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Science, Patriotism and Progress: Scientific Contributions from Bengal, 1800–2000

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Abstract: The early nineteenth century in Bengal saw the rise of a rational and scientific temper that reshaped Indian intellectual life. During the Bengal Renaissance, reformers like Raja Rammohan Roy promoted modern education based on science, mathematics, and empirical reasoning over traditional Sanskrit learning. Roy's 1823 appeal to Lord Amherst, along with Macaulay's recommendations and the founding of Hindu College and the University of Calcutta, laid the foundations for scientific education in India.

The paper traces this evolution from early contributors such as Ram Kamal Sen, Raja Kalikrishna Bahadur, and Raja Radhakanta Dev—whose works reflected an emerging empirical mindset—to Mahendralal Sarkar's establishment of the Indian Association for the Cultivation of Science. Later scientists including P.N. Bose, P.C. Ray, J.C. Bose, and Ashutosh Mukhopadhyay linked scientific inquiry with nationalist self-reliance.

In the twentieth century, S.N. Bose, Meghnad Saha, S.K. Mitra, and others made Bengal a global scientific centre. This tradition continued post-independence through major institutions, shaping India's scientific culture and national identity.

Keywords: Bengal Renaissance; Rationalism; Science Education; Raja Rammohan Roy; Mahendralal Sarkar; Satyendra Nath Bose; Indian Scientific Awakening.

Introduction:

The evolution of science in Bengal, particularly in physics, is deeply intertwined with the subcontinent's broader quest for intellectual self-assertion, cultural rejuvenation, and political freedom. From the dawn of the 19th century to the end of the 20th, Bengal produced a stream of thinkers, scientists, and patriots who not only advanced the frontiers of physics but also heed reshape India's socio-political destiny. In Bengal, scientific pursuit was rarely isolated from the spirit of nationalism—it was seen as an essential means to liberation and self-reliance.

This essay examines the rich tapestry of scientific advancement in Bengal, focusing on the field of physics, and situates it within the framework of patriotism and national progress. It presents an integrated narrative of how scientific inquiry, particularly in physics, became a force of intellectual resistance and nation-building between 1800 and 2000 AD.

Foundations of Rationalism in Colonial Bengal: Early 19th Century and the Spirit of Reform

The 19th century in Bengal witnessed a cultural and intellectual resurgence known as the Bengal Renaissance. Reformers like Raja Rammohan Roy advocated for education based on mathematics, and science. Although Roy himself was not a physicist or chemist, he laid the philosophical groundwork for a rational

worldview that rejected superstition and welcomed empirical inquiry. He wrote a letter in 1823 to Lord Amherst opposing the establishment of Sanskrit college. He argued to establish science-based education system. As per report from Charles Wood and James Princep, Thomas Babington Macaulay recommended a rational education system which paved the path for establishment of Calcutta, Bombay and Madras university

This shift set the stage for the acceptance of modern scientific education, which was institutionalized with the establishment of Hindu College (1817) and later the University of Calcutta (1857)—the first of its kind in Asia. These institutions became cradles of scientific talent that would mature over the century.

In the field of scientific culture, writings and publication three dignified Bengali figures -Mathematician Ashutosh Mukhopadhyay, Chemist Prafulla Chandra Roy and Physicist Jagadish Chandra Bose are well known to every Indians but before their pathbreaking works there were unnoticed scientific contributions from various patriotic science scholars.

Ram Kamal Sen (1783-1844) and scientific contribution:

He was a scholar in Calcutta's scholarly scenario and mostly known for lexicographical work in Bengali and English. As he was secretary of Asiatic society so he was aware of various articles in science and literature. An article on Bel trees or Bel was published in journal "Transactions of the medical and physical society of Calcutta" with title "Notice of the Bela (Vilwa) tree or Bel" in 1829 by him. This article was comprised of botanical characteristics and various information of leaf, bark, stem, root, flower and fruit and their medicinal properties.

Raja Kalikrishna Bahadur (1808-1874):

Raja had deep knowledge in chemical science. He had written a review article on minerals in 1832 with title "Oriental accounts of the precious minerals" in Journal of Asiatic society of Bengal. It was not fundamental one but a scholarly article on oriental knowledge system on chemistry. s a member of Shovabazar Royal family he advocated for expansion of education among women across Bengal. He served as a fellow of university of Calcutta.

Raja Radhakanta Dev (1784-1867):

Raja Radhakanta Dev of Shovabazar, Calcutta wrote a letter to the secretary of "Transactions of the agricultural and horticultural society of India" C K Robinson about Ber tree or Jujube tree on 15 April, 1829. This letter was published as article then in Journal of "Transactions of the agricultural and horticultural society of India" in 1838. In this letter he discussed various spices of Ber trees and fruits from round Ber to coconut Ber and how these trees spread across India from Badaricasrama (the Badrinath in modern times or sacred town on west bank of river Alakananda in Srinagar, Jammu Kashmir). He was engaged in many social and developmental activities. He was co-founder of Hindu College. He was determined to develop the agriculture and horticulture sector then. He was active associate of Agriculture and Horticulture Association of India from its establishment.

Sir Ashutosh Mukhopadhyay (1864-1924):

He was versatile genius Indian figure. He was physicists, mathematician, jurist, educationist. He was the only student in the history of Calcutta University who earned dual MA degrees in Mathematics and Physics and published many scholarly articles on these subjects in journals such as journal of Asiatic society of Bengal. He was fellow of the Royal society of Edinburgh at age 22. And fellow of Royal Astronomical Society at 21 only He published his article on mathematics in

British Journal "Messenger of Mathematics" in 1880 with title "Proof of Euclid 1.25". Then he published many papers on analytical methods for conics, elliptic functions. He was praised by British mathematician Arthur Cayley for his scholarly publications'. Mukherjee is celebrated as the first modern Indian mathematician to enter the field of mathematical research. To promote fundamental thinking and research work founded Calcutta Mathematical Society (1908). He played active role in establishment of Bengal Technical Institute (1906) which became later Jadavpur University. He served as Vice Chancellor of Calcutta University for multiple times (1906-1914) and (1921-1923). He established Calcutta University as a Centre of excellence in education scenario of Calcutta. He was visionary educationist and administrator who was champion in spotting real talents in various fields. He recruited CV Raman, S Radhakrishnan, Ganesh Deuskar, Prafulla Chandra Roy, mathematician S Ramanujan and Ganesh Prasad and many more.

A Visionary Physician with a Scientific Dream: Mahendralal Sarkar and Indigenous Science:

Dr. Mahendralal Sarkar (1833–1904), though a physician academically but foresaw the importance of nurturing indigenous scientific talent. He dreamt for an association that must be funded, run, managed by native Indians for reconstruction of the country. In 1876, he established the Indian Association for the Cultivation of Science (IACS) at Bow bazar street in Calcutta, which became India's first national scientific research institute funded by Indians themselves. The IACS provided a space for Indian scientists to pursue original research in physics and chemistry without colonial bias. This institute started journey with basic science departments -Physics, Chemistry, Mathematics, Physiology, Botany etc. Sarkar's motto was clear: India must foster homegrown scientific excellence to counter colonial notions of intellectual inferiority. Regular lectures and demonstrations were scheduled to popularize science among public. Weekly lectures of Jesuit father E. Lafont were very much impressive then. He was eager to propagate education among women. He favored the decision of Abala Bose to pursue study of medicine at Madras Medical College as admission of female at Calcutta medical College was restricted. He made an arrangement for attendance of Sarala Devi Chaudhurani in evening lectures at IACS.

Mahendralal Sarkar passed junior scholarship examination from Hindu college in 1849 from Hare School and admitted to Hindu College where studied up to 1854. At that time there was no facility for science study at Hindu College, so Mr. Sarkar transferred to Calcutta Medical College. There he was so exceptionally brilliant that he was invited in second year of his course by professors to deliver a series of lectures on Opticsto his fellow students.

Though he acquired medical degree and knowledge in traditional western system but he motivated to homoeopathy feeling inability of common people to afford costly allopathy medicine. This motivation got from interaction with renowned homoeopathy doctor Rajendralal Dutta and William Morgan's book "The Philosophy of Homoeopathy". He was ostracized by British doctors and faced loss in practice. But after some period, he became leading Homoeopathy doctor in India

Pramatha Nath Bose (1855–1934)

Forgotten iconic geologist and paleontologist saw the light at Gobardanga in 24 Paraganas district. He studied at Krishnanagar Government College and later at St. Xavier's College, Calcutta. During this study he achieved Gilchrist scholarship

to study in London in 1874. He was the first Indian to obtain a degree in geology from the University of London (1877). Then he joined at the Royal School of Mines in London, where he excelled in biology and palaeontology.

Contributions to Science and Education:

- ◊ Joined the Geological Survey of India (GSI) as one of its first Indian geologists.
- ◊ Conducted extensive studies on coal, iron, and mineral deposits across India, especially in Bengal and Central India.
- ◊ Advocated scientific and technical education in India and emphasized linking geology with national development.
- ◊ Promoted Indianization of scientific services, inspiring Indian youth to enter earth sciences.

Industrial Contributions:

- ◊ Discovered iron ore deposits in the Gorumahisani region (Odisha), which later became the basis for Tata Iron and Steel Company (TISCO) — India's first large-scale steel industry.
- ◊ His geological surveys and recommendations laid the foundation for India's industrial and mineral resource development.
- ◊ He is credited to setting up of first soap factory in India.

Jagadish Chandra Bose: Pioneer of Modern Physics in India: Bridging Physics and Biology

Sir Jagadish Chandra Bose (1858–1937) is a towering figure in the history of Indian science. Trained at Cambridge and returning to India with a degree in natural sciences, Bose initially faced racial discrimination in his academic career. Yet, he persevered and became a trailblazer in the field of radio wave propagation. J C Bose submitted first article "On polarization of electric rays by double refracting crystals" to Asiatic Society of Bengal" on May 1995. Then he submitted second paper "On a new electro-polariscope" to the Royal Society of London in October 1895. It was published by "The Electrician" in December 1895. Mr. Bose demonstrated the generation and transmission of Microwave, electromagnetic waves in nature for wireless communication years before Marconi, but he refused to patent his inventions, believing that knowledge should be shared. He invented Mercury Coherer, an early-stage detector of radio wave. It was prime component in Marconi's first transatlantic radio signal transmission. He also ventured into plant physiology, using instruments of his own design to demonstrate that plants respond to external stimuli—thus expanding the scope of physics into the realm of biology.

Science as a Form of Revolution

JC Bose was appointed in 1885 at Presidency College where he was paid only two-thirds the salary of his European co-workers. He was pained by this racist discrimination. He protested and refused to accept salary for three years. Then his determination and expertise in his work forced Principal and Director to step down. Then he was paid in full amount with three years due salary. Bose's work was not only scientific but it was political also. At a time when colonial rulers viewed Indians as incapable of original thought, Bose's contributions in physics were acts of intellectual defiance. His work reinforced the belief that Indians were fully capable of producing world-class scientific research. He founded a premier research institute "Basu Vigyan Mandir" in Calcutta in 1917. It was the first interdisciplinary research institute in Asia. There he served as the director until death.

Prafulla Chandra Ray and the Birth of Chemical Industry

Though primarily known as a chemist, Acharya Prafulla Chandra Ray (1861–1944) was a patriot-scientist and father of Indian Chemistry. whose influence spilled over into physics through his advocacy for industrial and scientific self-reliance. During pursuing D.Sc. at Edinburgh, he researched on metal double salt and communicated a paper focusing on "Conjugated sulphates of the copper-magnesium group" and published in 1888 in proceedings of the Royal Society of Edinburgh. It was his first scientific research paper. He completed more than 100 research paper and all of these was published in various renowned journals and proceedings. At least eight papers were published in glorious journal Nature. In his research life he focused on least focused Inorganic chemistry. In India around 1895 he started research journey in the field of nitrite chemistry. He succeeded to prepare mercurous nitrite. He published an article on new stable chemical compound in the Journal of the Asiatic Society of Bengal in 1896.

He founded Bengal Chemicals and Pharmaceuticals Limited with capital Rs. 800/- —India's first indigenous chemical industry—thereby linking science with economic nationalism and self-sufficiency of countrymen.

PC Ray encouraged young students to pursue the physical sciences, and many of his protégés would go on to shape modern physics in Bengal. He emphasized the necessity of scientific education as a pillar of Indian independence and prosperity.

The Calcutta School of Physics: A Quantum Revolution:

Satyendra Nath Bose: Quantum Trailblazer

Among Ray's most celebrated intellectual descendants was Satyendra Nath Bose (1894–1974), whose work revolutionized theoretical physics. Bose's 1924 paper on the statistics of photons—sent to Einstein and later expanded into the Bose–Einstein statistics—provided one of the foundational blocks of quantum mechanics.

Bose's achievement is even more remarkable considering he worked with minimal institutional support, limited resources, and no access to major Western journals. His work showed that Indians could not only keep pace with European scientists but could lead theoretical innovation.

Education and Patriotism:

Satyendra Nath Bose, best known for his work with Albert Einstein on quantum statistics (Bose–Einstein statistics), also played an important role in shaping science education in Bengal in the post-independence era. His contributions in brief:

Academic Leadership: After independence, he served as Professor and later as Dean at Calcutta University, where he emphasized reform in physics education by modernizing syllabi and introducing research-oriented teaching.

Institution Building: Bose played a key role in strengthening scientific institutions in Bengal, particularly at Calcutta University and Presidency College, nurturing a generation of physicists in the new India.

Science Popularization: He was deeply committed to spreading scientific knowledge in Bengali. He promoted the use of the Bengali language in higher education, translating scientific terms and writing popular science works to make science accessible to common people.

Mentorship: As a teacher, he inspired many students to pursue research in

physics and mathematics, helping to build a strong academic base in Bengal's universities.

Policy Influence: Bose was involved in national committees on education and science policy, contributing to the shaping of India's post-independence scientific vision, with Bengal as one of its hubs

Meghnad Saha: Astrophysics and Nation Building:
Ionization and the Stars

Meghnad Saha (1893–1956), a contemporary of Satyendra Nath Bose, made seminal contributions to astrophysics. His Saha Ionization Equation enabled astronomers to interpret the spectra of stars and determine their temperatures and compositions. This work established him as a global figure in theoretical physics.

Science for Society

Saha was also a political visionary. He believed science must be harnessed to eradicate poverty and backwardness. Being elected to Parliament in independent India, he advocated for scientific planning and industrialization. He founded the Institute of Nuclear Physics in Calcutta, which later became the Saha Institute of Nuclear Physics, one of India's premier research centers.

Saha was prominent figure in shaping India's river valley projects and atomic energy initiatives, embodying the idea that physics could drive national development. He was nominated seven times for Nobel prize from 1930 to 1955 with nominators including Nobel laureate Arthur H. Compton for his ground breaking works, mainly for Saha ionization equation fundamental to astrophysics. But Nobel committee failed to recognize his achievement.

Sisir Kumar Mitra (1890 – 1963)

Sisir Kumar Mitra was a pioneering Indian physicist best known for his outstanding contributions to **ionospheric physics and radio science.** His work placed India on the global map of space and atmospheric research. In brief, his major contributions are:

Ionosphere Research: He was one of the earliest scientists to study the ionosphere in detail, particularly its layers and role in long-distance radio communication. His research helped establish a deeper understanding of radio wave propagation through the Earth's upper atmosphere.

Author of a Landmark Book: His book *The Upper Atmosphere* (published in 1947) was an authoritative text on ionospheric physics and became widely referenced by researchers across the world.

Radio Physics in India: He founded and developed the Radio Physics and Electronics Department at the University of Calcutta, which later became a hub for advanced research in atmospheric and space sciences.

Radar and Communication Research: During World War II, Mitra's expertise contributed to the development of radar and improvements in radio communication technology.

International Recognition: He was elected a Fellow of the Royal Society (FRS) in 1958 for his path-breaking work in ionospheric science.

As a Mentor: He trained a generation of Indian physicists in radio and atmospheric sciences, laying the foundation for India's later achievements in space research and communication technology.

In short: Sisir Kumar Mitra is remembered as the father of ionospheric studies in India, blending physics with practical advances in radio communication and creating institutions that nurtured modern space science in the country.

Patriotic Physics in the Freedom Struggle:

Science as Swadeshi

In Bengal, science was often viewed as an extension of the Swadeshi movement. The idea was simple: just as Indians must make their own cloth, they must also produce their own science. Physics became a domain where colonial narratives were challenged and reversed.

Scientific Societies and Publications

Organizations like the Bose Institute (founded 1917) and journals like *Science and Culture* promoted the indigenization of scientific research. Science writing in Bengali also flourished, making complex ideas accessible to the masses and inspiring students to pursue careers in physics.

Post-Independence Resurgence and Challenges:

P.C. Mahalanobis and Planning

While not a physicist, Prasanta Chandra Mahalanobis (1893–1972) was a statistician whose work was vital to India's economic planning. As a physicist-trained intellectual, he used statistical models to drive the Second Five-Year Plan, emphasizing industrialization, including physics-based industries like metallurgy and electronics.

Institutional Growth

Bengal retained its leadership in physics research through the post-independence period with institutions such as:

- Saha Institute of Nuclear Physics (SINP)
- Indian Association for the Cultivation of Science (revitalized post-1947)
- Bose Institute
- Jadavpur University and University of Calcutta

These institutions focused on nuclear physics, condensed matter physics, and theoretical modeling, and they produced generations of physicists who contributed both nationally and internationally.

Purnima Sinha (1927 – 2015):

Purnima Sinha (1927 – 2015) daughter of prominent jurist Naresh Chandra Sengupta, holds a special place in the history of Indian science as the first woman to earn a PhD in Physics in India (from the University of Calcutta, 1956). She worked under Sisir Kumar Mitra, the eminent ionospheric physicist. Her contributions can be outlined as follows:

X-ray Diffraction Studies of Clay Minerals: Her doctoral research focused on the structure of clay minerals using X-ray diffraction techniques, which was pioneering in India at that time. Clay mineralogy was an important field for both physics and material sciences, with applications in soil science, ceramics, and geology.

Development of Experimental Physics in India: She mastered and applied sophisticated experimental techniques (X-ray crystallography), contributing to the growth of solid-state and material physics research in India during its formative years.

Interdisciplinary Work: Purnima Sinha's interest extended beyond pure

physics. She worked on problems connecting physics with geology, chemistry, and materials, showing an interdisciplinary approach long before it became common in Indian academia.

Breaking Gender Barriers: As the first woman PhD in Physics in India, she opened the path for future generations of Indian women in science, especially in a time when very few women pursued higher education in physics.

Science Popularisation & Cultural Work: Alongside her scientific career, she was also deeply involved in translation of scientific works into Bengali and had a strong interest in Indian music and culture, bridging the gap between science and society.

At a glance- Purnima Sinha is remembered for her X-ray crystallographic research on clay minerals, her pioneering role as the first woman PhD in physics in India, and her contributions to interdisciplinary science and science popularisation. She symbolises both scientific excellence and the breaking of social barriers for women in Indian science.

Asima Chatterjee (1917-2006)

She studied at Scottish Church College, Calcutta, earning her B.Sc. with Honours in Chemistry in 1936. She pursued postgraduate studies at University of Calcutta, obtaining an M.Sc. in Organic Chemistry in 1938. In 1944, she became the first woman to be awarded a Doctor of Science (D.Sc.) degree by an Indian university (Calcutta University) under the supervision of Prof. Prafulla Kumar Bose. Later, she undertook post-doctoral research abroad, working with renowned chemists in the USA and Europe on natural products and medicinal chemistry. Her education blended Indian academic knowledge with international research exposure, shaping her into a pioneering medicinal chemist.

Asima Chatterjee's scientific contributions as a chemical scientist:

Medicinal Chemistry: She was a pioneer in natural product chemistry, focusing on alkaloids, coumarins, and terpenoids from Indian medicinal plants. Her work laid the foundation for drug discovery from traditional sources.

Anti-Malarial Drugs: She developed antimalarial compounds from indigenous plants, contributing to the fight against malaria in India.

Anti-Epileptic and Anti-Cancer Research: Chatterjee synthesized novel anti-epileptic and anti-cancer drugs, advancing medicinal and pharmaceutical chemistry in India.

Organic Chemistry Education: Authored *Treatise on Medicinal Plants* and contributed extensively to organic reaction mechanisms, strengthening chemical education and research.

Recognition: She was the first woman to earn a Doctor of Science (D.Sc.) from an Indian university (Calcutta University, 1944), and the first female General President of the Indian Science Congress (1975).

Ashesh Prasad Mitra (1927-2007)

Ashesh Prasad Mitra popularly known as A P Mitra was born 21 February 1927 in Kolkata. He studied at Bangabasi College and completed MSc from Calcutta University. After completing D Phil from CU, he joined the National Physical Laboratory (NPL). Prof. Sisir Kumar Mitra laid the foundation stone in research of Ionospheric science in India and his student AP Mitra successfully carried out the program

Field of Expertise: A.P. Mitra was an eminent environmental, atmospheric and space physicist, known for his pioneering research in ionospheric physics, ra-

diowave propagation, and upper atmospheric studies.

He was the first Indian scientist to take up cudgels against US-Environment Protection Agency (US-EPA) for flawed data on methene generation in Indian rice fields. The agency in early 1990 estimated Indian rice fields were emitting 38.6 million tonnes per year and it badly impacting global warming. He scientifically measured methane emission from paddy fields and showed that it actually emits only one-tenth of the estimation value surfaced by US-EPA.

Scientific Contributions:

- Conducted pioneering research on the ionosphere and radio communications, crucial for satellite and space communication systems.
- Worked extensively on cosmic rays, solar activity, and their effects on the Earth's atmosphere.
- Led studies on the ionospheric disturbances during solar flares and geomagnetic storms.
- Played a vital role in developing radio and atmospheric science research in India through the National Physical Laboratory (NPL) and Indian Space Research Organisation (ISRO) collaborations.

Academic and Institutional Role:

- Served as Director General of the Council of Scientific and Industrial Research (CSIR).
- Promoted interdisciplinary research in atmospheric physics, space weather, and environmental studies.
- Member of several international scientific bodies and helped strengthen India's global collaboration in atmospheric sciences.

In short, Asesh Prasad Mitra made outstanding contributions to understanding the Earth's upper atmosphere and radio science, significantly advancing India's capabilities in space and atmospheric research. He achieved Shanti Swarup Bhatnagar in 1968 and Padma Bhushan in 1987 for his phenomenal contribution in Indian science spectra.

Dr. Dilip Mahalanabis (1934 – 2022):

The ORS (Oral Rehydration Solution), which became a global lifesaving therapy against dehydration caused by diarrheal diseases like cholera, was invented by Dr. Dilip Mahalanabis, a pediatrician and medical scientist.

Here are his scientific contributions in brief:

Pioneer of ORS Therapy: During the 1971 Bangladesh Liberation War, millions of refugees suffered from severe cholera and dehydration. At a refugee camp in Bongaon (West Bengal), Dr. Mahalanabis successfully used a simple mixture of glucose, salts, and clean water (ORS) to treat patients. This drastically reduced mortality rates from >30% to <3%.

Scientific Validation of ORS: He conducted rigorous field trials and published results showing that oral rehydration therapy was as effective as intravenous saline in treating dehydration. This was a groundbreaking finding for low-resource settings. It reduced the death rate from 30%-40% to only 3%.

Global Health Impact: ORS was later endorsed by the World Health Organization (WHO) and UNICEF as the standard treatment for dehydration caused by diarrhea. It is considered the "most important medical advance of the 20th century" and has saved an estimated 70–80 million lives worldwide.

Other Contributions: He worked at the International Centre for Diarrhoeal

Disease Research, Bangladesh (ICDDR,B) and the WHO, focusing on child health, nutrition, and diarrheal disease management.

Dr. Dilip Mahalanabis is remembered as the inventor and global champion of ORS therapy, a simple yet revolutionary medical innovation that has saved tens of millions of lives, particularly children, around the world. Such a global humanitarian invention was not properly recognised from scientific communities. Though in 2002, Dr Dilip Mahalanabis along with Dr Nathaniel F Pierce was awarded the Pollin Prize by Columbia University (considered the equivalent of Nobel in Pediatrics). Later, he also received the Prince Mahidol Award (2006)

Mani Lal Bhowmik (1931-)

Manilal Bhaumik was an Indian-born physicist best known for his pioneering work in laser physics.

Academic Expertise: He specialized in condensed matter physics and laser technology, making significant contributions to the development of the excimer laser, which became the foundation for modern LASIK eye surgery. His research career spanned institutions in India and the USA, combining deep theoretical knowledge with practical invention.

Fellow Feeling: Beyond his scientific achievements, Bhaumik was admired for his generosity and commitment to society. He actively supported education, donated for scholarships, and worked to inspire young students in India. In 2000 he founded Bhaumik educational Foundation to promote college education for students in rural area in West Bengal. He donated significant to institutions like UCLA to establish Mani L Bhaumik Institute for Theoretical Physics. Through public lectures and writings, he tried to bridge science and spirituality, showing a fellow feeling for both scientific peers and the broader community.

Sudipta Sengupta (1944-)

She completed B.Sc. (Geology Honours) at Presidency College, Calcutta then earned M.Sc. in Geology from the University of Calcutta. She specialized in structural geology and tectonics, with research focused on the Precambrian rocks of the Indian subcontinent. She served as Professor of Geology at Jadavpur University, where she guided students and advanced geological research. Then carried out extensive field studies in different terrains of India, including the Himalayas and Singhbhum craton. She published research papers on folding, deformation, and metamorphism in rocks, contributing to global geological knowledge.

Achievements:

- One of the first Indian women scientists to join an Antarctic expedition (1982–83), making her a pioneer in polar research.
- Recognized for her contributions to structural geology and Antarctic science.
- Actively worked to encourage women in science and popularize geology in India.

Sudipta Sengupta is a trailblazing geologist whose academic career combined research, teaching, and Antarctic exploration, making her a role model in Indian earth sciences.

Physics in the Cultural Imagination:
Literature, Cinema, and Scientific Temper

Bengali intellectual life did not isolate physics within the confines of academia. Cultural figures like Satyajit Ray and Sukumar Ray infused scientific ideas into

literature and cinema. Professor Shonku, Ray's fictional physicist, became a cultural icon, encouraging young minds to love science.

Popular Science Magazines and Education

Magazines like *Anandamela*, *Sandesh*, and *Jnan-O-Bijnan* introduced scientific themes—especially physics—through stories, experiments, and biographies. This democratization of scientific thought kept physics relevant to the Bengali middle class and embedded in everyday discourse.

Challenges in the Late 20th Century

Decline and Brain Drain

Despite its early leadership, Bengal saw a gradual decline in scientific output during the 1970s and 1980s due to political instability, economic challenges, and inadequate funding for research. Many brilliant minds migrated to institutions outside Bengal or abroad, leading to a brain drain.

Revival Attempts

In recent decades, efforts have been made to restore Bengal's scientific glory through collaborations, modernization of laboratories, and strengthening school-level science education. The culture of physics remains alive, though it now coexists with other emerging centers of excellence across India.

Conclusion

The history of physics in Bengal from 1800 to 2000 is a story of resilience, innovation, and national pride. It is the story of men and women who saw in science not just a career, but a calling—to liberate the mind, empower the nation, and resist domination through knowledge.

From J.C. Bose's wireless waves to S.N. Bose's quantum insights and Saha's stellar equations, Bengal's physicists helped reshape not only Indian science but also India's sense of what it could achieve. In Bengal, physics was not just an abstract pursuit—it was patriotism in action and a roadmap for progress.

As the world enters a new century dominated by quantum computing, space exploration, and climate physics, the legacy of Bengal's physicist-patriots serves as a guiding light, reminding us that science can indeed be a revolutionary force—when driven by purpose, passion, and patriotism.

References

- Sarkar, Sumit. *The Bengal Renaissance: Identity and Creativity from Rammohun Roy to Rabindranath Tagore*. Permanent Black, 2007.
- Chakrabarti, Prafulla. *Science and Modern India: An Institutional History (c. 1784–1947)*. Pearson Education India, 2004.
- Bose, Satyendra Nath. "Planck's Law and the Light Quantum Hypothesis." *Zeitschrift für Physik*, 1924 (via Einstein's translation and endorsement).
- Sen, Amartya. *The Argumentative Indian: Writings on Indian History, Culture and Identity*. Penguin Books, 2005.
- Ray, Prafulla Chandra. *A History of Hindu Chemistry*. Calcutta University Press, 1902 –1909.
- Dasgupta, Subrata. *Jagadis Chandra Bose and the Indian Response to Western Science*. Oxford University Press, 1999.
- Sen, S.N. (Ed.). *Dictionary of National Biography*, Volume I–III. Institute of Historical Studies, Calcutta, 1972.

- Saha. Meghnad and B.N. Srivastava. *A Treatise on Heat*. Indian Press, 1931.
- Roy, Sisir Kumar. *Founders of Modern Science in India*. Indian National Science Academy, 1983.
- Sarkar, Mahendralal. "On the Cultivation of Science by the Natives of India." *Address at the Inauguration of the Indian Association for the Cultivation of Science*, 1876.
- Bose Institute Archives, Kolkata: www.jcbose.ac.in
- Ray, Satyajit. *Professor Shonku Samagra*. Ananda Publishers, 1980s.
- Hazra Himanshu." Vigyansadhakmoy Bharat." Jayanti Prakashan (2019)
- Patra Sudhanshu. "Bharater Vigyansadhak". Sreejan Prakashani (1986)

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