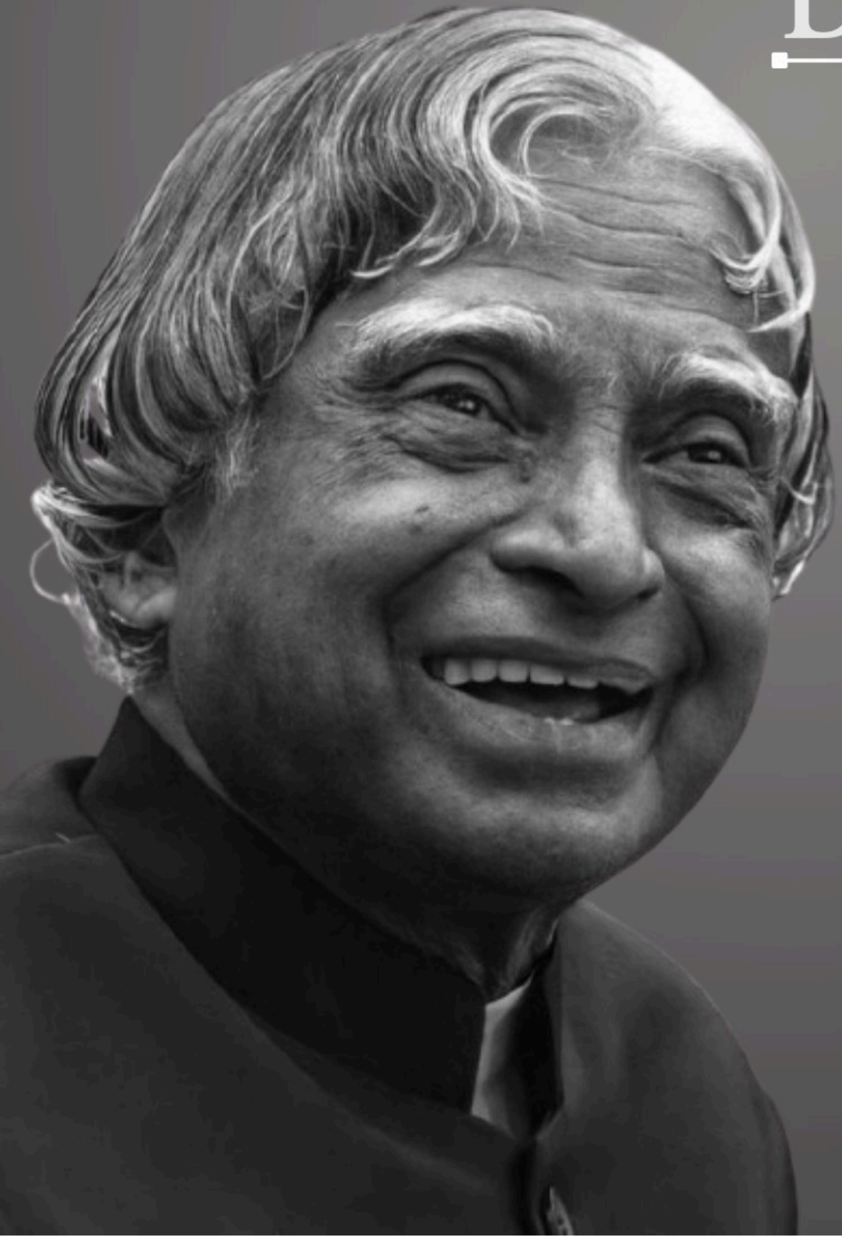
THE PARTICLE POST

THE REPUBLIC DAY SPECIAL



A. P. J. ABDUL KALAM

Lesser Known Gems
Satyendra Nath Bose

Quantum Queens
Donna Strickland

EDITION 2:1

QUANTUM QUORUM

"Give up your head, but forsake not those whom you have undertaken to protect. Sacrifice your life, but relinquish not your faith"

S. Amarjeet Singh
(Chairman,GTBIT)

We would like to express our sincere thanks to our respected Chairman **S.Amarjeet Singh** for his continuous support in all our endeavors.

S. Harjeet Singh
(Manager,GTBIT)

We are deeply grateful to **S.Harjeet Singh** for his unwavering support throughout our journey, which has been vital to our growth and achievements.

Prof. Rominder Kaur Randhawa
(Director,GTBIT)

Thank you to our honorable director, **Prof. Rominder Kaur Randhawa**, for encouraging us to start our society and explore the world of physics.

Prof. Simmi Singh
(Professor
Head, Exam cell)

We also want to express our sincere gratitude to **Prof. Simmi Singh** for continuously lighting our pathway with her valuable advice.

DR. Parsan Kaur
(Associate Professor
HoD, Applied Sciences Deptt.)

We want to thank **DR. Parsan Kaur** for their ongoing support and motivation, which helps us to achieve our goals.

DR. Daljeet Kaur
(Associate Professor,
Convener)

We would like to acknowledge the invaluable effort put forth by **DR. Daljeet Kaur** for guiding us and providing essential ground-level support.

LESSER KNOWN GEMS

Satyendra Nath Bose

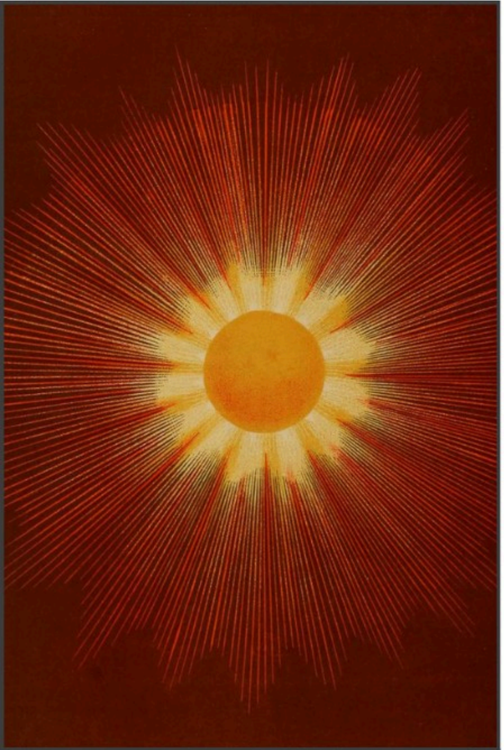
Satyendra Nath Bose (1894–1974) was a renowned Indian physicist and mathematician whose work with Albert Einstein led to **Bose-Einstein statistics** and the prediction of **Bose-Einstein condensation**, a revolutionary state of matter.

Bose was a brilliant student at Calcutta University but faced early job rejections for being overqualified. In 1916, he joined the Physics Department at Calcutta University as a lecturer, where he collaborated with Meghnad Saha. Despite limited resources, they made significant contributions to modern physics, including translating Einstein's works on relativity into English.

While Saha worked on thermodynamics, Bose focused on electromagnetism and relativity, developing the foundations for Bose statistics. In 1921, Bose moved to Dhaka University, seeking better opportunities.

In 1924, Bose sent Einstein a groundbreaking paper addressing flaws in quantum theory. Einstein recognized its significance, expanding on it to develop the Bose-Einstein statistics, which distinguish particles called bosons from fermions. Bose's revolutionary idea that particles with integer spins (bosons) are indistinguishable formed the basis for quantum statistics. Einstein extended this work to predict Bose-Einstein condensation, a state where particles occupy the same quantum state at extremely low temperatures. This theory was experimentally confirmed in 1995, earning researchers the Nobel Prize.

Bose's work introduced the concept of bosons, which follow Bose-Einstein statistics, differing fundamentally from fermions governed by Fermi-Dirac statistics. This distinction has become crucial in quantum mechanics and particle physics.



DR. PHOTON’S CORNER

Millions of kilometers away, in the depths of scorching Sun, an unprecedented event took place.The sun experiences a unique phenomenon of nuclear fusion to exhibit heat and light.

At the very heart of sun two hydrogen nuclei—Phobelues and Tonenolis—tired of being separate, collided with a loud BAM! and fused into a helium nucleus. The impact of this collision was so intense that it released a photon: minute and adorable harbouring boundless energy.
As the photon gained consciousness , he was pondering where he was. He wiggled here and there, exploring the intense core of the Sun. As he wiggled further, he noticed a spot that wasn’t as bright as the rest. Curious, he begun his venture towards it, and suddenly—BOOM!—the Sun’s plasma waves blasted him into the space. Thus began his chaotic yet marvelous journey. "Just keep swimming, just keep swimming," he constantly reminded himself as he navigated towards the unknown.

It was a wild ride from the Sun towards our solar system, darting through different regions of space. Finally, after escaping the Sun's gravitational force, he spotted a blue dot in the darkness. Intrigued, he set his sight on it, accelerating to an incredible 300,000 kilometers per second as he paced through the cosmos, eager to explore the universe.

First stop: Mercury!

STUDENT'S SPACE

Arnuv Saxena
IT 1

Understanding Paraparticles: A Simple Overview

Paraparticles are a fascinating concept in theoretical physics, especially in quantum mechanics and quantum field theory. Unlike regular particles, paraparticles follow unique statistics, blending properties of fermions and bosons. Fermions (like electrons) obey Fermi-Dirac statistics and the Pauli exclusion principle, while bosons (like photons) follow Bose-Einstein statistics, allowing them to share quantum states. Paraparticles exhibit a mix of these behaviors, adhering to generalized symmetry groups.

Theoretical models such as topological quantum field theory and fractional statistics explore paraparticles to explain phenomena that conventional particle physics cannot, like the quantum Hall effects and high-temperature superconductivity. These models aim to understand new particle behaviors and properties.

Although paraparticles haven't been directly observed, studying them helps physicists push the boundaries of our understanding of the universe. Advancements in technology and experimental methods may one day allow us to detect these unusual particles.

In conclusion, paraparticles challenge traditional particle concepts and offer exciting possibilities for understanding matter at the smallest scales. Their theoretical potential to reveal hidden aspects of the quantum world makes them a compelling subject for future research.

CONVENER'S COLUMN

DR. Daljeet Kaur

The Power of Synergy:

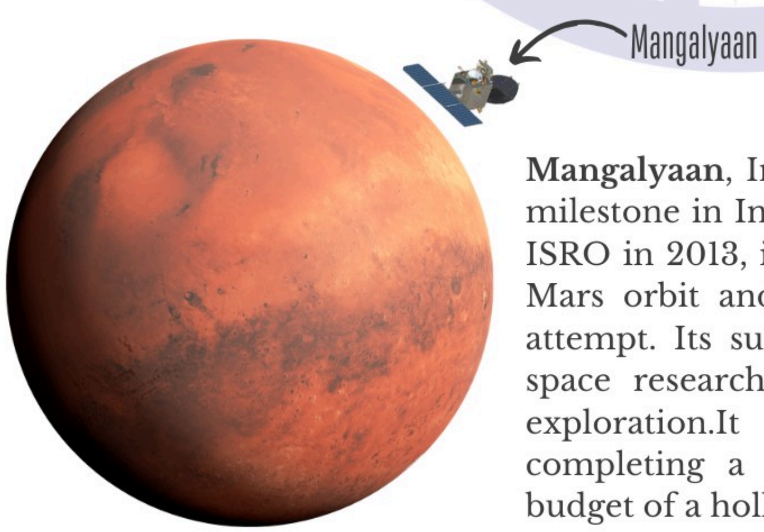
How Physics and Machine Learning are Shaping the Future

Physics and machine learning are coming together in exciting ways, each helping the other push boundaries. While physics reveals the fundamental laws that govern the universe, machine learning brings those laws to life by making sense of vast amounts of data, optimizing processes, and predicting outcomes. This partnership is making a big impact in fields like quantum computing, space exploration, and even climate modeling, where traditional methods can fall short. On the flip side, the principles of physics are inspiring new approaches in machine learning, opening up possibilities for solving some of the world's most complex challenges. Together, they're unlocking new frontiers, making science smarter and more powerful than ever before.

INDIA IN A KALEIDOSCOPE

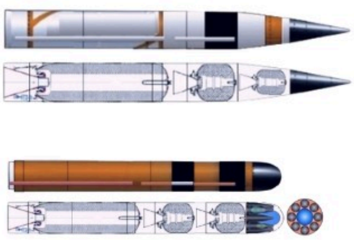
Aditya-L1 is India's first mission to study the Sun, launched by ISRO in 2023. It aims to explore solar phenomena and understand their impact on Earth's climate and space weather. Unlike other countries, India's mission is cost-effective and unique in its focus on solar observation from a stable L1 orbit.

Chandrayaan-1 (2008) laid the groundwork by discovering water molecules on the Moon. **Chandrayaan-2** (2019) advanced our capabilities even further, and although its lander faced challenges, the orbiter continues to provide valuable insights about the lunar surface. However, it was **Chandrayaan-3 (2023)** that truly marked a turning point. With its successful soft landing near the Moon's south pole, it showcased India's engineering expertise and placed us among the elite nations capable of lunar landings. This mission signifies more than just technological progress; it reflects the resilience, precision, and ambition of the Indian scientific community.



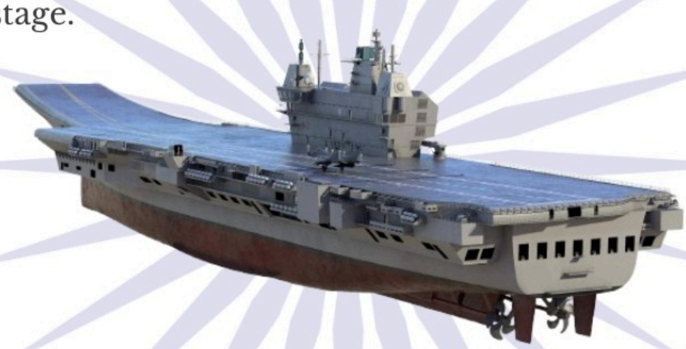
Mangalyaan, India's Mars Orbiter Mission, marked a major milestone in India's space exploration journey. Launched by ISRO in 2013, it made India the first Asian country to reach Mars orbit and the first globally to do so on its maiden attempt. Its success has boosted India's global standing in space research and inspired future innovations in space exploration.It showcased India's cost effectiveness by completing a space exploration program in less than a budget of a holly wood movie.

ROCKETING AHEAD: INDIA’S SPACE AND TECH MARVELS



AGNI-5 is an advanced intercontinental ballistic missile (ICBM) developed by India. With a range of over 5,000 km .AGNI-5 is unique because it’s India's first fully indigenous ICBM capable of striking targets over 5,000 km away. It showcases India’s growing technological and defense capabilities, making it a symbol of national pride. Its success boosts India’s global stature in defense innovation.

BrahMos is a supersonic cruise missile developed jointly by India and Russia. It can be launched from land, sea, and air, with speeds of Mach 2.8. BrahMos stands out for its speed, precision, and versatility, being the world’s fastest cruise missile. The collaboration between India and Russia makes it a unique symbol of India's technological expertise. As a powerful deterrent, it reflects India’s pride in self-reliance and its defense capabilities on the global stage.



INS Vikrant is India’s first indigenously built aircraft carrier, symbolizing India’s growing defense capabilities and technological prowess. Its importance lies in enhancing India’s naval power, allowing the country to project military strength in the Indian Ocean region. The ship can carry various aircraft, providing air superiority in naval warfare. INS Vikrant not only strengthens India’s defense but also represents the nation's self-reliance in defense technology, making it a significant asset for national security.

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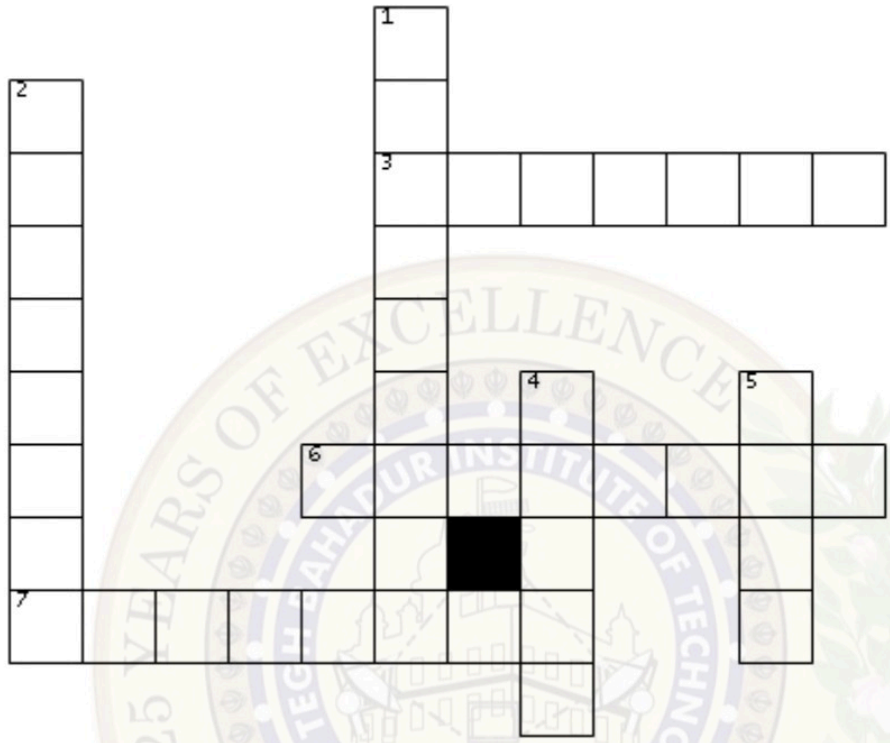
LAB LAUGH LOGIC

CROSSWORD



DOWN

1. - The distance light travels in a year
2. - Force divided by area
4. - A form of energy produced by vibrating objects, transmitted as waves
5. - The smallest unit of an element

ACROSS

3. - The fundamental force responsible for attraction between masses
6. - The speed of an object in a specific direction
7. - A subatomic particle with a negative charge

SUDUKO

				6	8			1
4			7			5		
	1	3		9	4		2	7
	7		1	5		8		
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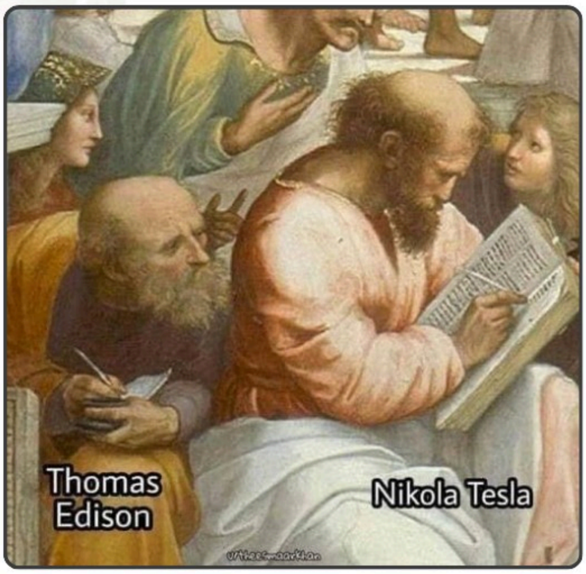
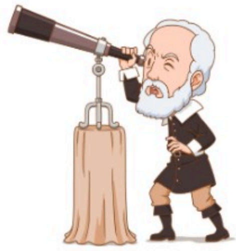


WHO OWNS THE MOON ??

USE THE DETAILS GIVEN TO FILL THE GRID CORRECTLY!!!



Color: Blue, Green, Purple, Red, Yellow
Name: Albert Einstein, Isaac Newton, Marie Curie, Niels Bohr, Richard Feynman
Favorite Discovery: Calculus, Copenhagen Interpretation, Photoelectric Effect, Radiation, Relativity
Experiment/Tool: Feynman Diagrams, Pendulum, Radiation Experiments, Relativity, Spectroscopy
Subject: Astrophysics, Classical Mechanics, Quantum Mechanics, Quantum Theory, Thermodynamics
Dream Vacation: Antarctica, Cambridge, Canada, Moon, Amazon Rainforest

ATTRIBUTES	GRID 1	GRID 2	GRID 3	GRID 4	GRID 5
NAME					
COLOR					
DISCOVERY					
EXPERIMENT					
SUBJECT					
VACATION					

HINTS

1.Albert loves relativity.
2.The scientist who admires spectroscopy loves green.
3.Marie is fascinated by radiation experiments.
4. Issac is immediately to the left of Niels.
5.Richard sits in the first seat on the left .
6.The Scientist in the first seat on the right enjoys quantum mechanics.
7.The scientist who discovered the photoelectric effect dreams of visiting america.
8.The scientist who likes red studies classical mechanics.
9.The person in the middle seat dreams of visiting the moon.
10. The Scientist who discovered who loves coppenhegan interpretation sits next to the one who dreams of visiting Norway.
11. The Scientist who enjoys purple sits in the middle and prefers astrophysics.
12.The one who likes blue sits next to the person who dreams of going to Switzerland.
13.Niels dreams of exploring the Amazon Rainforest.
14.The one who loves yellow sit next to the person who uses Feynman diagrams.
15.The scientist who works with calculus dreams of visiting Cambridge.
16. The scientist who studies thermodynamics owns a pendulum.
17.The person sitting to right of the scientists who likes quantum theory prefers skiing.
18.The one who enjoys green sits next to the person who likes spectroscopy.

QUANTUM QUEENS

DONNA STRICKLAND

Donna Theo Strickland (born May 27, 1959) is a Canadian optical physicist renowned for her pioneering work in pulsed lasers. She was awarded the Nobel Prize in Physics in 2018, alongside Gérard Mourou, for the practical implementation of chirped pulse amplification (CPA)1. This groundbreaking technique allows for the creation of ultra-short, high-intensity laser pulses, which have revolutionized fields such as medicine, industry, and scientific research.

Strickland's journey began in Guelph, Ontario, where she developed an early interest in lasers and electro-optics. She pursued her passion at McMaster University, earning a Bachelor of Engineering degree in engineering physics in 1981. She then moved to the University of Rochester for her graduate studies, where she completed her Ph.D. under the supervision of Gérard Mourou in 1989.

After her doctoral studies, Strickland held research positions at the National Research Council of Canada and Lawrence Livermore National Laboratory. Since 1997, she has been a professor at the University of Waterloo, where she continues to inspire and mentor future generations of physicists1.

Strickland's contributions to the field of optics have been widely recognized, and she has served as a fellow, vice president, and president of Optica (formerly OSA). In 2018, she was listed as one of BBC's 100 Women, highlighting her influence and achievements

1985
Co-invented Chirped Pulse Amplification (CPA) with Gérard Mourou

1998
Awarded the Alfred P. Sloan Research Fellowship

1999
Received the Premier's Research Excellence Award

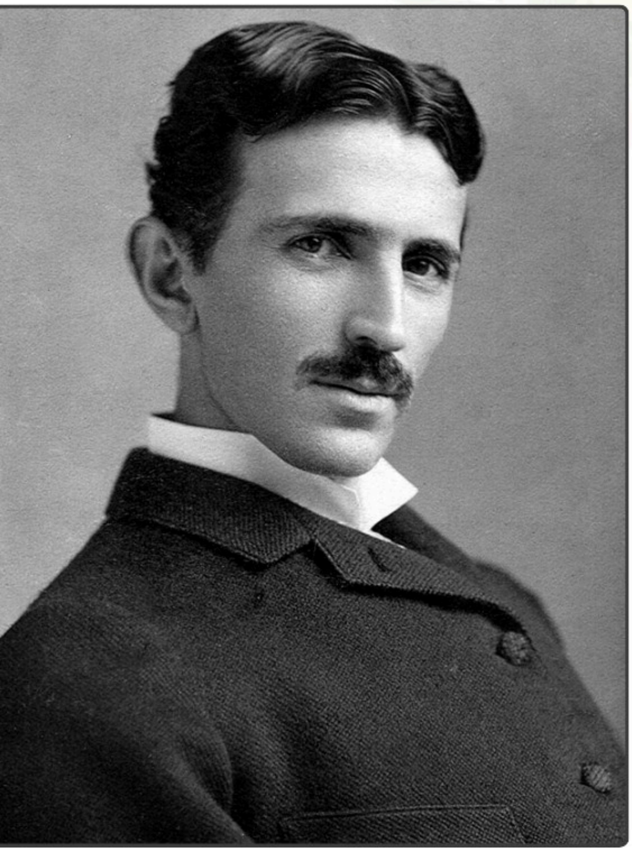
2000
Honored with the Cottrell Scholars Award from Research Corporation

2018
Awarded the Nobel Prize in Physics for CPA

2022
Awarded Joseph Carrier C.S.C. Science Medal from the University of Notre Dame.

MYTHBUSTER: PHYSICS EDITION

Benjamin Franklin's kite experiment is often misrepresented as a daring act where lightning struck the kite and traveled down the string, proving that lightning is electricity. This dramatic version of the story is a myth. If lightning had struck the kite, Franklin would almost certainly have been killed due to the immense power of a lightning bolt. What actually happened was far less perilous but no less groundbreaking. In 1752, Franklin flew a silk kite with a metal key attached to the string during a thunderstorm. The string, damp from the rain, conducted electrical charges from the storm clouds. Franklin observed that the key became electrically charged and produced sparks when he moved his knuckle close to it. This demonstrated that storm clouds carry an electrical charge and that lightning is indeed a large-scale electrical discharge.



Franklin's experiment was part of the broader 18th-century exploration of electricity, which had intrigued scientists like William Gilbert, who studied static electricity in the late 1500s, and Stephen Gray, who explored electrical conduction in the 1720s. Later, Michael Faraday's work on electromagnetic induction in 1831 led to practical applications like the electric generator.

By the late 19th century, pioneers like Thomas Edison and Nikola Tesla transformed electricity into a commercial powerhouse, enabling innovations like electric lighting, power grids, and motors. Franklin's discovery marked the beginning of humanity's electrified era.

Meet Our Team

Vishal Verma
CSE-AIML
President

Sukhmeet Kaur
CSE-DS
Vice President

Harshal Chauhan
CSE-DS
General Secretary

Paridhi Pandey
CSE-DS
Chief Co-ordinator

Dikshant Tayal
IT-3
Content Team Head

Abhinoor Singh
CSE-DS
Graphic Design Head

Harmanjeet Singh
CSE-AIML
Project Team Head

Lavanya Bedhara
CSE-DS
Social Media Head

Archita Garg
CSE-DS
Management Lead

Vanshika Bansal
CSE-DS
Outreach Team Head

Team Members

- Sidak Singh Suri (Co-Head Content Team)
- Ashish Jakhmola (Co-Head Design Team)
- Abu Bakar (Co-Head Project Team)
- Satyam Singh Negi (Member Design Team)
- Karanbeer Singh (Member Social Team)
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- Manan Makhija (Member Project Team)
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- Jaskaran Singh (Member Management Team)
- Kinshunk Garg (Member Management Team)
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