

DEC 2021

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DEPARTMENTAL E-MAGAZINE



DEPARTMENT OF PHYSICS, SURENDRANATH COLLEGE



DR INDRANIL KAR
PRINCIPAL
SURENDRANATH COLLEGE

It gives me immense pleasure to share my views on this e-magazine by Dept. of Physics. I extend my best wishes to the students who contributed in this issue through their writings and beautiful paintings. I also congratulate the department for their endeavor and wish the magazine an immense success.

MESSAGES FROM PRINCIPAL & IQAC DESK

I am glad to know that Department of Physics, Surendranath College is going to publish the first issue of their e-magazine. I heartily congratulate all the faculty members and students of the department for their contributions and sincere efforts and extend my best wishes to all of them. Hope all the readers will enjoy going through this volume. Happy reading to all!



DR SUCHANDRA CHATTERJEE
IQAC COORDINATOR
SURENDRANATH COLLEGE

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ON THE COVER

Front cover by Poushali Mallick (ex-student),
Department of Physics and back cover by Eram
Tanwir, Physics Hons. Sem 5 student.

EDITOR-IN-CHIEF



**ARITRA
GHOSH**

ABOUT

Aritra Ghosh is an alumnus of Surendranath College, Kolkata. A former student of the physics department, he is currently a Prime Minister's Research Fellow at the Indian Institute of Technology Bhubaneswar, India. His research interests lie within theoretical and mathematical physics.

MESSAGE FROM THE EDITOR

I am very glad to have been offered editorial responsibilities for the first issue of the departmental e-magazine. Many thanks to the principal of the college and the physics department for providing the necessary support.

This magazine is based on contributions received from undergraduate students of the department and the editorial board wholeheartedly appreciates their active participation. I hope that the readers shall take great pleasure in going through this magazine.

ASSOCIATE EDITORS



**DR PRASANNA
KUMAR MONDAL**

Dr Mondal is an Assistant Professor in the Physics Department of Surendranath College, Kolkata since 2017. He has obtained his PhD degree from the University of Calcutta. His research interests lie in experimental condensed matter physics. He has published more than 25 research papers in various international peer-reviewed journals.

Dr Mitra is an Assistant Professor in the Physics Department of Surendranath College, Kolkata since 2017. He has obtained his PhD degree from the Harish-Chandra Research Institute in 2013. His area of research includes cosmological reionization, galaxy formation and dark matter having published more than 20 papers in these areas in international journals. He was awarded Young Astronomer of the Year 2013 Award by the Astronomical Society of India and the INSPIRE Faculty Award by Department of Science & Technology (DST), Government of India in 2017.

DR SOURAV MITRA



MEET OUR STUDENT COORDINATORS



**POUSHALI
MALICK**

Poushali Mallick is an ex-student of the department. She is a really talented painter. She completed her BSc (H) in physics in 2021.



**ERAM
TANWIR**

Miss Eram Tanwir is currently a final year student of the department. She is particularly fond of photography and sketching.



**SONALI
SINGH**

Sonali Singh is a second year student of the department. An avid reader, she takes interest in debates and extempore competitions.

ABOUT THE COLLEGE & THE DEPARTMENT



Surendranath College is an undergraduate college located in Kolkata. The College is affiliated under University of Calcutta since 1884. Surendranath Banerjea, an eminent scholar, orator and statesman, founded the College in 1884.

Surendranath College had a noble vision of enhancing the spirit of freedom sacrifice and gallant idealism among the youth of the country. The college aims at providing quality education to students of all sections of the society irrespective of gender, academic and socio-economic background and to prepare them to face the challenges in all circumference of life with courage and conviction.

In the year 1882, *Rashtraguru* Surendranath Banerjea took over the charge of Presidency School. In January 1884, the institution was renamed as 'Presidency Institution' and was affiliated to the intermediate standard of University of Calcutta. In the same year the name of the institution changed to 'Ripon College' with the permission from Lord Ripon and it became a full-fledged degree college under the University of Calcutta.

The Law Department was added in 1885 (later converted into a separate College in 1911 named as Ripon Law College), the Department of Commerce in 1940 (converted into a separate Degree College in 1961), a branch College at Dinajpur (now a separate College in Bangladesh) in 1942, the Evening science Section in 1947 (now a part of Surendranath Evening College) and the Women's section in 1948.

OUR HISTORY


In 1948-49 the Trustees renamed the college as Surendranath College in homage to the Founder of the institution and author of 'A Nation in making'. In accordance with the instruction of U.G.C., the State Government and the Calcutta University, all the day Sections of the institution have been incorporated in Surendranath College.

The Department of Physics in this prestigious college started functioning before the independence. Currently the department has 8 full-time faculty members and is equipped with one ICT enabled gallery, 4 Hons. Physics laboratory, one general laboratory and one computer lab with more than 20 computers. The department also has its own library with plenty of books and journals for students to read and borrow.

PHOTO GALLERY OF PHYSICS DEPARTMENT



DEPARTMENTAL ACTIVITIES (2020-21)






DEPARTMENT OF PHYSICS
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STUDENT'S SEMINAR ON:

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INTERNATIONAL ONLINE FACULTY ENRICHMENT

Tips & Tricks for Publishing in International Scientific Journals



SPEAKER:

Dr. Anand Chakraborty
Associate Publishing Editor
Springer-Verlag, Heidelberg
Germany



DATE:
18-06-2015

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Anand Chakraborty is Associate Publishing Editor at Springer-Verlag, Heidelberg, Germany.

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 <p style="text-align: center;">JULY 3</p> <p style="text-align: center;">'Why is COVID-19 so different and dangerous?'</p> <p style="text-align: center;">MEGHNI MUKHERJEE</p> <p style="text-align: center;">Post-doctoral Fellow Jaya Prakash Institute Bhopal, Madhya Pradesh, INDIA</p>	 <p style="text-align: center;">JULY 4</p> <p style="text-align: center;">'Latest Update of COVID-19 Vaccines: The Heterogeneity of Elderly People'</p> <p style="text-align: center;">MS. SUJANA DAS</p> <p style="text-align: center;">PhD Scholar Department of Immunology, Pathology and Infectious Diseases University of Hyderabad Medical Hyderabad, INDIA</p>
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SAYAN DOLAI

PHYSICS HONS., 3RD SEM



Photo Credit: Wikipedia

K SIVAN

THE ROCKET MAN OF INDIA

SONALI SINGH
PHYSICS HONS., 3RD SEM

Nicknamed the **rocket man of India** for developing cryogenic machines for India's Space, K Sivan (born 14 April 1957) is an Indian space scientist who is the current Secretary (Space) and ex-officio chairman of Indian Space Research Organisation (ISRO) and Space Commission. He has previously served as the director of the Vikram Sarabhai Space Centre and the Liquid Propulsion Systems Centre.

Sivan was born in Mela Sarakkalvilai near Nagercoil in Kanyakumari district of Tamil Nadu state of India. His parents are Kailasa Vadivu, a mango farmer and mother named Chellam, a homemaker.

Despite the poor teaching at the college, Sivan studied hard, got top marks and even aced in Mathematics where he got a perfect 100. Later Sivan graduated with a bachelor's degree in engineering from Madras Institute of Technology in 1980. He then got a master's degree in aerospace engineering from Indian Institute of Science, Bangalore in 1982. He also did PhD in Aerospace at IIT, Bombay in 2007.

Dr K Sivan joined ISRO in 1982 and was inducted into PSLV Projects. He has significantly contributed towards end-to-end mission planning, design, integration and analysis.

Sivan says one of the biggest lessons that life has taught him is, as he puts it, "Whenever something is denied to you, something bigger is waiting for you."

For Sivan, adversity has been a constant companion, he has only learnt to turn it into an opportunity. Coming from a family that earned their living as marginal farmers, Sivan faced many hardships early in his life. His father was able to send him to high school with great difficulty. "Wearing chappals", he recalls, "was a luxury for us – we walked barefoot to school and wore dhotis instead of pants."

He studied in a Tamil medium Govt. school in Mela Sarakkalvilai Village and later in Kanyakumari district. He is the first graduate from his family. He did Bsc Mathematics from the Madurai University, 1977.

His innovative contributions, particularly the strategies adopted in mission design enabled the consistent performance of PSLV. This has also proved to be a good foundation for other launch vehicles of ISRO, like GSLV MkII and MkIII including RLV-TD. He is the chief architect of 6D trajectory simulation software, SITARA, which is the backbone of the real-time and non-real-time trajectory simulations of all ISRO launch vehicles.

He was responsible for commissioning world-class simulation facility in ISRO for mission synthesis and analysis, which is used for mission design, sub-system level validation and integrated validation of avionics systems in all ISRO launch vehicles. He developed and implemented an innovative 'day-of launch wind biasing strategy' that enables rocket launch on any day, under varied weather and wind conditions. He was the chief mission architect for successful launch of 104 satellites in a single mission of PSLV. Dr. APJ Abdul Kalam also recognised him after they had met once and said in his characteristic manner: "You are the trajectory guy".

The Geosynchronous Satellite Launch Vehicle (GSLV) Mark III - India's most powerful rocket that successfully launched the Chandrayaan-2 mission which ran on cryogenic engines. Under his chairmanship ISRO launched the second mission to the moon on July 22, 2019, Vikram rover crashed, but the orbiter is fine and orbiting the moon. The ISRO chief broke down and wiped his tears on Prime Minister Narendra Modi's shoulder, after the space agency lost contact with the Vikram lander of Chandrayaan 2 minutes before it was expected to make a soft landing. Prime Minister Narendra Modi consoled K Sivan as he got emotional and said that India is with you and the best is yet to come.

Today as ISRO's chairman, Sivan presides over some of the most ambitious projects the organisation has ever conceived. These include the forthcoming manned space flight apart from exploratory missions to the moon, Venus and even the sun. Importantly, the Union Government has recently announced major reforms in the space sector by opening it out to massive private participation. Sivan has been tasked with ensuring that the new policy is a success so that Indian space can grow manifold and achieve its fullest potential.

Sivan believes in teamwork and prefers a management style of motivating others to get the best out of them. Citing the GSLV example which carried out its first successful flight after suffering five successive failures he tells them: "Whatever the task you have been entrusted with, ensure that you excel in it. Don't keep aspiring for other things before doing the best you can with the task at hand." And he sure practices what he preaches.

“Whatever I felt was momentary. That setback gave me more energy to aggressively find out what went wrong and correct it.”

Photo Credit: The Indian Express





SCHOLARLY APTITUDE OF ANCIENT INDIANS

LONG BEFORE WESTERN CIVILIZATION

AYAN ROY

PHYSICS HONS., 3RD SEM

13

ARTICLE

India has always been a treasure trove of knowledge. Our country's illustrious past in the fields of science, medicine, architecture, literature and many other areas of study has been forgotten, hidden or lost due to innumerable invasions. I would like to mention a list of 9 contributions, made by ancient Indians.

1. THE IDEA OF ZERO

Zero was fully developed in India around fifth century AD. First place to see the ideally zero beginning to be born is from "Bakhshali" manuscript dating back to the third or fourth century. Later Zero became an important part of the number system in India. Even in the past mathematical equations were chanted in poetry. Words meaning void, sky, space represent nothingness or zero. **Pingala** an Indian Vedic scholar, in his book 'Chandahśāstra', which is the earliest known Sanskrit treatise on prosody (the study of poetic metres and verse) used binary numbers and he was the first who use 'shunya' for zero as a Sanskrit word. **Brahmagupta** a scholar and mathematician in AD 628 first time defined zero and its operation and developed a symbol for it which is a dot underneath the numbers. He had also written rules for mathematical operations like addition and subtraction using zero. Then, **Aryabhatta** a great mathematician and an astronomer used zero in the decimal system.

2. ANCIENT SURGERIES

Written by **Sushruta** in 6th Century BC, "**Sushruta Samhita**" is considered to be one of the most comprehensive textbooks on ancient surgery. The text mentions various illnesses, plants, preparations and cures along with complex techniques of plastic surgery. The Sushruta Samhita's most well-known contribution to plastic surgery is the reconstruction of the nose, known also as rhinoplasty. Also the first cataract surgery is said to have been performed by the ancient Indian physician Sushruta, way back in 6th century BCE. To remove the cataract from the eyes, he used a curved needle, "**Jabamukhi Salaka**", to loosen the lens and push the cataract out of the field of vision. The eye would then be bandaged for a few days till it healed completely. Sushruta's surgical works were later translated to Arabic language and through the Arabs, his works were introduced to the West.



Statue of Aryabhata at the IUCAA, Pune
Photo Credit: Wikipedia



Statue of Sushruta at Haridwar

Photo Credit: Wikipedia

3. CHAKRAVALA METHOD

The Chakravala method is a cyclic algorithm to solve indeterminate quadratic equations, including the Pell's equation. This method for obtaining integer solutions was developed by **Brahmagupta**, one of the well-known mathematicians of the 7th century CE. Another mathematician, **Jayadeva** later generalized this method for a wider range of equations, which was further refined by **Bhāskara II** in his "Bijaganita" treatise.

4. THEORY OF ATOMS

One of the notable scientists of the ancient India was **Kanad** who is said to have devised the atomic theory centuries before John Dalton was born. He speculated the existence of "anu" or a small indestructible particle, much like an atom. He also stated that "anu" can have two states - absolute rest and a state of motion. He further held that atoms of same substance combined with each other in a specific and synchronized manner to produce "dvyanuka" (diatomic molecules) and "tryanuka" (triatomic molecules).

5. HELIOCENTRIC THEORY

Aryabhatta (476–550 CE) in his book "**Ariabhatiyam**" (499 CE) correctly propounded that the Earth is round, rotates on its own axis and revolves around the Sun i.e the heliocentric theory. He also made predictions about the solar and lunar eclipses, duration of the day as well as the distance between the Earth and the Moon.

6. WOOTZ STEEL

A pioneering steel alloy matrix developed in India, Wootz steel is a crucible steel characterized by a pattern of bands that was known in the ancient world by many different names such as "Ukku", "Hindwani" and Seric Iron. This steel was used to make the famed Damascus swords of yore that could cleave a free-falling silk scarf or a block of wood with the same ease. Produced by the Tamils of the "**Chera**" **Dynasty**, the finest steel of the ancient world was made by heating black magnetite ore in the presence of carbon in a sealed clay crucible kept inside a charcoal furnace.

Did you know that in his book **Ariabhatiyam**, **Aryabhatta** estimated the value of pi (π) to be 3.1416 which is accurate to three decimal places!

7. SMELTING OF ZINC

India was the first to smelt zinc by the distillation process, an advanced technique derived from a long experience of ancient alchemy. The ancient Persians had also attempted to reduce zinc oxide in an open furnace but had failed. **Zawar** in the **Tiri valley** of Rajasthan is the world's first known ancient zinc smelting site. The distillation technique of zinc production goes back to the **12th Century AD** and is an important contribution of India to the world of science.

8. FIBONACCI NUMBERS

The Fibonacci numbers and their sequence first appear in Indian mathematics as “**mātrāmeru**”, mentioned by **Pingala** in connection with the Sanskrit tradition of prosody. Later on, the methods for the formation of these numbers were given by mathematicians **Virahanka**, **Gopala** and **Hemachandra**, much before the Italian mathematician Fibonacci introduced the fascinating sequence to Western European mathematics.



9. AYURVEDA

Long before the birth of Hippocrates, **Charaka** authored a foundational text, “**Charakasamhita**”, on the ancient science of Ayurveda. Referred to as the Father of Indian Medicine, Charaka was the first physician to present the concept of digestion, metabolism and immunity in his book. Charaka's ancient manual on preventive medicine remained a standard work on the subject for two millennia and was translated into many foreign languages, including Arabic and Latin.

Ancient India was a land of sages and seers as well as a land of scholars and scientists. Research has shown that from making the best steel in the world to teaching the world to count, India was actively contributing to the various fields of science centuries long before modern laboratories were set up. Many theories and techniques discovered by the ancient Indians have created and strengthened the fundamentals of modern science and technology. While some of these ground-breaking contributions have been acknowledged, some are still unknown to most.

MATH PUZZLES & RIDDLES

RIZU KANKON DAS

PHYSICS HONS., 3RD SEM

Problem 1

When the units and tens digits of a certain two-digit number are reversed, the sum of the two numbers is 121 and the difference is 9. What is the tens digit of the original number?

Problem 2

Can you plug in either addition (+), subtraction (-), multiplication (x), division (/) and parenthesis among five numbers of 7 to make a target result number 50?

Problem 3

One brother says of his younger brother: "Two years ago, I was three times as old as my brother was. In three years time, I will be twice as old as my brother." How old are they each now?

Problem 4

Using only addition, add eight 8s to get the number 1,000.

Problem 5

A man is paid Rs. 240 plus one coat for one year service. However he left after 9 months and receives Rs. 150 and a coat. Then find the price of the coat.

Problem 6

When a student weighing 54 kg left a class, the average weight of the remaining 59 students increased by 100g. What is the average weight of the remaining 59 students?

Problem 7

I have a half-cup of tea and a half-cup of coffee. I take one teaspoon of tea and mix it with my coffee, then I take one teaspoon of this mixture and mix it with the tea. Which cup contains more of its original contents?

**ANSWERS WITH EXPLANATION
ARE IN NEXT PAGE.**

Answer 1

The correct answer is 6.

Taking the number $10t + u$, when we reverse the digits, we get $10u + t$. The sum is then $(10t + u) + (10u + t) = 11t + 11u = 121$. Dividing by 11, we have $t + u = 11$. Taking the difference: $(10t + u) - (10u + t) = 9t - 9u = 9$, and dividing by 9: $t - u = 1$. Finally, adding: $t + u = 11$ and $t - u = 1$ one obtains $t = 6$.

Answer 2

$$((7 \times 7 \times 7) + 7) / 7 = 50$$

or

$$((7 / 7) / 7 + 7) \times 7 = 50.$$

Answer 3

One way to solve this math riddle is to use even numbers: The older brother will be twice as old as his younger brother in three years' time. This immediately rules out the older brother currently being 8, 11, and 14, so he must be 17, and the younger brother 7. Two years ago, they were 15 and 5 respectively, and in three years' time, they will be 20 and 10.

Answer 4

$$888 + 88 + 8 + 8 + 8 = 1,000.$$

This is the kind of number riddle you can work out with times tables, or by simple logic. First, get as close to 1,000 as you can (888). From there, it's easy to figure out the rest.

“No problem can be solved from the same level of consciousness that created it.”

— Albert Einstein

Answer 5

The man worked for 9 months instead of 12 months, he should receive $9/12$ of his annual payment i.e., $(3/4)(240 + 1C)$ which is equal to $150 + 1C$ where C is the price of the coat.

Thus, $C = 120$ rupees.

Answer 6

Let the average weight of the 59 students be A . Therefore, the total weight of the 59 of them will be $59A$. When the weight of the student who is left is added, the total weight of the class = $59A + 54$. When this student is also included, the average weight decreases by 0.1 kgs.

Thus, $(59A + 54) / 60 = A - 0.1$, therefore giving $A = 60$ kgs.

Answer 7

Each will have the same amount of its original content. How much liquid is being moved does not matter (whether it is a teaspoon, half a cup, or, in extreme case the full cup does not make any difference).



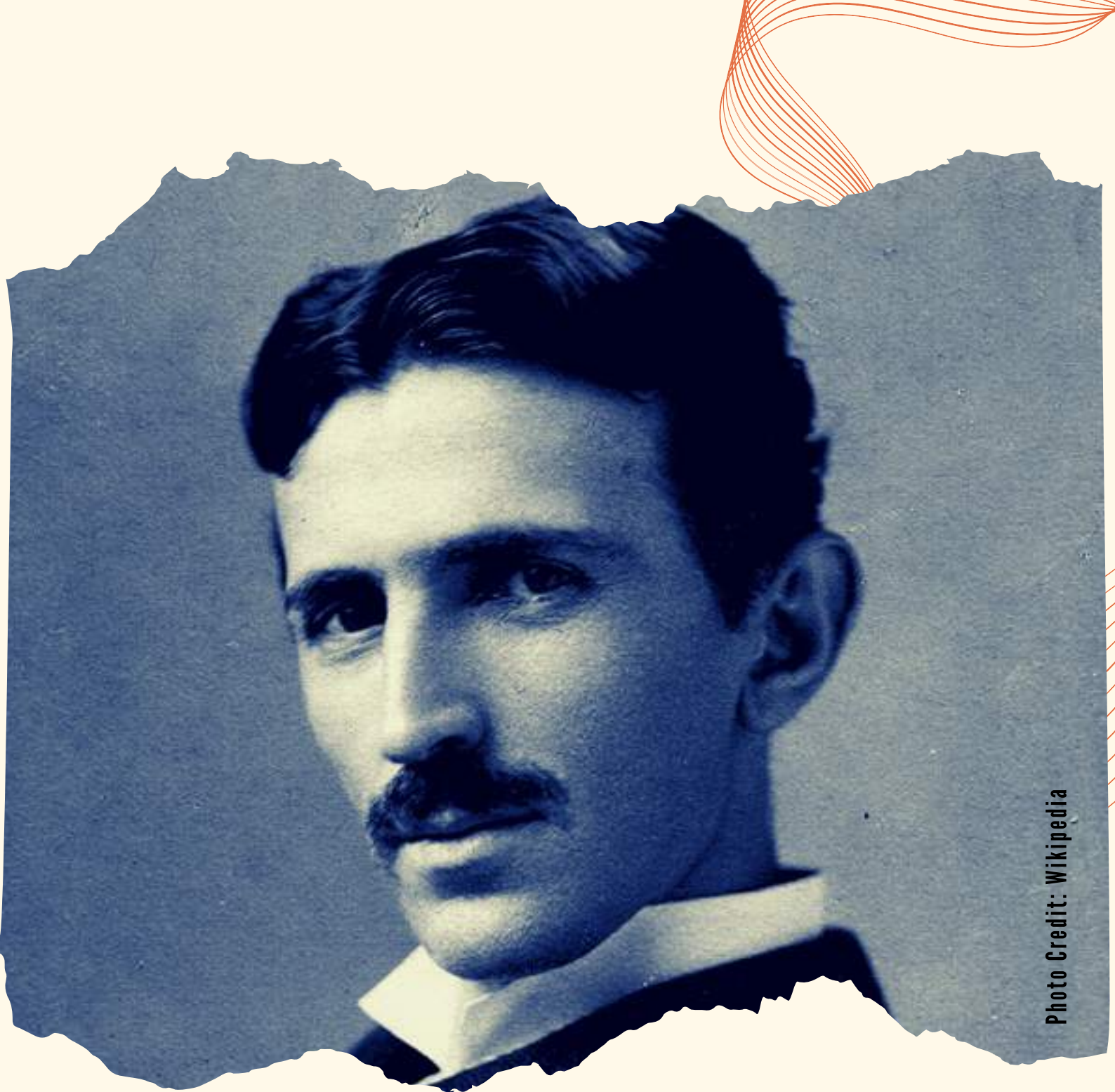


Photo Credit: Wikipedia

NIKOLA TESLA

THE GENIUS WHO LIT THE WORLD

PRITAM MONDAL

PHYSICS HONS., EX-STUDENT

Nikola Tesla is known for designing the **alternating-current** (AC) electric system, which is the predominant electrical system used across the world today. He also invented the "**Tesla coil**", which is still widely used.

Tesla was one of five children, including siblings Dane, Angelina, Milka and Marica. Tesla's interest in electrical invention was spurred by his mother, Djuka Mandic, who invented small household appliances in her spare time while her son was growing up. His father was a stern Orthodox priest, gifted writer and poet whose desire was for Nikola to enter the priesthood.

But Nikola's interests lay squarely in the sciences. Tesla was educated at the Austrian engineering School at Graz and the University of Prague, where for four years he studied mathematics, physics and mechanics. Tesla learned to speak six languages and could perform calculus problems mentally as a student. Not only did he possess a photographic memory, he was able to use creative visualization with an uncanny yet practical intensity.

“The scientists of today think deeply instead of clearly. One must be sane to think clearly, but one can think deeply and be quite insane.”

In 1884, Tesla arrived in the United States with very little clothes on his back and a letter of introduction to renowned inventor and business mogul **Thomas Edison** whose DC-based electrical works were fast becoming the standard in the country. Thomas Edison hired Tesla, and the two men were soon working tirelessly alongside each other, making enhancements to Edison's inventions. He worked there for a year, impressing Edison with his intelligence. At one purpose Edison told Tesla he would pay \$50,000 for an improved design for his DC dynamos. After months of experimentation, Tesla presented a solution and asked for the money. Edison demurred, saying, "Tesla, you don't understand our American humor". **Tesla quit soon after.**

In 1887 and 1888 Tesla was granted more than 30 patents for his inventions and invited to address the American Institute of Electrical Engineers. His lecture caught the attention of **George Westinghouse**, the inventor who had launched the first AC power system near Boston and was Edison's major competitor in the "Battle of the Currents". Westinghouse hired Tesla, licensed the patents for his AC motor and gave him his own lab. In 1890 Edison arranged for a convicted New York murderer to be put to death in an AC-powered electric chair - a stunt designed to show how dangerous the Westinghouse standard could be buoyed by Westinghouse's royalties, Tesla struck out on his own again.

But Westinghouse was soon forced by his backers to renegotiate their contract, with Tesla relinquishing his royalty rights. In the late 19th century, Tesla patented the **Tesla coil**, which laid the foundation for wireless technologies and is still used in radio technology today. The heart of an electrical circuit, the Tesla coil is an inductor used in many early radio transmission antennas.

The coil works with a capacitor to resonate current and voltage from a power source across the circuit. Tesla himself used his coil to study fluorescence, x-rays, radio, wireless power and electromagnetism in the earth and its atmosphere. Having become obsessed with the wireless transmission of energy, around 1900 Tesla set to work on his boldest project yet: to build a global, wireless communication system — to be transmitted through a large electrical tower — for sharing information and providing free energy throughout the world.

With funding from a group of investors that included financial giant J. P. Morgan, in 1901 Tesla began work on the free energy project in earnest, designing and building a lab with a power plant and a massive transmission tower on a site on Long Island, New York, that became known as **Wardenclyffe**.

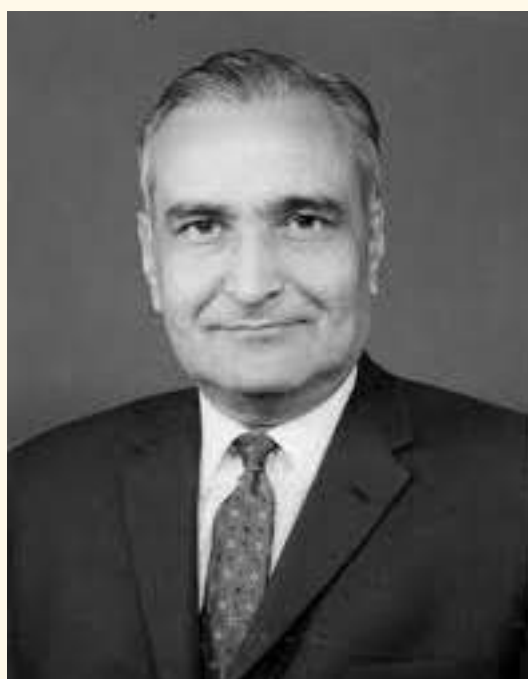
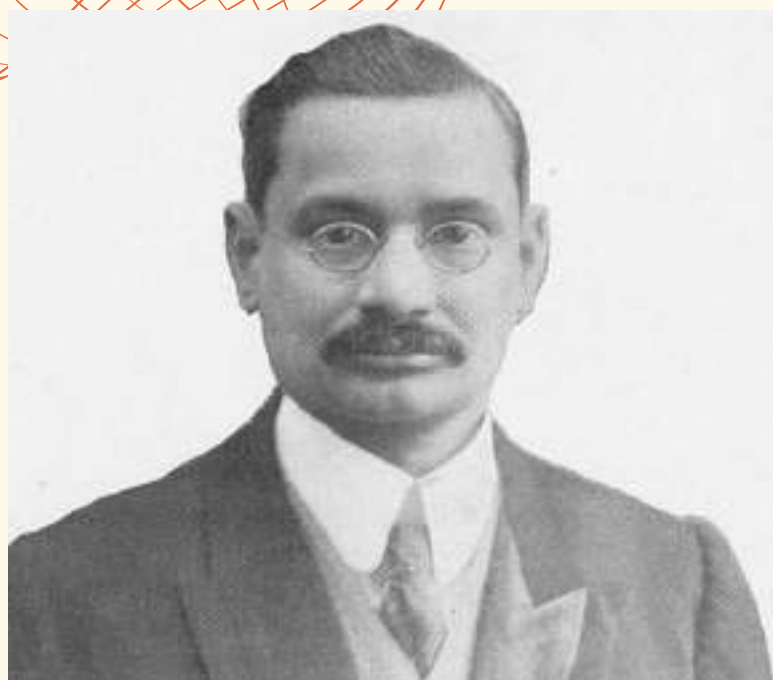
However, doubts arose among his investors about the plausibility of Tesla's system. As his rival, Guglielmo Marconi — with the financial support of Andrew Carnegie and Thomas Edison — continued to make great advances with his own radio technologies, **Tesla had no choice but to abandon the project.**

After suffering a nervous breakdown following the closure of his free energy project, Tesla eventually returned to work, primarily as a consultant. But as time went on, his ideas became progressively more outlandish and impractical. He grew increasingly eccentric, devoting much of his time to the care of wild pigeons in the parks of New York City.

However, the legacy of the work Tesla left behind him lives on to this day. Today, the SI unit of “Magnetic Flux Density” is known as “Tesla.”

“ I don't care that they stole my idea... I care that they don't have any of their own. ”





5 UNSUNG INDIAN SCIENTISTS

WHOSE BRILLIANT INNOVATIONS WOWED THE WORLD

AYAN ROY

PHYSICS HONS., 3RD SEM

India is full of geniuses and innovators who have made us proud. Needless to say, our country's contributions to the field of science are some of the greatest. But most of these scientists are either not well-known or not talked about enough. The years of hard work that these people have put in is immensely applaudable and deserves our attention. If you haven't heard of them, here are 5 lesser talked about Indian innovators that you must take out time to read about.

1. ANNA MODAYIL MANI (1918 - 2001)



Photo Credit: Wikipedia

Back in the days when women were barely visible in the scientific domain, Anna Modayil Mani from Travancore, Kerala, was a distinguished meteorologist and physicist who astounded the world with her amazing inventions. Among other accomplishments, she devised novel methods to **gauge the weather** — by standardising around 100 meteorological instruments — and established a series of stations to measure solar radiation.

She also pioneered the research to utilise solar and wind power as renewable sources of energy and set up her instruments in over 700 sites. Her study on ozone level measurement using her apparatus 'ozone-sonde' is also strikingly remarkable. Inspired by Gandhiji's principles and the ideals of Vaikom Satyagraha, Mani started wearing only khadi garments to express her solidarity with the stirring rebellion. While all her sisters got married in their adolescent years, she persisted on her wish to pursue higher studies and enrolled for an honours degree in Physics at Presidency College in Madras (Chennai). Later, she landed the opportunity to work as a researcher in Nobel Laureate Sir **CV Raman**'s laboratory. Undeterred, she used her scholarship savings to head to Imperial College in London to pursue higher physics research and later specialised in meteorological instrumentation. Mani returned to a newly independent India in 1948 and designed radiation instrumentation from scratch at Indian Meteorological Department, Pune. Mani is also credited for setting up a meteorological observatory and an instrumentation tower at the Thumba rocket launching facility.

“ Much of Indian science seems intuitive and not bound by the rigid thinking of classical scientists. ”

— Roland Joffe

2. SHANKAR ABAJI BHISEY (1867 - 1935)



Photo Credit: bbc.com

Shankar Abaji Bhisey was a child prodigy who designed an **indoor coal-gas generator**, when he was only 14. Hailing from Bombay, the brilliant researcher seemingly got his early exposure to global science through science magazines. By his early 20s, he had already invented electrical bicycle contraptions, a station indicator for Bombay's suburban railway system, tamper-proof bottles and a cutting-edge grocery weighing machine that earned him the first prize at a British inventor's contest.

However, Bhisey is most recognised for his iconic **Bhisotype**, a type-casting machine that revolutionised the **printing industry**. In one minute, the machine could cast and assemble 1200 different types automatically. Throughout his career, Bhisey had 200 inventions and 40 patents to his name, which include a unique telephone model, kitchen appliances, automatic toilet flushers etc. Bhisey later upgraded the Bhisotype to comprise finer features and faster performance.

However, the funding for his continued research was compromised with the advent of World War I, after which he gradually faded into oblivion.

3. GOPALSWAMY D. NAIDU (1893 - 1974)

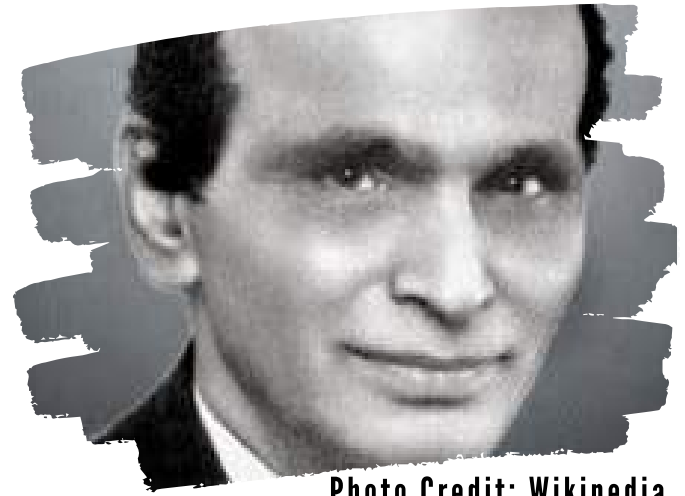


Photo Credit: Wikipedia

Revered as the '**Edison of India**,' G.D. Naidu is often credited with influencing the Industrial Revolution in India. The creator of the **first electric motor** in the country is also acknowledged for his wondrous inventions like the mechanical calculator, the ticket vending machine, early electric razor, fruit juice extractor, kerosene-run-fan and a projection TV. And perhaps the most astounding fact about him was that he dropped out of school in Class 3, as he strongly detested the curriculum at school. After dropping out of school, the young boy assisted his father on his farm. His first tryst with technology was at age 16 when he spotted a 1912 model Rudge motorcycle and was so incredibly fascinated by it, that he left home, worked as a waiter for three years and saved money to buy this bike.

After owning the bike, he did not set out on a joy ride. Instead, he chose to dismantle its parts and study the internal framework. Decades later, he would go on to own a fleet of 280 buses as the founder of Universal Motor Service (UMS). His electric company **New Electric Works** was the place where India's first electric motor was manufactured. In fact, Naidu went on to the extent of starting an indigenous company for almost every invention of his. Naidu spent most of his sunset years in philanthropy.

4. NARINDER SINGH KAPANY (1926 - 2020)



Photo Credit: indianexpress.com

Considered the '**Father of Fibre Optics**', this Punjab-born scientist's glorifying discovery of communication through optical fibres paved the way for the 'internet' as well as medical marvels like laser surgeries or endoscopic imaging.

Unfortunately, Narinder Singh Kapany's contribution was grossly overlooked for Nobel Prize when Charles Kuen Kao was awarded the honour for furthering on Kapany's discovery.

Kapany studied at the University of Agra and later joined Imperial College, London to conduct extensive research in technology. It was during his PhD at this institution that Kapany succeeded in transmitting images over a bundle of optical fibres and coined the term 'fibre optics' in 1955, opening up an entirely new portal of Optical Physics. He joined the **University of Rochester** as a faculty member and later went on to become a successful entrepreneur in Silicon Valley, USA. He was credited for over 100 patents in his name and started a philanthropic organisation called the Sikh Foundation.

“ We owe a lot to the Indians, who taught us how to count, without which no worthwhile scientific discovery could have been made. ”

— Albert Einstein

5. NAUTAM BHATT (1909 - 2005)

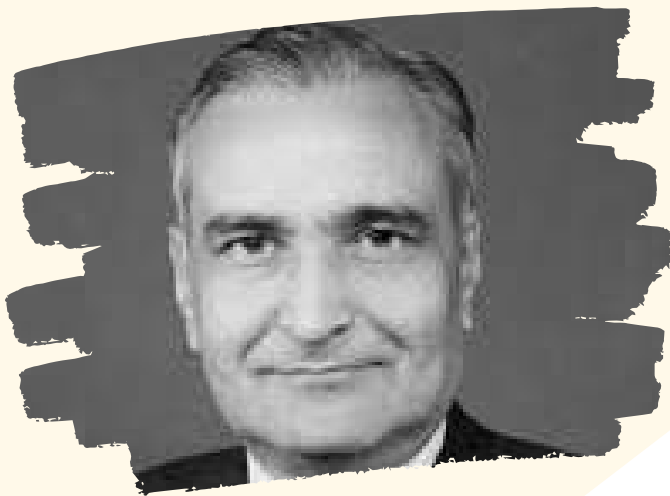


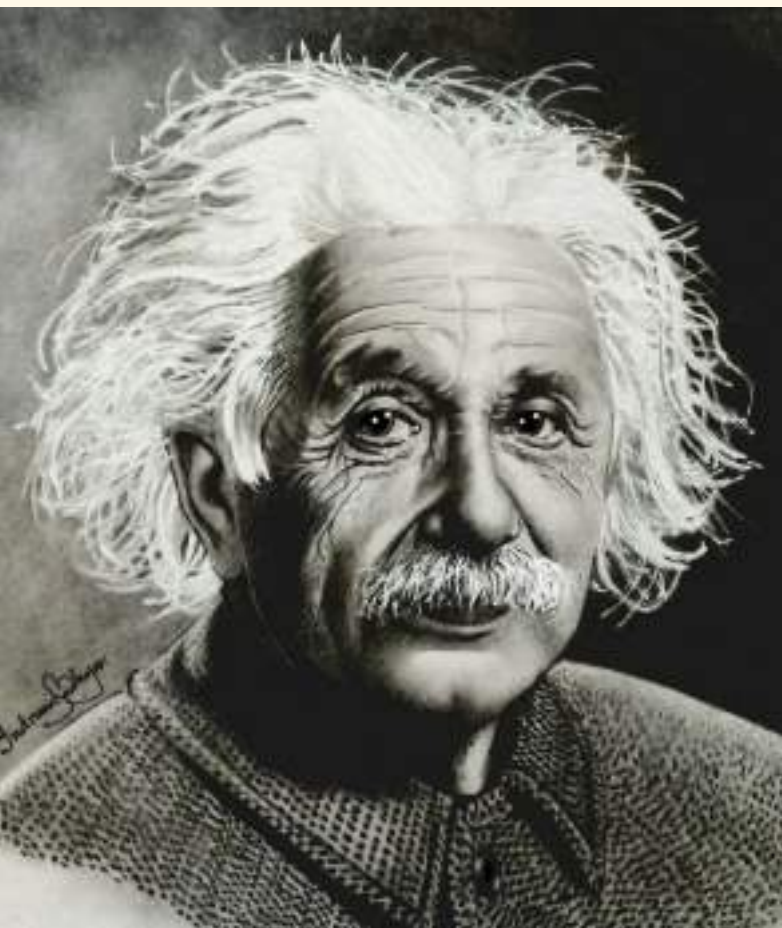
Photo Credit: princeton.edu

Nautam Bhatt was a **Padma Shri** physicist whose name rarely features in the list of top Indian scientists though his contribution continues to inspire, influence and aid present-day physics research in India. He was the founding director of Solid-State Physics Laboratory, Delhi.

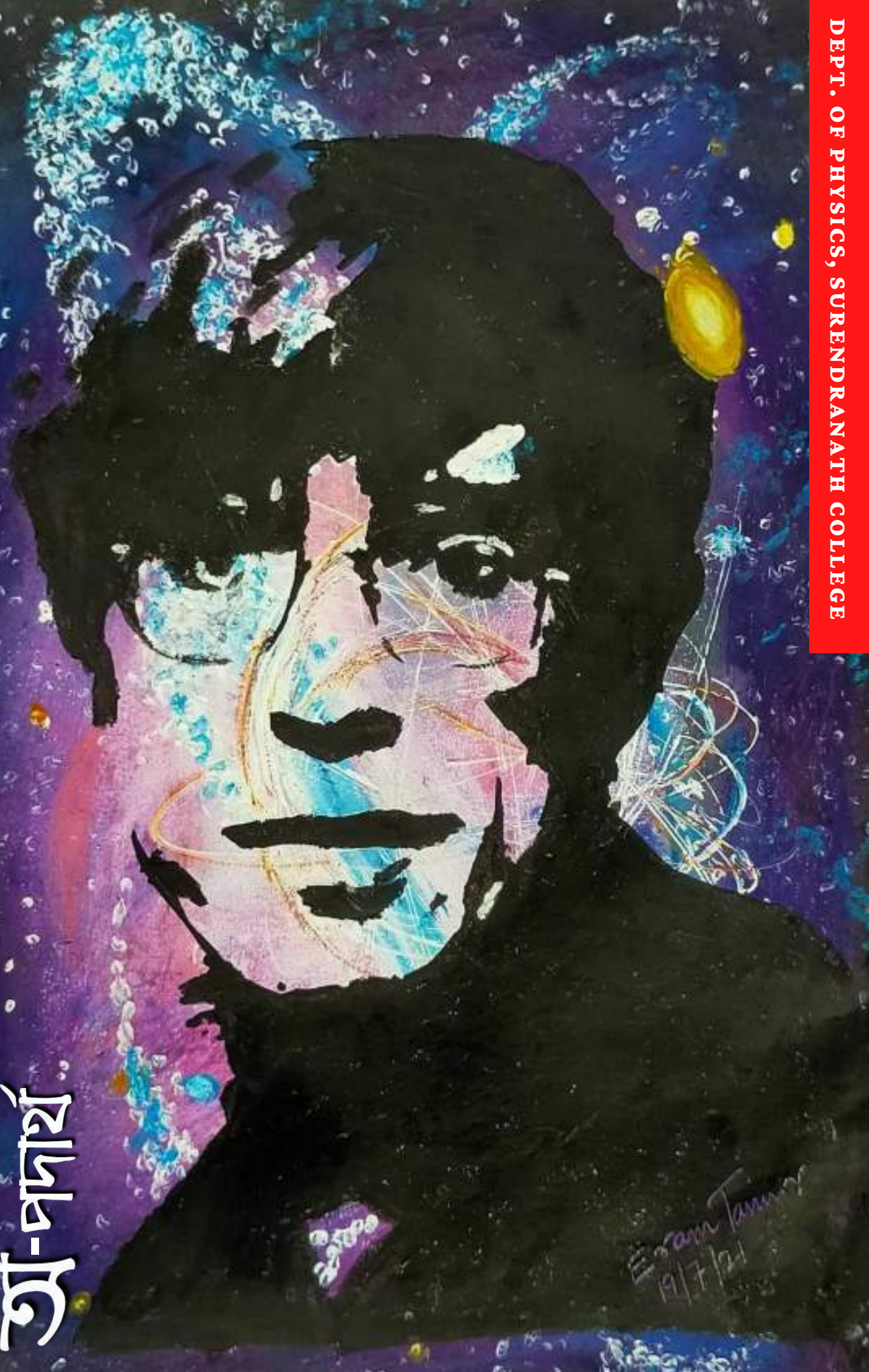
Bhatt attained unprecedented heights in defence research in India by designing the Variable Time Fuse for missiles as well as spearheading the development of helium-neon lasers, solar cells, semiconductor chips etc. which revolutionised India's defence domain.

Bhatt obtained his master's degree in Physics under the supervision of the great Sir **C V Raman** at Indian Institute of Science (IISc). After earning his doctorate at the MIT, he returned to India and served as a professor in IISc. Just after Independence, in 1949, he was inducted into the Defence Science Organization in Delhi, where he presented his most fascinating innovations. Although most of his work is under the wraps owing to the strict confidentiality protocols of Defence Science Organization, his active contribution to acoustics in India must be mentioned.





(Top-left) Indranil Sadhya, ex-student, Dept of Physics
(Top-right & bottom) Poushali Mallick, ex-student, Dept of Physics



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