

Scientific research papers by native Bengali authors during the nineteenth century

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This note aims at preparing a list of papers on the contribution of native Bengali authors during the 19th century in the field of science and technology (S&T). A distribution profile of subjects and authorship pattern has also been prepared. The major sources of information are the Catalogue of Scientific Papers of the Royal Society of London; A Bibliography of Physics, Astronomy, Astrophysics and Geophysics in India: 1800–1950 compiled by S. N. Sen and Santimay Chatterjee; The Centenary Review of the Asiatic Society and the Index to the publications of the Asiatic Society (1788–1953). Other sources such as available bibliographies of authors, primary journals and Internet resources have also been used.

The study of modern science in India was initiated by the Europeans in the late 17th and early 18th centuries¹. These studies were mostly related to observations on geographical, geological, botanical, climatological, anthropological and socio-cultural conditions of the country. The major players were the British who took over administrative control of the whole country, as also parts of adjacent areas such as Burma (now Myanmar), Tibet, etc. after winning the Battle of Plassey or Palasi in 1757 (ref. 2). The capital of British India not only in terms of political, legal and economic, but also of academic, scientific and technological matters was Calcutta (now Kolkata). The colonizing British also took a keen interest in handicraft, art, technology and techniques that prevailed and were practised in India. Flow of information was not just one-way, as is commonly believed. It has been argued that the Industrial Revolution in England had received significant thrust and influence from her empire in India³.

In 1784, the Asiatic Society of Bengal was established in Calcutta and publication of *Asiatick Researches* was started in 1788. The journal was renamed as the *Journal of the Asiatic Society of Bengal* in 1832.

The impact of the Western developments in literature, politics, philosophy, and science began to be felt in India, particularly in Bengal in the late 18th century. The impact gave rise to the so-called Bengal Renaissance⁴. In 1816, Raja Rammohan Roy, considered to be the first modern personality in India, stayed in Calcutta on a permanent basis and mobilized his activities in literary, social and religious matters. He strongly advocated for a rational approach and scientific attitude. In 1817, the Hindu College

was established. The precursor of the Presidency College in Calcutta, the Hindu College was the first institution of higher learning in Western science, literature and freethinking. In the same year, the Calcutta School Book Society was established with the objective of publishing school books in Bengali. The Society published a number of books on science and mathematics. Many authors consider these two years as the beginning of the Bengal Renaissance⁴. The headquarter of the Great Trigonometrical Survey of India (later the Survey of India) was Calcutta, established in 1818 and was followed by the Geological Survey of India (GSI) (1851), Archaeological Survey (1859), Botanical Survey (1890), Zoological Survey (1916), etc. However, it took another 15–16 years for a native person to publish a research article. 'A description of a common tree found in Bengal "Bel" or "Bilwa" (*Aegle marmelos*)' written by Baboo Ramcomol Shen (1829) was published in *The Transactions of Medical and Physical Society of Calcutta*. This is probably the first ever research-type scientific article written by a native Bengali in the modern era. Such descriptive accounts continued for another 40 years or so. Many articles were simple notes on something found in old Sanskrit texts. In the meantime Calcutta Medical School was established (1835) and a few medical journals such as, *The Transactions of Medical and Physical Society of Calcutta* (1825), *Indian Journal of Medical Science* (1834), *Indian Annals of Medical Science* (1853) were started⁵. But most of these were controlled by the Europeans.

Soon the Indians started visiting Europe for studies from the fourth decade of the 19th century. The highly educated Bengalis who had studied in Europe began to

return home during 1870–1880, but hardly anyone among them devoted time to scientific research. Two remarkable examples among these scholars are Ananda Mohan Bose (Basu) (Wrangler in Mathematics from Cambridge University in 1874) and Aghor Nath Chattopadhyay (D Sc in Chemistry from Edinburgh University in 1877 and illustrious father of poet and politician Sarojini Naidu). Aghor Nath became a Diwan (Chief Minister) in the Nizam's state in Hyderabad after returning to India. Interestingly enough, P. C. Ray has mentioned in his 'autobiography' that Van't Hoff asked him about Chattopadhyay when Ray met him sometime in 1904 (ref. 6). Anand Mohan Bose took up the career of a (not so successful) barrister and later became President of the Indian National Congress. However, he retained a keen interest in science education and research throughout his life. There were others who were involved in scientific research without having any exposure to foreign universities.

Gopal Chandra Roy published a paper 'On the solvent action of Papaya juice on the nitrogenous articles of food' (1874) in *Glasgow Medical Journal*. This is most probably the first article written by a native Indian to be published in a foreign journal. In 1876, another major event took place; the Indian Association for the Cultivation of Science (IACS) was established after a long struggle by Mahendra Lal Sarkar. However, IACS could not work properly before mid-1880s. In 1880, P. N. Bose joined GSI as the first Indian in a graded officer post. He published a research paper in palaeozoology in the *Journal of the Geological Society of London*. The same year saw the publication of a short mathematical paper in *Messenger of Mathematics*,

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Table 1. List of papers (1829–1900)

Year	Title	Author	Journal	Subject
1829	Notice of the Bela (Vilwa tree), or bel	Shen (Baboo); Ramcomol	<i>Transactions of the Medical and Physical Society of Calcutta</i>	Botany
1832	Oriental accounts of the precious minerals, translated with remarks by James Prinsep	Kalikishan; Bahadur, Raja	<i>Journal of the Asiatic Society of Bengal</i>	Earth Sciences
1832	On the indications of the pulse according to the Hindus. Translated from the second section of the <i>Oushudh-vali</i> , a medical treatise in the Bhaka language	Kalikishan; Bahadur, Raja	<i>Journal of the Asiatic Society of Bengal</i>	Medical Science
1833	Description of an Indian balance called Tula	Kalikishan; Bahadur, Raja	<i>Journal of the Asiatic Society of Bengal</i>	Technology
1833	Mode of dyeing Kharwa cloth; practised in Bundelkhand. Translated from a Persian account	Sen, Harimohan	<i>Journal of the Asiatic Society of Bengal</i>	Technology
1838	On the Bair or Ber tree	Deb, Radhakant	<i>Transactions of the Agricultural and Horticultural Society of India</i>	Agriculture
1842	An account of the table used for reducing Barometrical observations to 32 degree Farenheit taken in the Surveyor-General's office, Calcutta	Sickdhar, Radhanath	<i>Journal of the Asiatic Society of Bengal</i>	Earth Sciences
1854	Cases in Midwifery	Chatterjee, Brindaban	<i>The Indian Annals of Medical Science</i>	Medical Science
1855	Cases of tetanus consequent on a lacerated wound, and its treatment	Basak, Babu; Dayal Charan	<i>The Indian Annals of Medical Science</i>	Medical Science
1855	Remarks on the epidemic diseases in the Deegah Penitentiary during 1852–1853	Dutta, Babu N. M.	<i>The Indian Annals of Medical Science</i>	Medical Science
1856	Note on Asthma	Chakravorty, S. G.	<i>The Indian Annals of Medical Science</i>	Medical Science
1856	Report of dispensary cases	Chakravorty, S. G.	<i>The Indian Annals of Medical Science</i>	Medical Science
1865	Account of a meteorite which fell at Gopalpur, near Bagerhaut, in the district of Jessore, on the 23 May 1865	Bysack, Babu Gour Doss	<i>Proceedings of the Asiatic Society of Bengal</i>	Astronomy
1865	Cases illustrative of the pathology of Dysentery	Chakravorty, S. G.	<i>The Indian Annals of Medical Science</i>	Medical Science
1865	Note on a whirlwind at Pundooah	Chunder Sikar; Chatterjea, Babu	<i>Proceedings of the Asiatic Society of Bengal</i>	Technology
1865	A short account of a native medicine called 'Bakus'	Dutta, Babu; Uday Chandra	<i>The Indian Annals of Medical Science</i>	Medical Science
1866	Hindu social laws and habits viewed in relation to health	Dey, Babu; Kanailal	<i>The Indian Annals of Medical Science</i>	Medical Science
1866	On scientific technology	Mitra, Rajendralala	<i>Proceedings of the Asiatic Society of Bengal</i>	Technology
1867	A clinical retrospect of hospital experience of civil medical cases	Chakravorty, S. G.	<i>The Indian Annals of Medical Science</i>	Medical Science
1868	The adjustment of the Hindu calender	Ghosh, Pratap Chandra	<i>Journal of the Asiatic Society of Bengal</i>	Astronomy

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Table 1. (Contd.)

Year	Title	Author	Journal	Subject
1869	Notes on Sanscrit Materia Medica	Dutta, Babu; Uday Chandra	<i>The Indian Annals of Medical Science</i>	Medical Science
1869	Note on an extraordinary flood in upper Assam	Paula, Ratna	<i>Proceedings of the Asiatic Society of Bengal</i>	Earth Sciences
1869	Monthly mean of the principal meteorological elements and actual rainfall recorded at the Calcutta observatory for twelve years, from 1856 to 1867	Sen, Gopenath	<i>Journal of the Asiatic Society of Bengal</i>	Earth Sciences
1869	Tabular statement showing the monthly rainfall, from January, 1837 to November, 1868, and the monthly Quinquennial average for each month during that period, as taken at the Surveyor-General's Office, Calcutta	Sen, Gopenath	<i>Journal of the Asiatic Society of Bengal</i>	Earth Sciences
1870	Notes on Charak Sanhita	Sarcar, Mahendralal	<i>Proceedings of the Asiatic Society of Bengal</i>	Medical Science
1871	On a new species of Scincus	Mitra, Rajendralala	<i>Proceedings of the Asiatic Society of Bengal</i>	Zoology
1872	Electrotypes of two ancient seals	Mitra, Rajendralala	<i>Proceedings of the Asiatic Society of Bengal</i>	Technology
1874	On the solvent action of Papaya juice on the nitrogenous articles of food	Roy, Gopaul Chunder	<i>Glasgow Medical Journal</i>	Medical Science
1874	On Burdwan fever	Roy, Gopaul Chunder	<i>Indian Medical Gazette</i>	Medical Science
1875	Report of an enquiry into the conditions, during life, of the liver and kidneys in Asiatic Cholera	Banerjee, Rajmohan	<i>Indian Medical Gazette</i>	Medical Science
1875	Reply to enquiry regarding the mention of leprosy by ancient Hindu writers	Mitra, Rajendralala	<i>Proceedings of the Asiatic Society of Bengal</i>	Medical Science
1875	Obstruction of the bowels treated by means of Strychnine	Nandi, Kalidas	<i>Indian Medical Gazette</i>	Medical Science
1875	Surgery in the Malarious district of Jehanabad	Roy, G. C.	<i>Indian Medical Gazette</i>	Medical Science
1875	Treatment of liver abscess by aspiration	Roy, G. C.	<i>Indian Medical Gazette</i>	Medical Science
1875	Is Quarantine effective in Cholera?	Roy, G. C.	<i>Indian Medical Gazette</i>	Medical Science
1875	Kidney disease including hypertrophy of heart and haemorrhage into Brain	Roy, G. C.	<i>Indian Medical Gazette</i>	Medical Science
1875	Cold water treatment of Fever	Roy, G. C.	<i>Indian Medical Gazette</i>	Medical Science
1875	Catheter Fever	Roy, G. C.	<i>Indian Medical Gazette</i>	Medical Science
1875	On the relative digestive value of Fairchild's Peptonising powders, Pepsine, and Papaya juice on milk	Roy, G. C.	<i>Indian Medical Gazette</i>	Medical Science
1875	Two cases of poisoning by opium successfully treated by subcutaneous injection by Atropine	Roy, G. C.	<i>Indian Medical Gazette</i>	Medical Science
1875	Lithotomy	Roy, Radhanath	<i>Indian Medical Gazette</i>	Medical Science
1876	Experiments with cobra poison	Roy, Gopaul Chunder	<i>Indian Medical Gazette</i>	Medical Science
1877	Remarks on the action of snake poison on the blood	Roy, Gopaul Chunder	<i>Indian Medical Gazette</i>	Medical Science

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Table 1. (Contd.)

Year	Title	Author	Journal	Subject
1878	Sarcomatous tumour of left upper jaw: partial excision of bone	Dutta, Dinobandu	<i>Indian Medical Gazette</i>	Medical Science
1878	Cases of Vesical Calculus	Dutta, Dinobandu	<i>Indian Medical Gazette</i>	Medical Science
1879	Some remarks on the relation of filaria sanguinis hominis to chyluria and other lymphoid diseases	Roy, Gopaul Chunder	<i>Indian Medical Gazette</i>	Medical Science
1880	Notes on the history and comparative anatomy of the Carnivora	Bose, P. N.	<i>Geological Magazine</i>	Palaeontology
1880	Undescribed fossil Carnivora from the Sivalik Hills in the collection of the British Museum	Bose, P. N.	<i>Quarterly Journal of the Geological Society of London</i>	Palaeontology
1880	The effect of lunar influence on disease	Chatterjee, S. C.	<i>Indian Medical Gazette</i>	Medical Science
1880	Proof of Euclid I.25	Mukherjee, Ashutosh	<i>Messenger of Mathematics</i>	Mathematics
1881	Note on some earthen pots found in the alluvium at Mahesvara (Mahesar)	Bose, P. N.	<i>Journal of the Asiatic Society of Bengal</i>	Earth Sciences
1881	Undescribed fossil Carnivora from the Sivalik Hills in the collection of the British Museum	Bose, P. N.	<i>Records of the Geological Survey of India</i>	Palaeontology
1881	Some remarks on leprosy	Roy, Gopaul Chunder	<i>Indian Medical Gazette</i>	Medical Science
1883	Note on Mahesvara on the Narvada, and the identification of Hiouen Thsang's 'Mushevarapara'	Bose, P. N.	<i>Proceedings of the Asiatic Society of Bengal</i>	Earth Sciences
1884	Note on lignite near Raipur, Central Provinces	Bose, P. N.	<i>Records of the Geological Survey of India</i>	Earth Sciences
1884	Extension of a theorem of Salmon	Mukherjee, Ashutosh	<i>Messenger of Mathematics</i>	Mathematics
1885	Geology of the lower Narvada valley between Nimawar and Kawant	Bose, P. N.	<i>Memoirs of the Geological Survey of India</i>	Earth Sciences
1885	Notes on a portion of the lower Vindhyan area of the Sone Valley	Datta, P. N.	<i>Records of the Geological Survey of India</i>	Earth Sciences
1886	A note on elliptic function	Mukherjee, Ashutosh	<i>Quarterly Journal of Mathematics</i>	Mathematics
1887	The iron industry of the western portion of the district of Raipur	Bose, P. N.	<i>Records of the Geological Survey of India</i>	Earth Sciences
1887	Conjugated sulphates and isomorphous mixtures of the copper-magnesium group	Ray, Prafulla Chandra	<i>Edinburgh Chemical Society Proceedings</i>	Chemistry
1888	Notes on the igneous rocks of the districts of Raipur and Balaghat, Central Provinces	Bose, P. N.	<i>Records of the Geological Survey of India</i>	Earth Sciences
1888	The manganese-iron and manganese-ore of Jabalpur	Bose, P. N.	<i>Records of the Geological Survey of India</i>	Earth Sciences
1888	Notes on some mica-traps from Barakar and Raniganj	Bose, P. N.	<i>Records of the Geological Survey of India</i>	Earth Sciences
1888	The geometric interpretation of MONGE'S differential equation to all conics	Mukherjee, Ashutosh	<i>Nature</i>	Mathematics
1888	The geometric interpretation of MONGE'S differential equation to all conics; the sought found	Mukherjee, Ashutosh	<i>Nature</i>	Mathematics

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Year	Title	Author	Journal	Subject
1888	Remarks on MONGE's equation	Mukherjee, Ashutosh	<i>Proceedings of the Asiatic Society of Bengal</i>	Mathematics
1888	On MONGE's differential equation to all conics. Remarks on a letter by G. H. Stuart	Mukherjee, Ashutosh	<i>Proceedings of the Asiatic Society of Bengal</i>	Mathematics
1888	Note on a bicircular quartic	Mukherjee, Ashutosh	<i>Proceedings of the Asiatic Society of Bengal</i>	Mathematics
1888	On the differential equation of trajectory	Mukherjee, Ashutosh	<i>Journal of the Asiatic Society of Bengal</i>	Mathematics
1888	On MONGE's differential equation to all conics	Mukherjee, Ashutosh	<i>Journal of the Asiatic Society of Bengal</i>	Mathematics
1888	A memoir on plane analytic geometry	Mukherjee, Ashutosh	<i>Journal of the Asiatic Society of Bengal</i>	Mathematics
1889	The manganiferous iron and manganese-ore of Jabalpur	Bose, P. N.	<i>Records of the Geological Survey of India</i>	Earth Sciences
1889	Further notes on a portion of the lower Vindhyan area (sub-Kaimur) of the Sone Valley, Rewah	Datta, P. N.	<i>Records of the Geological Survey of India</i>	Earth Sciences
1889	On the conjugated sulphates of the copper-magnesium group	Ray, Prafulla Chandra	Edinburgh Royal Society Proceedings	Chemistry
1890	The Darjelling coal between the Lisu and the Ramthi river exploring during season 1889-1890	Bose, P. N.	<i>Records of the Geological Survey of India</i>	Earth Sciences
1890	On two astrolabes purchased for the society by Prof. Mahesachandra Nyayaratna at Allahabad	Mitra, Rajendralala	<i>Proceedings of the Asiatic Society of Bengal</i>	Earth Sciences
1890	Genesi del baco da seta	Mukerji, Nitya Gopal	Society of Entomologists Bulletin	Zoology
1890	Note on piuri or 'Indian Yellow'	Mukharji, T. N.	<i>Kew Bulletin</i>	Chemistry
1890	Some applications of elliptic functions to problem of mean values	Mukherjee, Ashutosh	<i>Journal of the Asiatic Society of Bengal</i>	Mathematics
1890	On the differential equation of all parabolas	Mukherjee, Ashutosh	<i>Journal of the Asiatic Society of Bengal</i>	Mathematics
1890	A general theorem on the differential equations of trajectories	Mukherjee, Ashutosh	<i>Journal of the Asiatic Society of Bengal</i>	Mathematics
1890	The geometric interpretation of MONGE'S differential equation to all conics	Mukherjee, Ashutosh	<i>Journal of the Asiatic Society of Bengal</i>	Mathematics
1890	On Poisson's integral (with a wood-cut)	Mukherjee, Ashutosh	<i>Journal of the Asiatic Society of Bengal</i>	Mathematics
1890	On some definite integrals	Mukherjee, Ashutosh	<i>Proceedings of the Asiatic Society of Bengal</i>	Mathematics
1891	Extracts from the journal of a trip to the glaciers of the Kabru, Pandim, etc.	Bose, P. N.	<i>Records of the Geological Survey of India</i>	Earth Sciences
1891	Further note on the Darjelling coal exploration	Bose, P. N.	<i>Records of the Geological Survey of India</i>	Earth Sciences
1891	Note on the geology and mineral resources of Sikkim	Bose, P. N.	<i>Records of the Geological Survey of India</i>	Earth Sciences
1891	On CLEBSCH'S transformation of the hydrokinetic equations	Mukherjee, Ashutosh	<i>Journal of the Asiatic Society of Bengal</i>	Mathematics

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Table 1. (Contd.)

Year	Title	Author	Journal	Subject
1891	Note on STOKES's theorem and hydrokinetic circulation	Mukherjee, Ashutosh	<i>Journal of the Asiatic Society of Bengal</i>	Mathematics
1891	On a curve of aberrancy	Mukherjee, Ashutosh	<i>Journal of the Asiatic Society of Bengal</i>	Mathematics
1891	Nobile age of females in India	Sen, Boyle Chunder	<i>Indian Medical Gazette</i>	Medical Science
1892	On the study of indigenous drugs	Basu, B. D.	<i>Indian Medical Gazette</i>	Medical Science
1892	Tar ointment in chronic Eczema	Basu, B. D.	<i>Indian Medical Gazette</i>	Medical Science
1892	A case of Beri-Beri	Basu, B. D.	<i>Indian Medical Gazette</i>	Medical Science
1892	Village sanitation	Gupta, K. P.	<i>Indian Medical Gazette</i>	Medical Science
1892	Medical-legal work in the district of Backergunge from January to June 1892	Gupta, K. P.	<i>Indian Medical Gazette</i>	Medical Science
1892	Compound fractures treated by Creolin irrigation	Mitra, A.	<i>Indian Medical Gazette</i>	Medical Science
1892	Winter practice in Kashmir	Mitra, A.	<i>Indian Medical Gazette</i>	Medical Science
1893	Note on granite in the districts of Tavoy and Mergui	Bose, P. N.	<i>Records of the Geological Survey of India</i>	Medical Science
1893	Notes on the geology of a part of the Tenasserim valley with special reference to the Tendau-Kamapying coal-field	Bose, P. N.	<i>Records of the Geological Survey of India</i>	Earth Sciences
1893	Note on two cases of aphonia	Chatterjee, A.	<i>Indian Medical Gazette</i>	Medical Science
1893	Vesicular mole	Das, Kedar Nath	<i>Indian Medical Gazette</i>	Medical Science
1894	Idiopathic tetanus with remarks on the etimology of tetanus	Das, Kedar Nath	<i>Indian Medical Gazette</i>	Medical Science
1894	Rough notes on some of the sacred flowers of the Hindus	Ghosh, Yogendracri	<i>Journal of the Agricultural and Horticultural Society of India</i>	Agriculture
1894	Capsicum, potatoes and some other economic Solanaceae of India	Ghosh, Yogendracri	<i>Journal of the Agricultural and Horticultural Society of India</i>	Agriculture
1894	Notes on some ornamental aquatics	Ghosh, Yogendracri	<i>Journal of the Agricultural and Horticultural Society of India</i>	Agriculture
1894	On the chemical examination of certain Indian food stuffs. Part I. Fats and oils	Ray, Prafulla Chandra	<i>Journal of the Asiatic Society of Bengal</i>	Chemistry
1894	Diabetes mellitus	Sen, Boyle Chunder	<i>Indian Medical Gazette</i>	Medical Science
1895	On polarisation of electric rays by double refracting crystals	Bose, J. C.	<i>Electrician</i>	Physics
1895	On double refraction of the electric ray by a strained dielectric	Bose, J. C.	<i>Electrician</i>	Physics
1895	On a new electro-polariscope	Bose, J. C.	<i>Electrician</i>	Physics
1896	On the transformation of hypochlorites into chlorites	Bhaduri, Jyotibhushan	<i>Proceedings of the Asiatic Society of Bengal</i>	Chemistry
1896	On the determination of the indices of refraction of various substances for the electric ray. Index of refraction of sulphur. Index of refraction of glass	Bose, J. C.	<i>Proceedings of the Royal Society of London</i>	Physics
1896	On polarisation of electric rays by double refracting crystals	Bose, J. C.	<i>Journal of the Asiatic Society of Bengal</i>	Physics
1896	Diabetes mellitus and its prevention	Bose, Koilas, C.	<i>Indian Medical Gazette</i>	Medical Science
1896	Puerperal eclamsia	Das, Kedar Nath	<i>Indian Medical Gazette</i>	Medical Science

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Table 1. (Contd.)

Year	Title	Author	Journal	Subject
1896	Small pox in Calcutta	Das, Sundari Mohan	<i>Indian Medical Gazette</i>	Medical Science
1896	Notes from the chemical laboratory of the Presidency College, Calcutta. Notes on new salts of cobalt and nickel	Nag, Nagendra Chandra	<i>Journal of the Asiatic Society of Bengal</i>	Chemistry
1896	Ueber Merkuronitrite	Ray, Prafulla Chandra	<i>Ztschr. Anorg. Chem.</i>	Chemistry
1897	Note on the decomposition of mercurous chlorite and estimation of free chlorine	Bhaduri, Jyotibhushan	<i>Journal of the Asiatic Society of Bengal</i>	Chemistry
1897	Electromagnetic radiation and the polarisation of the electric ray	Bose, J. C.	<i>Friday Evening Discourse, Royal Institute</i>	Physics
1897	On a complete apparatus for investigations on electromagnetic radiation	Bose, J. C.	<i>Berlin Phys. Ges. Verh.</i>	Physics
1897	Sur un appareil complet pour les recherches relatives, aux ondes electromagnetiques	Bose, J. C.	<i>Paris, AC. Sci. C R</i>	Physics
1897	On a complete apparatus for the study of the properties of electric waves	Bose, J. C.	<i>Philosophical Magazine</i>	Physics
1897	On the determination of the wave-length of electric radiation by diffraction grating	Bose, J. C.	<i>Proceedings of the Royal Society of London</i>	Physics
1897	On the selective conductivity exhibited by certain polarising substances	Bose, J. C.	<i>Proceedings of the Royal Society of London</i>	Physics
1897	Is perforation justifiable in delay of delivery of the after-coming head?	Das, Kedar Nath	<i>Indian Medical Gazette</i>	Medical Science
1897	Dermatitis exfoliativa	Das, Kedar Nath	<i>Indian Medical Gazette</i>	Medical Science
1897	Cases of Scarlatina in India	Das, Kedar Nath	<i>Indian Medical Gazette</i>	Medical Science
1897	The nitrite of mercury and the varying conditions under which they are formed	Ray, Prafulla Chandra	<i>Chem. Soc. Jl.</i>	Chemistry
1897	Mercury hyponitrites	Ray, Prafulla Chandra	<i>Chem. Soc. Jl.</i>	Chemistry
1897	The interaction of mercurous nitrite and the alkyl iodides	Ray, Prafulla Chandra	<i>Chem. Soc. Proc.</i>	Chemistry
1897	On the action of sodium hyponitrite on mercuric solution	Ray, Prafulla Chandra	<i>Chem. Soc. Jl.</i>	Chemistry
1897	On a new method of preparing mercuric hyponitrite	Ray, Prafulla Chandra	<i>Chem. Soc. Jl.</i>	Chemistry
1897	On mercurous nitrite	Ray, Prafulla Chandra	<i>Journal of the Asiatic Society of Bengal</i>	Chemistry
1897	Note on the breeding of various birds (herons and cormorants) in a wild state in the Alipur zoological gardens	Sanyal, Ram Brahma	<i>Proceedings of the Asiatic Society of Bengal</i>	Zoology
1898	Contribution from the chemical laboratory, Presidency College, Calcutta. On double thiosulphates of copper and sodium	Bhaduri, Chandrabhushan Bhaduri, Jyotibhushan	<i>Journal of the Asiatic Society of Bengal</i>	Chemistry
1898	On the production of a 'dark cross' in the field of electromagnetic radiation	Bose, J. C.	<i>Proceedings of the Royal Society of London</i>	Physics
1898	On the influence of thickness of air-space on total reflection of electric radiation	Bose, J. C.	<i>Proceedings of the Royal Society of London</i>	Physics

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Year	Title	Author	Journal	Subject
1898	On the rotation of plane of polarisation of electric waves by a twisted structure	Bose, J. C.	<i>Proceedings of the Royal Society of London</i>	Physics
1899	Leucorrhea	Banerjee, R. P.	<i>The Indian Lancet</i>	Medical Science
1899	Electromagnetic radiation and polarisation of the electric ray	Bose, J. C.	<i>Proceedings of the Royal Institute of London</i>	Physics
1899	Report (on the great earthquake of 12th June 1897, Eastern Bengal)	Bose, P. N.	<i>Memoirs of the Geological Survey of India</i>	Earth Sciences
1899	Tropical diseases in England	Mullick, Sarat Kumar	<i>The Indian Lancet</i>	Medical Science
1899	A new coherer	Ray, Jagadindu	<i>Calcutta University Magazine</i>	Mathematics
1900	On a self-recovering coherer and the study of the action of different metals	Bose, J. C.	<i>Proceedings of the Royal Society of London</i>	Physics
1900	On electric touch and the molecular changes produced in matter by electric waves	Bose, J. C.	<i>Proceedings of the Royal Society of London</i>	Physics
1900	On the periodicity in the electric touch of chemical elements. Preliminary notice	Bose, J. C.	<i>Proceedings of the Royal Society of London</i>	Physics
1900	On the similarity of effect of electrical stimulus on inorganic and living substances	Bose, J. C.	<i>Electrician</i>	Physics
1900	A note on snakes, snake-bite and their treatment	Chatterjee, N.	<i>Indian Medical Gazette</i>	Medical Science
1900	On a new method of treating the properties of the circle and analogous matters	Datta, Promothonath	<i>Journal of the Asiatic Society of Bengal</i>	Mathematics
1900	On the interaction of mercurous and mercuric nitrites with the nitrites of silver and sodium	Ray, Prafulla Chandra	<i>Chem. Soc. Proc.</i>	Chemistry
1900	The interaction of mercurous nitrite and ethyl iodide	Ray, Prafulla Chandra	<i>Chem. Soc. Proc.</i>	Chemistry
1900	On mercurous iodide	Ray, Prafulla Chandra	<i>Chem. Soc. Proc.</i>	Chemistry
1900	On mercurous iodide and a new method of its preparation	Ray, Prafulla Chandra	<i>Journal of the Asiatic Society of Bengal</i>	Chemistry
1900	Further researches on mercurous nitrite and its derivatives	Ray, Prafulla Chandra	<i>Journal of the Asiatic Society of Bengal</i>	Chemistry

Cambridge by Ashutosh Mukherjee, then only a boy of 16 years. In 1895, two major events occurred which radically changed the scenario of research and education in science in Bengal. J. C. Bose and P. C. Ray made significant publications, respectively, in physics and chemistry. Major activities by the five persons, M. L. Sarkar, P. N. Bose, Ashutosh Mukherjee, J. C. Bose and P. C. Ray ushered in a new era. The successive generations of scientific researchers were mostly students of J. C. Bose and P. C. Ray.

With this background we can make a period division for the growth of scien-

tific activity and research in Bengal: (i) 1784–1816: establishment of the Asiatic Society and the first phase; (ii) 1817–1835: establishment of the Hindu College, Calcutta School Book Society, Trigonometrical Survey and Medical College; (iii) 1836–1876: establishment of the Engineering College, GSI, Archeological Survey, University of Calcutta, IACS; (iv) 1877–1895: starting phase of significant academic research by native Bengalis; (v) 1896–1916: spread of research, beginning of the Indian Science Congress, starting of the Science College, University of Calcutta.

Thus, exactly a century (1817–1916) had lapsed for scientific research to reach its maturity in Bengal. We may consider the next period 1916–1947, till independence, as one of the matured research and development in S&T with a nationalistic zeal. Between 1784 and 1828, there was no publication by a native Bengali worthy of being called as ‘research work’. One had to wait till 1842, when Radhanath Sickdhar, the chief computer of the Trigonometrical Survey published ‘An account of the Table used for reducing Barometrical observations to 32 degree Fahrenheit taken in the Surveyor-General’s office, Calcutta’. It is the only

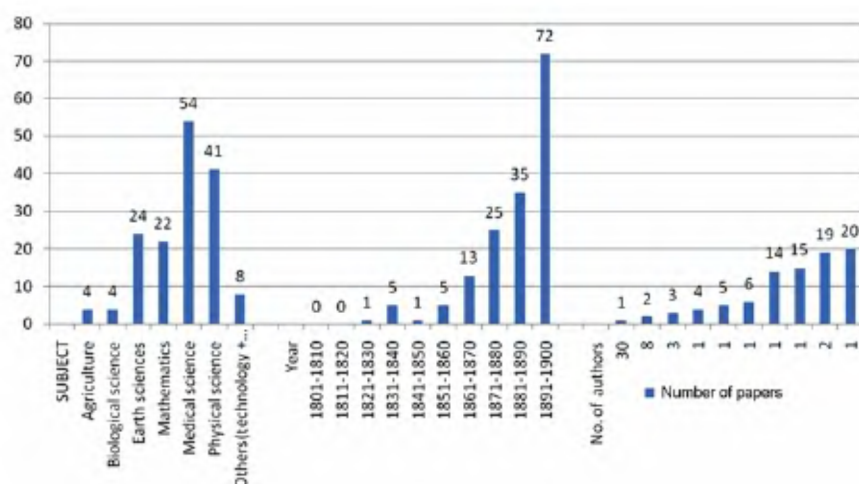


Figure 1. Distribution profile of subjects, a decade-wise distribution of data for 1801–1900, and authorship pattern.

research paper during the whole decade of 1840s. There were only five in the previous decade and five articles in the next decade. But there were 12 articles in the 1860s. It took another three decades for serious experimental work to be done. During the 1870s activities of a few doctors like G. C. Roy and during the 1880s research publications by P. N. Bose and Ashutosh Mukherjee paved the way for activities of the 1890s.

During 72 years (1829–1900) of the 19th century, 157 articles were published. During the period break-up of the divisions was as follows: there were five publications between 1816 and 1835, 37 between 1836 and 1876, 70 between 1877 and 1895, and 45 between 1896 and 1900.

A list of research publications by native Bengalis has been prepared (Table 1) to analyse data and for bibliographic record. We have not changed or made uniform spellings of names and have reproduced them as they were found. The list may be considered as more or less comprehensive. The main sources of information were the *Catalogue of Scientific Papers of the Royal Society of London*⁷; the paper by S. N. Sen and Chatterjee⁸, *The Centenary Review of the Asiatic Society and the Index to the Publication of the Asiatic Society* (1788–1953)⁹; *The Indian Annals of Medical Science*, *Indian Medical Gazette*; *The Indian Lancet* and some other sources, including *Records of the Geological*

Survey of India and *Memoirs of the Geological Survey of India*, available bibliographies of authors and Internet resources. For medical science papers, in the absence of suitable secondary sources, direct searching of available journals was made. Issues of the short-lived medical science abstract named *Calcutta Medical News: A Monthly Abstract of Medical Literature* (1880) could not be found. The list lacks in two other aspects: (a) coverage of papers on agricultural science was scanty and research papers by native Indians were few in number. It has not been possible for us to search agricultural journals published from India. (b) There were no Bengali vernacular research journals. It was also not possible to scan through the available old Bengali periodicals to find out a rare occasional research-based paper. We may claim that the list is complete in pure science subjects, largely comprehensive for medical science, but of uncertain coverage in other subject fields. A distribution profile of subjects, a decade-wise distribution of data for 1801–1900, and authorship pattern are shown in Figure 1.

Thirty authors published one article each; eight authors two articles each; three authors three articles each. Although 4, 5, 6, 14, 15, 20 articles have been published by one author, two authors contributed 19 articles each. They were P. N. Bose and J. C. Bose. Fourteen and 15 articles were published by G. C.

Roy and P. C. Ray respectively. Twenty articles were published by Ashutosh Mukherjee.

There was only a single instance of collaborative effort; the Bhaduri brothers (Jyotibhushan and Chandrabhushan) published a paper in 1898 in the *Journal of the Asiatic Society of Bengal*.

Note: A question may be raised as to the criteria of inclusion of titles in the list as research papers. We have rarely applied our own judgements; we have depended on the secondary services and the nature of the primary source.

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