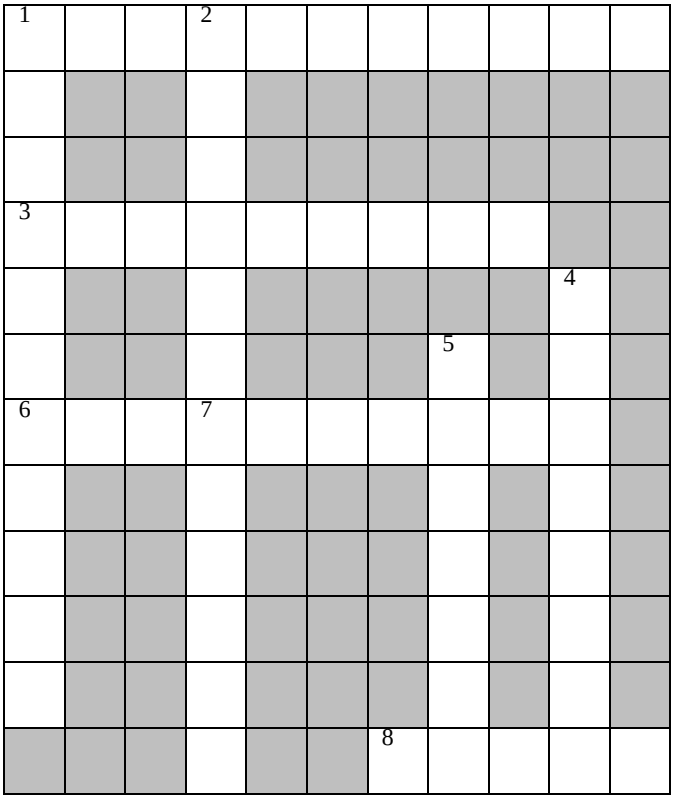
Compete the crossword with the help of clues given below

I. Across

1. This is necessary for photosynthesis
3. Term for component present in the cytoplasm
6. The living substance in the cell
8. Units of inheritance present on the chromosomes

II. Down

1. Green plastids
2. Formed by collection of tissues.
4. It separates the contents of the cell form the surrounding medium
5. Empty structure in the cytoplasm
7. A group of cells



Answers

[1] C	H	L	[2]O	R	O	P	H	Y	L	L
H			R							
L			G							
[3]O	R	G	A	N	E	L	L	E		
R			N						[4]M	
O							[5]V		E	
[6]P	R	O	[7]T	O	P	L	A	S	M	
L			I				C		B	
A			S				U		R	
S			S				O		A	
T			U				L		N	
			E			[8]G	E	N	E	S

Shreya P G
II Year Student Teacher

SCIENCE AND SUPERSTITION

In this scientific era of many discoveries and inventions, science making the impossible possible with the blink of an eye, there's no place for superstition. Science and superstitions are poles apart. Yet

they are the two sides of the same coin unknown of their interdependence. Superstitions are self-imposed selfish beliefs, something imaginary yet unimaginable disbelief, or mere beliefs. But science – the most well-known and popular word of this era. Science as is believed to be something realistic which even makes the unreal real; the unachievable achievable. Science in itself is a sweet beginning and sometimes a bitter ending whereas superstitions have neither beginning nor end; it is complete in itself. But still, these two unrealistic and realistic, unimaginable and imaginable, never-ending and ever ending concepts are interconnected somewhere beyond the universe by some unpredictable threads of God. Science completes superstitions in the same way as reasons complete assumptions. Reasons sometimes fail to explain rendering the assumptions to be almost dark and blank. And sometimes baseless reasons succeed in explaining a taboo.

Let's have a quick look at the following examples: -

- **Eat curd and sugar before heading out**

  Eating curd and sugar before stepping out for something new and important is considered to be good luck as the consumption of curd has a cooling effect on the stomach and sugar which is added provides instant glucose which makes your work easier and successful. This combination is indispensable for Indians and its consumption was slowly linked to good luck.

- **Don't wash or cut hairs on certain days**

  Washing or cutting hairs on certain days like on Tuesdays or Thursdays are considered to be bad luck but there's no truth in this as it was one of the water management practices. And moreover, during those days, barbers got a holiday on those days. So, just to give them a holiday people don't cut hairs on those days.

- **Swallow tulsi leaves never chew**

  Tulsi leaves shouldn't be chewed, it needs to be swallowed. The science behind his is that the tulsi leaves contain a little amount of arsenic. Thus, chewing it directly could result in degradation of enamel.

- **Bathe after attending a funeral ceremony**

  Earlier bathing was necessary after attending a funeral ceremony but today it's not like earlier as our ancestors didn't have vaccinations against smallpox, hepatitis and other deadly diseases. So they came up with this ritual of bathing so as to prevent themselves from infection from the dead body.

- **Lizard falling on human is bad luck**

  It is said to be bad luck but the scientific reasons behind this is that the lizard releases poisonous chemicals from its body in order to protect themselves from enemies and if it falls on human body or food, it is bound to contaminate it. So, bathe is taken after it falls on someone.

- **Using lemons and green chillies to avoid buri nazar**

  The nimbhu mirchi tadka is one of the commonly visible superstitions among the society whose use is often encouraged due to the qualities of lemon and chillies as they both are rich in different vitamins Ad create certain acidic odour which helps keep away insects. Thus, our ancestors used this as a symbol during ceremonies which now turned into a tadka.

- **Bats entering the house means death**

  It is considered to be a bad omen. The real reason behind this superstition is that the bats bring a lot of deadly diseases along with them and when there was no medical facility available during those days, people would die due to rabies, Ebola, Nipah and other illness brought in by the illness.

- **Ghosts residing in peepal trees**

  This myth continues to prevail even today. But the scientific reason behind this is that the trees use carbon dioxide during the day and releases oxygen but at night, it is the other way round. So, when you sleep under the tree, the excess carbon dioxide level can make you feel heavy in the fist and suffocated which is associated with the feeling of being possessed by some spirits.

- **Throwing coins in fountains and rivers bring good**

  Most currencies in ancient times were made of copper and by throwing copper coins into rivers, our forefathers apparently ensured that they were consuming pure water. Science has it that copper has antimicrobial property and it can kill 99.9% of infection-causing bacteria. However, today neither do we use copper coins nor do we drink water directly from the river. This belief has brought in more pollution than good luck.

In technological age some people also belief in some traditionally feeling. So we the people cannot totally avoid the feeling of superstitions. But through the knowledge of scientific Reason we can improve our introspective concept to the external behavior. Especially superstition is very impact on the field of some area of people like backward, uneducated, rural, etc. They are easily belief in superstition through. Their traditional rules as well as per their mores and folks. For example a mirror which is broken may bring bad Luck; it is said, house where mirror was broken cannot get well for a period of six/seven years, milk cannot be Given to nobody in the darkness of night, it is said that if it is given then cow does not produce milk any more, that Crows fly around a house is not considered as a good luck, hands should not be bound together, if so that person Becomes unsuccessful, a bird's knocking on the window with its beak is the sign of news to be

received etc. Besides, there are different examples like these in our day to day life situation.

Sowmya L
II Year Student Teacher

GOLDEN SUN

Great, glorious, golden sun,

Shine down on me today!

You are the life of all this earth,

You and your magic ray.

You are the life of bird and plant,

All must depend on you.

Shine down, great sun, the whole day long!

Shine from the heaven's blue.

And I will welcome your golden rays,

For you mean life to me,

And you mean happiness and health,

Strength and energy.

Shine down, great sun, on flower and field,

And never say goodbye.

Forever and ever give us your light

From out the wide, blue sky.

Sunitha C P
II Year Student Teacher

SCIENCE INNOVATIONS-ABCELLERA CELIUM

In late March, biotech firm AbCellera hosted a call with 40 researchers to review the data they'd collected on potential antibodies against SARS-CoV-2. Using AbCellera's high-throughput microfluidics and single-cell analysis tools to probe samples of COVID-19 patients, the company's team had deciphered the genetic sequences encoding hundreds of antibodies that might treat the disease. Sifting through all of that data by hand was tedious, though, so the team fed it into Celium, a data visualization tool that intersects more than a million high-quality data points for those antibodies to reveal which ones might work best in patients as a potential therapy. In real time, on the call, the researchers used Celium to probe those relationships and home in on the LY-CoV555 antibody that, months later, entered clinical trials as a possible COVID-19 treatment, says Maia Smith, lead of data visualization at AbCellera and creator of Celium. "I think that kind of says it all."

Before Celium came on the market in 2017, scientists working with AbCellera to find antibodies would get back complex spreadsheets of data that were difficult to navigate, and it was hard to know where to start, Smith says. Using Celium, data are presented in a visual format and the tool "helps you identify the right molecule for your needs," Fernando Corrêa, a protein engineer at Kodiak Sciences in Palo Alto, California tells *The Scientist*. He's partnered

with AbCellera to identify antibodies to treat retinal diseases, and says the company's package of microfluidics, single-cell analysis, and data visualization tool "streamlines the process of antibody discovery in a user-friendly manner."

Sushma Pujar
II Year Student Teacher

JAMES CHADWICK

James Chadwick was born in Bollington, Cheshire, on 20 October 1891, the first child of John Joseph Chadwick, a cotton spinner, and Anne Mary Knowles, a domestic servant. He was named James after his paternal grandfather. In 1895, his parents moved to Manchester, leaving him in the care of his maternal grandparents. He went to Bollington Cross Primary School, and was offered a scholarship to Manchester Grammar School, which his family had to turn down as they could not afford the small fees that still had to be paid. Instead he attended the Central Grammar School for Boys in Manchester, rejoining his parents there. He now had two younger brothers, Harry and Hubert; a sister had died in infancy. At the age of 16, he sat two examinations for university scholarships, and won both of them. He received the Nobel Prize in Physics 1935 for his discovery of the neutron, a subatomic particle with zero electrical charge. Neutrons are found in the nucleus of all elements (except hydrogen) along with protons, which carry a positive charge.

Honours:

- Elected a Fellow of the Royal Society in 1927.

- Medal for Merit from the United States, Pour le Merited from Germany.
- Foreign member of the Royal Netherlands Academy of Arts and Sciences in 1946
- International member of the American Philosophical Society in 1948.
- Member of the Order of the Companions of Honour
- In the New Year Honours on 1 January 1970 for "services to science", and went to Buckingham Palace for the investiture ceremony

Tejaswini D C
II Year Student Teacher

E = mc2

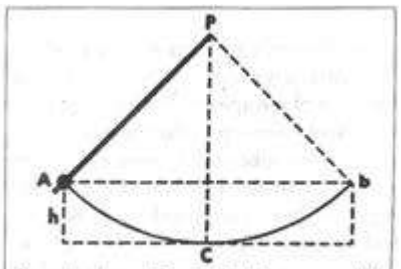
Albert Einstein Written for a popular science magazine, Science illustrated, April 1946

In order to understand the law of the equivalence of mass and energy, we must go back to two conservation or “balance” principles which, independent of each other, held a high place in pre-relativity physics. These were the principle of the conservation of energy and the principle of the conservation of mass. The first of these, advanced by Leibniz as long as ago as the 17th century, was developed in the 19th century essentially as a corollary of a principle of mechanics. Consider, for example, a pendulum whose mass swings back and forth between the points A and B. At these points the mass is higher by the amount h than it is at C, the lowest point of the path (see drawing). At C, On the other hand, the lifting height has disappeared and instead of it the mass has a velocity v. It is as though the lifting height could be converted entirely into velocity.

The exact relation would be expressed as mgh = ½ mv2, with g representing the acceleration of gravity. What is interesting here is that this relation is independent of both the length of the pendulum and the form of the

path through which the mass moves. The significance is that something remains constant throughout the process, and that something is energy. At A and at B it is an energy of position, or "potential" energy; at C it is an energy of motion, or "kinetic" energy. If this concept is correct, then the sum mgh + mv2 must have the same value for any position of the pendulum, if h is understood to represent the height above C, and v the velocity at that point in the pendulum's path. And such is found to be actually the case. The generalization of this principle gives us the law of the conservation of mechanical energy. But what happens when friction stops the pendulum?

This study, based on the assumption that heat is an indestructible substance which flows from a warmer to a colder object, seemed to give us a principle of the "conservation of heat". On the other hand, from time immemorial it has been known that heat could be produced by friction, as in the fire-making drills of the American Indians. The physicists were for long unable to account for this kind of heat "production". Their difficulties were overcome only when it was successfully established that, for any given amount of heat produced by friction, an exactly proportional amount of energy had to be expended. Thus did we arrive at a principle of the "equivalence of work and heat". With our Pendulum, for example, mechanical energy is gradually converted by friction into heat.



Drawing from Dr. Einstein's manuscript.

In such fashion the principles of the conservation of mechanical and thermal energies were merged into one. The physicists were thereupon persuaded that the conservation principle could be further extended to take in chemical and electromagnetic processes- in short, could be applied to all fields. It appeared that in our physical system there was a sum total of energies that

remained constant through all changes that might occur. Now for the principle of conservation of mass. Mass is defined as the resistance that a body opposes to its acceleration (inert mass). It is also measured by the weight of the body (heavy mass). That these two radically different definitions lead to the same value for the mass of a body is, in itself, an astonishing fact.

According to the principle – namely, that masses remain unchanged under any physical or chemical changes – the mass appeared to be the essential (because unvarying) quality of matter. Heating, melting, vaporization, or combining into chemical compounds would not change the total mass. Physicists accepted this principle up to a few decades ago. But it proved inadequate in the face of the special theory of relativity. It was therefore merged with the energy principle- just as, about 60 years before, the principle of the conservation of heat.

We might say that the principle of the conservation of energy, having previously swallowed up that of the conservation of heat, now proceeded to swallow that of the conservation of mass- and holds the field alone. It is customary to express the equivalence of mass and energy (though somewhat inexactly) by the formula = mc2, in which c represents the velocity of light, about 300,000 kilometres per second. E is the energy that is contained in a stationary body; m is its mass. The energy that belongs to the mass m is equal to this mass, multiplied by the square of the enormous speed of light- which is to say, a vast amount of energy for every unit of mass. But if very gram of material contains this tremendous energy, why did it so long go unnoticed? The answer is simple enough: so long as none of the energy is given off externally, it cannot be observed. It is as though a man who is fabulously rich should never spend or give away a cent; no one could tell how rich he was.

Now we can reverse the relation and say that an increase of E in the

amount of energy must be accompanied by an increase of E /(c2) in the mass. I can easily supply energy to the mass- for instance; I can heat it by 10 degrees. So why not measure the mass increases; or weight increase, connected with this change? The trouble here is that in the mass increase the enormous factor c2 occurs in the denominator of the fraction.

In such a case the increase is too small to be measured directly; even with the most sensitive balance. For a mass increase to be measurable, the change of energy per mass unit must be enormously large. We know of only one sphere in which such amounts of energy per mass unit are released: namely, radioactive disintegration. Schematically, the process goes like this: An atom of the mass M splits into two atoms of the mass M' and M'', which separate with tremendous kinetic energy. If we imagine these two masses are bought to rest that is, if we take this energy of motion from them –then, considered together, they are essentially poorer in energy than was the original atom. According to the equivalence principle, the mass sum M' + M'' of the disintegration products must also be somewhat smaller than the original mass M of the disintegration atom- in contradiction to the old principle of the conservation of mass. Pendulum

The relative different of the two is on the order of 0.1%. Now we cannot actually weight the atoms individually. However, there are indirect methods for measuring their weights exactly. We can likewise determine the kinetic the energies that are transferred to the disintegration product M' and M''. Thus it has become possible to test and confirm the formula. Also, the law permits us to calculate in advance, from precisely determined atom weights, just how much energy will be released with any atom disintegration we have in mind. The law says nothing, of course, as to whether – or how- the disintegration reaction can be brought about.

What takes place can be illustrated with the help of our rich man. The atom M is a rich miser who, during his life, gives away no money (energy). But in his will he bequeaths his fortune to his son's M and M on condition that they give to the community a small amount, less than one thousandth of the whole estate (energy or mass). The sons together have somewhat less than the father had (the mass sum M' + M'' is somewhat smaller than the mass M of the radioactive atom). But the part given to the community, though relatively small, is still so enormously large (considered as kinetic energy) that it brings with it a great threat of evil. Averting this threat has become the most urgent problem of our time.

Pooja K
II Year Student Teacher

DECARBONIZING ROAD TRANSPORT

Environment Conservation

Context: The air quality crisis in many Indian cities, exacerbated by transport and construction, demands urgent mitigation strategies, including decarbonizing road transport.

Decarbonizing Transport: Decarbonizing Transport refers to the process of reducing or Eliminating carbon dioxide (CO2) and other greenhouse gas Emissions from the transportation sector.

Examples: Promoting electric vehicles, using alternative Fuels, improving energy efficiency, and investing in public, Transport and active mobility.

Status of transport and emissions in India:

- Globally, the transport sector contributes around 25% of CO_2 emissions and 15% of Greenhouse Gas (GHG) emissions from fuel combustion
- The road freight sector is a major contributor to Emissions, consuming over one-fourth of Indian oil
- Imports and contributing to over 90% of road transport CO2 emissions.
- Key studies on Delhi's pollution, namely Urban
- Emission (2015) and TERI (2018), highlight a significant factor in urban smog are PM2.5 and PM10 particles. These tiny particles, majorly stemming from Vehicles and construction activities

Strategies for Decarbonizing transport

- To achieve decarburization in the transport sector, various strategies and technologies can be employed. Some potential approaches include:

- Electric Vehicles (EVs): Encouraging the adoption of electric vehicles is a key strategy to reduce emissions from road transport. This involves improving EV charging infrastructure, providing incentives for EV purchases, and promoting the development of more affordable and efficient EV models.

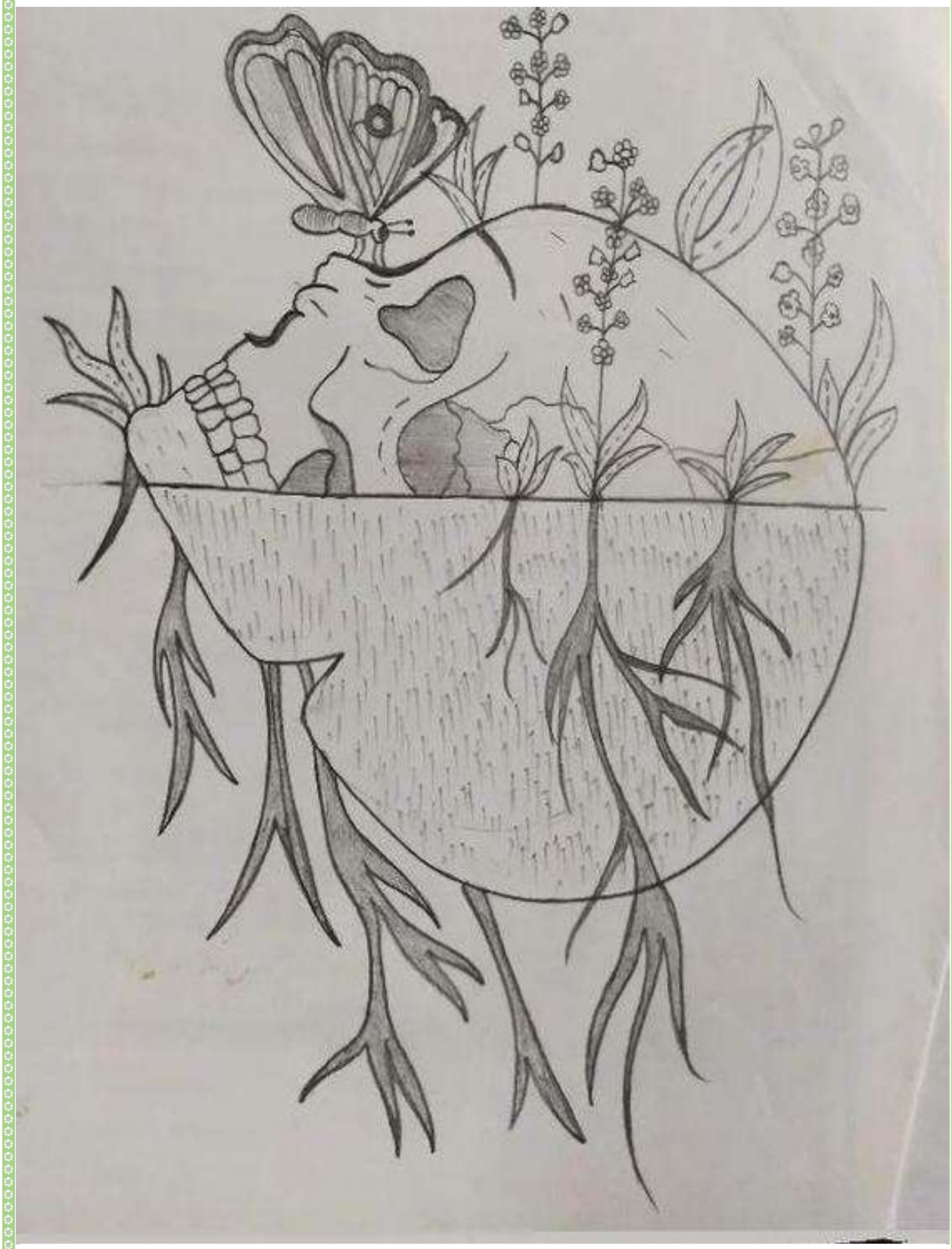
- Alternative Fuels: Expanding the use of alternative fuels, such as biofuels, hydrogen, and synthetic fuels, can help decarbonize various modes of transport, including aviation, shipping, and heavy-duty vehicles.
- Public Transport and Active Mobility: Investing in and promoting public transport systems and non-motorized modes of transport, such as walking and cycling, can help reduce the reliance on private cars and lower overall emissions.
- Energy Efficiency: Implementing measures to improve the energy efficiency of vehicles, including the adoption of lightweight materials, aerodynamics, and advanced propulsion systems, can contribute to emission reductions.
- Infrastructure Upgrades: Upgrading infrastructure to support sustainable transport, such as building dedicated cycling lanes, expanding public transport networks, and integrating smart transportation systems, can lead to more efficient and eco-friendly mobility.
- Regulations and Incentives: Implementing regulations and providing financial incentives to encourage the purchase of low-emission vehicles, reward energy-efficient transportation practices, and penalize high-emission practices can drive behavior change.
- Renewable Energy: Integrating renewable energy sources, such as solar and wind, into transportation infrastructure and operations can further reduce the carbon footprint of the transport sector.
- International Collaboration: Collaborating with other countries and international organizations on research, development, and implementation of decarbonization technologies and policies can lead to more effective global solutions.

Government initiatives to decarbonize transport

- India's Long-Term Low-Carbon Development Strategy includes improved fuel efficiency, a phased transition to cleaner fuels, the modal shift towards public and less polluting modes of transport, electrification across multiple modes, demand-side management, traffic management, and intelligent transport systems.
- Some initiatives by the government are:
- Bharat Stage VI Emission Standards
- Forum for Decarbonizing Transport in India by NITI Aayog
- FAME India (part of the National Electric Mobility Mission Plan)
- Vehicle scrappage policy
- Comprehensive package for electric vehicles
- Making Indian Railways net-zero by 2030
- Mission Life 2022–23 to nudge individuals, communities, and institutions to practice environmentally friendly actions such as the use of public transport, ride-sharing and use of bicycles, electric vehicles and vehicles running on clean fuels.

However, solely emphasizing the electrification of road transport will fall short of achieving effective decarburization in the transportation sector. To address this challenge comprehensively, a holistic approach is required that not only promotes efficient, less carbon-intensive modes of transportation but encompasses addressing grid emission factors, investing in alternative fuel generation, and eliminating fossil-fuel subsidies, all of which are crucial steps toward advancing the energy transition and achieving DEecarbonization within the transport sector in India.

Archana P N
II Year Student Teacher



Archana P N
II Year Student Teacher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ಸ್ವಾಮಿ ವಿವೇಕಾನಂದ ವಿದ್ಯಾಸಂಸ್ಥೆ (ರಿ)

ಕುಮದ್ವತಿ ಶಿಕ್ಷಣ ಮಹಾವಿದ್ಯಾಲಯ

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