

Acharya Prafulla Chandra Ray

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Prafulla Chandra Ray was born in the village of Raruli in the District of Jessore (now Khulna) in the then undivided Bengal (now Bangladesh) on August 2, 1861. In the same year, two other great personalities, one Rabindranath Tagore was born at Jorasanko, Calcutta, and the other Mr Motilal Nehru was born at Allahabad. Also during the same year, the 81st element in the Mendeleev's Periodic Table, Thallium was discovered in the Crook's Chemical Laboratory. His father, Harish Chandra Ray was a wealthy land lord, He was the youngest among his brothers.

Harish Chandra was a very meritorious student. But, during his study at Krishnanagar College, suddenly his father died. Such circumstance compelled him to discontinue his study and come back to Raruli for taking the responsibility of looking after the Zamindari. He became an active associate of the then New Bengal Movement and engaged himself for the spread of education in his locality. By virtue of his attachment to various federal committees as member, he had close association with many high profile personalities. He was well versed in several languages like English, Parsi, Arabic and Sanskrit. He built a library at home where he kept many books covering all the above languages. Besides, he used to subscribe regularly various News Papers and Magazines. So, Prafulla Chandra had the opportunity to utilize this literary environment at home to build the foundation of learning above languages and developing interest in literatures. Through the reading of editorials and criticisms in all those news papers and magazines, he developed the attitude of expressing his personal opinion on any issue, which, actually, was reflected in his various writings in the future. His father maintained a friendly relation with his sons, and he used to quench Prafulla Chandra's thirst for knowledge with all possible care.

Prafulla Chandra got his early education in a village school, which was founded by his father. He came to Calcutta with his parents in 1870 and got admitted in Hare School. Here he faced some problems in getting association with his Calcuttan class-mates. When those class-mates came to know that Prafulla Chandra had come from Jessore, they started making fun of him by calling him 'Bangal' a derogatory word imposed on peoples of East Bengal indicative of rustic behaviour. He could not protest due to his shyness and simplicity and felt uncomfortable. Soon after admission in this school, he suffered badly from dysentery for a long period for which he could not go to school. During this period of confinement at home, he read a lot of books covering biographies of great men, history and literature. Two years later (in 1874), he joined Albert School that was established by Keshab Chandra Sen, the founder of Brahmo Samaj. He passed the Entrance Examination from this School in 1879. Then he got admitted in F.A. class in the then Metropolitan Institution (now Vidyasagar College) founded by Pandit Iswar Chandra Vidyasagar. He already developed great fascination for biographies of great men, literature, history, and geography in his school

life. He had Chemistry as one of the science subjects in F.A. course. Those days, there was a dearth of good teachers in science subjects in colleges in general excepting Presidency College. However, there was a system in Presidency College by which the students from other colleges were allowed to attend lectures in science subjects in this College by payment of nominal fees. Professor Alexander Pedler was then teaching Chemistry in Presidency College. Prafulla Chandra used to go regularly to this College to listen to the lectures on Chemistry delivered by Prof. Pedler. By the fascinating lectures of this Professor, Prafulla Chandra gradually developed deep interest in Chemistry. In the B.A. course also, he opted for Chemistry as one of his study subjects. During the study of B.A., Prafulla Chandra appeared at the Gilchrist Scholarship Examination arranged by the London University. He passed this examination with eligibility for Scholarship that provided him with money for his travel to U.K. and the expense of his study there. There was another boy named Bahadurji (a Parsi) from Bombay also qualified in the above Gilchrist Examination that year. He proceeded to UK in 1882. He started his journey from Calcutta by sea via Colombo and Eden. When he reached Gravesend and then to Fen Chuch Street station in London after 33 days journey, Jagadish Chandra Basu along with Satya Ranjan Das (the elder brother of Mr. S. R. Das, the then Law Secretary to the Govt. of India) came to receive him. Prafulla Chandra stayed with them in London as their guest for a week or so, got acclimatized with the cold weather of the country. Then he proceeded to Edinburgh which is located about 400 miles north of London. He then got admitted into B.Sc class in Edinburgh University. There also he opted for Chemistry as one of the science subjects and was greatly fascinated by the lectures on Chemistry delivered by Prof. Alexander Crum Brown. After passing B.Sc. in 1885, he started basic research in Inorganic Chemistry under Prof. Crum Brown and got the D. Sc. degree in 1887. Based on the high quality of work he did during his doctoral research, he got the chance of carrying out advanced research as a Hope Prize Scholar. After completing this, he returned to India at the end of 1888.

Before he left for India from U.K., Prafulla Chandra tried his best to get a higher position in the Indian Educational Service as per his excellent academic qualifications. In those days, in the Educational Service in India, Indians were not given higher positions, even if they had eligibility. These higher positions were under the category of Imperial Service where only the Britishers were eligible. Indians were given the positions under Provincial Service category. Many British Educationists tried hard for Prafulla Chandra getting a position in the Imperial Service category but were not successful. After coming back to India, he joined Presidency College as an Assistant Professor of Chemistry in 1889 with a salary of Rs 250/- per month under unclassified category.

Around that time, Prafulla Chandra noticed that adulteration of food items especially oil and ghee by dishonest businessmen was widespread in Bengal. He prepared ghee from butter made from the milk that was milked from cow or buffalo and mustard oil from mustard seeds both under his direct supervision. Then he analyzed samples of ghee and mustard oil from the market as well as those prepared by him and published the results for public awareness for the benefit of the Society

When he started teaching, he realized that by delivering lecture only, the subject like Chemistry could not be made interesting to the students. So, he started giving experimental demonstrations along with the lectures in the class. Around 1890, educationists in India started thinking that the postgraduate teaching in science would be more effective, if there were also infrastructures that would provide environments for basic research. In 1885, Sir J. C. Bose joined Presidency College and started developing infrastructures for research in physics which took long nine years. In 1894, Dr. Ray got his new laboratory constructed according to his own plan and started basic research in inorganic Chemistry. In 1896, he discovered, though accidentally, mercurous nitrite. Such compound was not known earlier. Actually, he had a plan for preparing mercurous chloride (calomel) for which he wanted to use water-soluble mercurous nitrate as one of the starting material. So, in an attempt to prepare mercurous nitrate by reaction of mercury with dilute nitric acid, he observed a yellowish material settling at the bottom of the reaction flask. The material of that colour was not expected. But, as an experienced chemist, he had the inner eye to suspect it to be a new compound and concentrated on identifying it. After a thorough analysis, he identified it to be mercurous nitrite. He became very much excited for this discovery. During the later years, he prepared various other nitrite compounds including ammonium nitrite, hyponitrite as well as organic nitrites and studied extensively their properties. This discovery of Dr. Ray made revolutionary impact world wide. Indian minds were not yet prepared to feel the impact of this discovery, while the Western scientists (mainly chemists) were overwhelmed by this discovery and many of them congratulated Dr. Ray on his discovery. Actually, as Dr. Ray said that this discovery had changed his career as a researcher of Chemistry.

Prafulla Chandra developed the infrastructures and facilities for carrying out basic research in Chemistry under the then Indian conditions when science, especially Chemistry was not so popular. By his teaching and research, many bright students were influenced and induced to carry out research in Chemistry and were successful in establishing themselves as top ranking chemists putting the name of India in the map of world Chemistry. They are: Manick Lal Dey, F. V. Fernandez, Rajendra Lal Dey, Sir. J. C. Ghosh, J. N. Mukherjee, Rasik Lal Datta, Pulin Behari Sarkar, Priyada Ranjan Ray, Nil Ratan Dhar, Jitendra Lal Rakshit, Prafulla Chandra Mitra, Prafulla Kumar Basu, Jogendra Chandra Bardhan, Hemendra Kumar Sen and Biresh Chandra Guha, to name a few. In the 23rd issue of Nature 1912, there was published a monograph praising the effort and leadership of Dr. Ray in the rapid growth and advancement of research as well as in the increase of number of active and successful researchers in Chemistry in India.

Those days, for publishing a paper on any research work in Chemistry (and also in other science subjects), those had to communicate to the journals being published from Western countries (UK and USA). But, with time, publishing even a good piece of work in those journals became difficult for the fact that papers from all over the globe were crowding for consideration of publication, which was practically beyond the capacity of those journals. So, the fate of even good research papers from India was nothing but merciless refusal. To solve this problem related to the publication of research papers in Chemistry, Dr. S. S.

Bhatnagar, Dr. J. N. Mukherjee and Dr. J. C. Ghosh persuaded Dr. Ray to establish Indian Chemical Society. Dr Ray responded to this call and established it in the protocol of British Chemical Society as a founder President in 1924 and also initiated the publication of a journal under the same name, where the research papers in Chemistry could be published without any difficulty.

When Prafulla Chandra was studying in U.K. in 1885, the Rector of the Edinburgh University circulated a notice about an essay competition on the title “India-Before and After Mutiny”. The best essay would be awarded with prize. After reading this notice, he gave a serious thought on his taking part in this competition. His only hesitation was for the ensuing B.Sc. examination. Ultimately, he decided to take part in this competition leaving behind the study of Chemistry for some time because, he gave a priority to point out through this essay all the odds of British Rule imposed on India. He did not want to miss this chance. Also, his inherent interest in history gave him impetus to proceed in the way for collecting historical information related to the political, economic, and administrative mishandling by the British Ruler in India. During this compilation, he faced difficulty in assimilating the economic-related facts and figures. To overcome this, he made a thorough study of the basics of the economics with a particular emphasis on that of Indian Finance. He also utilized his knowledge about Latin and French in retrieving the historical information from the related journals and other media documents. In his writing, he openly discussed about the gradual changes of British Rule-directed political and economic environments and their progress in negative direction in some instances during the 125 years after the Battle of Plassy in 1757. He did not hesitate to openly criticize as to how the Annexation Rule (to annex a part of Burma to India), abolition of import tax on clothes, and closure of the salt factories in Oudh and Bengal had affected the Indian economy. He incorporated many other important issues in his writing and completed it within the deadline. Type writer was not available those days. He submitted the handwritten copy of the essay without keeping any extra copy with him. Looking into the final form of the essay, he himself said, ‘the pleasure I got by using my fingers to hold the pen for writing this essay is by no means less than that I used to get by using the same fingers to hold the test tubes in the laboratory for doing experiments’. When the result of adjudication was published, Prafulla Chandra’s essay was not awarded, while two others were. He apprehended such fate of his essay. He requested the authority to give back the copy of the essay, and his request was complied with. After he got it back, he looked into the copy and found adjudicator’s comment, which spelled like: “This article is of very high standard, though it had not been awarded. In this article, the candidate has attached a personal note telling his motto of writing this article”. The adjudicator had also pointed out that the candidate had attacked the British Ruler with harsh language throughout the essay. These comments of the adjudicator actually disclosed the reason for not considering the article for the award. At this, Prafulla Chandra became very much energized and activated and published the essay in the form of a book and distributed it among the Indian students with an appeal to them to keep in mind about the negligence and aloofness of British Ruler towards India. He also asked the young Indian students to act accordingly if and when they

would become the part of Indian Administration in future. Later, he published a simplified version of the book and distributed it among common peoples. (This book entitled “India: Before and after Mutiny” is available in the book bazaar at College Street, Calcutta). The Principal of Edinburgh University, Sir William Muir (who was one of the adjudicator of the essay of Prafulla Chandra), while delivering his lecture in the opening of the academic session in 1885, mentioned about his essay and uttered heart-felt words of praise about his capability. Prafulla Chandra also sent this book to the Parliamentarian John Brite with a separate note explaining how the annexation of Burma to India caused an adverse effect on Indian economy. Brite, in his reply, fully supported the above view of Prafulla Chandra and gave him freedom for using the reply letter in whatever way he would like. This essay became the frontline news and was a matter of immense discussion in both India and abroad.

In 1912, Dr. Ray attended the British Empire University Congress held at London as a representative of the Calcutta University. During his lecture in that Congress, Dr. Ray pointed out in details about the difficulties the graduates of the Indian Universities had been facing in UK. He also requested the relevant authority to resolve those difficulties.

Prafulla Chandra was in favour of teaching science in mother tongue, because he thought that this endeavour would help provide better opportunity for understanding science by the students. With such an intention in mind, he decided to write Chemistry in Bengali. But, soon he realized that it would not be an easy task to write on the unpalatable subject like Chemistry in Bengali to make it palatable to the students. So, he changed his mind and decided to write on plants and animals considering the fact that the youngsters are exposed to these components of nature while they grow up in the environment surrounding them. But, the difficulty was that he had no better knowledge than what he learned about the plants and animals during his study of B.Sc. So, to freshen up his knowledge with direct experience about plants and animals, he started visiting Botanical Garden at Shibpur and Zoological Garden at Alipore. He also went through the books on animals and plants. Furthermore, he got himself acquainted with the internal organs of animals with the help of his friends Drs. Nil Ratan Sarkar and Pran Krishna Acharyya through dissection of some animals. During this period, a funny event occurred. One day, while Dr. Ray was on morning walk, he came across a dead “Bham” (Indian Palm Civet) lying on the street. Immediately, he picked up this dead animal and brought it home. Then he got the body of the “Bham” dissected with the help of his above two friends and identified the different internal organs. Dr. Ray felt that such experience would help him write the book on animals with confidence.

Compilation of the ‘History of Hindu Chemistry’ is the greatest contribution of Dr. P. C. Ray. His inherent interest in history actually led him to proceed in this direction. He was studying the history of Chemistry out of his own interest. He knew that the KAVIRAJAs (Ayurvedic doctors) in this country had been using metal-based medicines for a long time. He got this information from “Hindu Materia Medica” by Uday Chand Datta. He thought that the preparation of these medicines must involve chemical processing. So, being curious, he consulted several original references in Sanskrit listed in the above book. As he was well versed in Sanskrit language, he faced no difficulty at all in retrieving the Alchemy-

related information of ancient India from the above book. Later, in the Presidency College Library, he also came across the book entitled “L’Alchimistes Grecs” compiled by the famous French Chemist Berthelot. From this book, he could not find any mention about the Indian Chemistry that was practiced even much before Greek did. He immediately wrote a letter to Berthelot telling that probably he (Berthelot) did not know about the Alchemy that was practiced in ancient India. In reply, Berthelot wrote that he would remain grateful after knowing all the information about the History of Indian Chemistry. This reply from Berthelot energized and inspired Dr. Ray. He then wrote a short essay incorporating the information on Indian alchemy mainly based on ‘RASENDRA-SAR-SAMGRAHA’ (written in Sanskrit) and sent that to Berthelot. After reading that monograph, Berthelot wrote an article with vivid discussion on this monograph of Dr. Ray and published in “Journal de Savant”. He sent a copy of that writing along with three other volumes written by him on the Chemistry in the middle age in Syria and Arab. Dr. Ray read all the above three books and became energized and inspired, and immediately decided to write the History of Hindu Chemistry. He completed the compilation and published it (Vol. I) in 1902 and sent a copy to Berthelot. After going through this book, Berthelot was very excited and wrote a 15-page review on this book in “Journal de Savant”. Good comments about this book were also published in various journals including Nature. When Dr. Ray came to know that Berthelot had called him (Dr. Ray) a ‘Savant’ (meaning a Saint or great man), he became overwhelmed with joy and felt himself rewarded. All those comments inspired and induced Dr. Ray to write the second volume of the History of Hindu Chemistry, which he completed and published in 1909. After going through this second volume, the French Professor of Chemistry Dr. Levy commented, ‘The Chemical Research Laboratory of P. C. Ray is the birthplace of new generation of chemists of India’. In fact, from the Chemical Research laboratory of P. C. Ray, many renowned chemists were made, few of them have been listed earlier in this article. In these two historical compilations, Dr. Ray has brought to the whole world about how and to what extent the Chemistry was progressed from the ancient time (from around 400 B.C.) to the time of compilation (1909).

Another great contribution of Dr. Ray was the establishment of Bengal Chemical and Pharmaceutical Works. Even 50 years before independence, Prafulla Chandra dreamt about industry, and he made it possible by establishing a chemical industry by his hard labour and scientific thinking. When he was in UK in 1880s, he noticed that there the industry and science were running side by side. Science was helping industries and the industries were helping science to progress in their respective path. He realized that for the benefit of the Society, man developed industries without knowing the relevant scientific principles at the initial stages. During later years, the progress of basic research in science helped develop better processes and methodologies, which in turn helped progress of industries. Also, gradual development of advanced industrial processes helped the advancement of basic scientific research by the supply of new materials and tools to be used in research. So, he made up his mind to start industries in India in near future. After his return to India, he noticed that the young generation in Bengal after having University Degree became mentally

passive with respect to doing something as they were not getting any clerical job due to insufficient opening under the then British Ruler. They were not inclined at all to take any other job/self employment that might help earn their living. They were enlisting them in the jobless class. Dr. Ray thought that these young men could be engaged in industrial jobs. But he did not find any industry where they might be engaged. He made a thorough enquiry and became aware of the fact that there were several products of nature, which could be used as raw materials to develop industries. The imported medicines were known to be very costly. So, he thought that by utilizing the knowledge of Chemistry, he could prepare from the materials available in the surrounding areas a varieties of chemicals that could find use in medicine. So thinking, he made an attempt to prepare citric acid from lemon juice. But, soon he realized that the cost of citric acid prepared by him would be higher than that of the market price of this chemical. So, he rejected this plan. From earlier time, people were habituated in using naturally available SAJIMATI as detergent for washing clothes. So, he decided to prepare Soda (Sodium Carbonate) from SAJIMATI. But this plan was also rejected on the ground that soda prepared from low quality SAJIMATI would not be able to compete in the market. In the meantime, he enquired from the then businessmen about the type of chemicals that had huge demand. Then he turned his interest to the preparation of Sodium Phosphate and Superphosphate of lime. While proceeding in this direction, an interesting event did occur.

Dr. Ray used to reside in a rented house at 91, Upper Circular Road. It was very close to Rajabazar where cows were slaughtered in huge numbers leaving the bones as residues in huge quantity. So, he planned to use those waste bones as the cheap source of calcium phosphate and bought those bones at nominal cost and heaped on the roof of his residence (the rented house) for sun drying. That was winter season when usually no rain occurs. But that winter, there was continuous rain for several days. During this period of rain, the pieces of flesh adhering to the bones were rotten and produced obnoxious smell, which spread all around. This caused two problems: (1) Being attracted by the bad smell from the rotten flesh, herds of crow began to come and carry the bones to the neighbouring roofs and residential areas, and (2) the neighbours could not tolerate this bad smell. The area was inhabited by orthodox Hindus. These neighbours requested Dr. Ray to remove the bones to other distant places and if not removed, they would be compelled to lodge complaint to the Health Department of the Corporation. To solve this problem, Dr. Ray requested one of his friends to help him rescue from this odd situation. His friend responded and took away the bones from his roof to distant uninhabited area. After those were dried, at one night, they (Dr. Ray and his friend) set fire to the heap of bones. This led to another funny incident. When the bones were burning, the watchman on night duty noticed it and thought that possibly some body was burning a human body after murder to vanish the body. So thinking, they rushed to the spot and charged Dr. Ray and his friend of such anticipated misdeed. Dr. Ray explained the matter clearly, and he pulled out some bone pieces from the burning heap and showed them to police. Having been satisfied, the police went away. After the bones were completely burnt, they collected the bone ash, took it to his residence and preserved it. While lecturing to

the students in the class (at Presidency College), he explained how he prepared bone ash; he also used to take a handful of the bone ash and eat it saying that this was no more cow bones, this was calcium phosphate which is an important component of human nutrition.

Gradually, his mental orientation was turning to the preparation of other chemicals having medicinal value. Thus, he prepared ether, syrup ferri-iodide, ferrous sulphate (hirakosh) and many others. He purchased impure nitre from market, purified it and packed for marketing. For packaging the chemicals thus prepared, he purchased used glass bottles at low cost, cleaned those and used for packaging the chemicals. During this preparatory phase for the establishment of full-fledged chemical industry, he opened a stall (for exhibiting the chemicals he prepared) in the All India Medical Congress held at Calcutta in 1898. In that Congress, Dr. Ray interacted with medical delegates explaining the quality of indigenously prepared chemicals and medicines, and was able to motivate them for the purchase of those chemicals. In this way, he prepared the path of entry to the pharmaceutical market.

During the initial adventure into the preparation of preliminary infrastructure and facilities conducive to the establishment of chemical industry, he did everything (as described above) in his residence (rented house) at 91, Upper Circular Road. In this house, he used to manufacture chemicals in small scale as well as to run his office. Having developed the preliminary infrastructure suitable for chemical industry, he now decided to constitute a company under the management and direction of which chemical factories could be set up. After giving considerable thought, he made such a company in 1901 and christened it as "Bengal Chemical and Pharmaceutical Works". In 1903, this was converted into a Limited Company and was shifted to a new location at 90, Manicktala Main Road where it is located at present. Gradually, production increased. Also, medicines from medicinal plants were made. The latter items included Aqua Ptychotis, Aqua Kalmegh, Syrup Vasaka etc. Alcohol was also produced. Within a short time, the various products made by this company captured the market with reputation and the company earned good will. In the later years, manufacturing units for many other chemicals were also added. Quality of the product was tested under the direct supervision of Dr. Ray. Many of his students extended voluntary co-operation for the overall growth of the company.

Dr. Ray had no practical experience about running business and industry. He was out and out a scientist and teacher. But with his tenacity and diligence, he prepared his mental orientation towards this direction. While proceeding in this new path, he learnt how to overcome various difficulties. With such experience coupled with his knowledge of basic Chemistry, he was able to succeed in establishing the chemical industry, which became the premier of its kind in pre-independent India. This was possible for his scientific thinking and "do or die" attitude towards the execution of any work plan, which he decided to undertake. In spite of his bad health, he used to work around 12 hours a day. After completing the day's teaching and associated duties at Presidency College, he used to come to the Bengal Chemical Factory at around 4-30 P.M. every day. He personally used to check and supervise the running production, go through various papers related to order and supply and to take

decision thereon. He often said, 'when one enjoys work, one cannot feel bored, and under this condition health is not affected at all'.

When the reconstitution of service conditions related to the entry of Indians in the Education Department got approval of the relevant Departmental Secretary, Dr. Ray was promoted to a higher grade in the Educational Service. By virtue of this promotion, he was asked to take up the post of Principal in Rajsahi College. Such offer was indeed a very lucrative one to any educationist as because such post carried various extra benefits besides the salary. But, Dr. Ray declined the offer and wrote to the Director of the Education Department, Dr. Martin explaining the following reasons in support of his decision: (1) There were no infrastructure facilities that would help him continue his basic research in Chemistry; (2) he would have to stay in Calcutta for the collection of information related to the 'History of Hindu Chemistry', which he was compiling, and the third and most important one according to Dr. Ray was that (3) if he would decide to accept the administrative job like the one offered to him, he would have to spend most of his time in writing letters, going through files, attending lots of committee meetings and doing many other odd jobs, which would snatch away his valuable time of study and research. So, he decided to stay in Presidency College in the post he was holding. Dr. Martin accepted his arguments.

In 1912, the then Vice-Chancellor Sir Ashutosh Mukhopadhyay requested Dr. Ray (he was then in London) in advance for joining the proposed University Colleges of Science as a Professor of Chemistry. After his retirement from Presidency College in 1916, Dr. Ray joined the Science College as 'Palit Professor' of Chemistry, and he continued in this post till 1936. In this newly set up Science College, there was a dearth of instruments even in the instrument-dependent Departments. The Government remained aloof on the issue of sanctioning money for the purchase of instruments. At the initial phase, the Science College was running by the financial donation from various persons. Sir Ashutosh arranged to purchase few instruments by utilizing the savings from examination fees paid by the students. Dr. Ray went to London in 1926 to attend the Second Congress of the British Empire Universities. In that meeting, he exposed the wretched condition prevailing in the Education system in Bengal (and in India). He told that when many Indian citizens were coming forward with their donations to help develop infrastructure and improve the environments conducive for providing good science education and also in many cases to set up new Educational Institutions of better standard, then why the Government would remain aloof? He also did not forget to mention the role of Indian in the development and progress of science around the globe. In summary, standing on the land of the Ruler, he showed the courage of attacking the Ruler with fighting attitude on any points of negligence from the Government side.

Dr. Ray used to play a great rescuing role towards the peoples in distress. Whenever any man suffered from natural calamity or otherwise, he immediately rushed to them to extend help. During the famine of Khulna in 1921 and the devastating flood in North Bengal next year, the way he extended help to the affected people actually reflect his devotion and attitude towards social service. During flood when the Government was aloof, Dr. Ray

walked down the street begging for money and various other relief materials from the people for distribution among the flood-affected people. He got huge response from the people in this regard. Actually, the common men did know that their donation given to the Government officials would not reach the affected people, but the same given to Dr. Ray and his people would reach the actual destination without any misappropriation. At that time, Dr. Ray converted his research laboratory at Science College into a storehouse of the relief materials collected from the people, and he himself made proper arrangement for distribution of those materials under his own supervision with assistance from his students. The relief service rendered by the Agency working under his supervision was considered the best compared to other agencies extending similar service under similar situation. Above all, Dr. Ray used to visit the flood-stricken areas personally and extended heart-felt support to the people. He did not hesitate to openly criticize the aloofness of the Government in such a situation. Seeing the ability of a top grade educationist like Dr. Ray to come down the street for doing social work towards the men in distress, a European commented that if Mr. M. K. Gandhi could have made two more persons like Sir P. C. Ray, he would have been able to get Swaraj (freedom) for the country within a year.

In spite of his bad health during the period from 1921 to 1926, Dr. Ray used to travel each and every remote village to evaluate the need of national school, to educate the people to turn to Khaddar and to get rid of their sentiment of untouchability. When non-cooperation movement was in full swing, he raised his voice saying that science could wait but the Swaraj could not. He never sided openly with any political movement; even then he never kept himself far away from such movement. He presided over some of the Congress Conferences. After the end of First World War, Indians were expecting certain liberalization of administrative and other related rules in the country. But, what the country got in lieu of that was the proclamation of 'Baralat Law' by which the police was empowered of arresting any people and keeping him in prison for an indefinite period without giving him the chance of getting justice. Under this background, a meeting was called for creating public opinion against this damaging Law (Deshbandhu C. R. Das was the main speaker in this meeting). Dr. Ray was invited and was requested to speak in that meeting. In his delivery, he told, 'the scientists are supposed to work within the laboratory, but a time may come when he too has to come out of the laboratory in response to the distress call for the country. Based on this theory, he has come out of his laboratory leaving behind research work for sometime keeping in mind about the danger the nation is going to face, and he has attended the meeting to vouch against the Law'. The famous chemist, Edward Thorpe said that the way Sir P. C. Ray was being dragged by different political, educational and industrial organizations for his advice in relation to the honest and perfect directions for the overall progress and development in all those areas, the life of this sick and thin man would end soon. Dr. Thorpe commented further that Sir P. C. Ray had become the property of the common people.

Prafulla Chandra was a small businessman dealing with manufacture of chemicals. In that scale of his mental orientation, he did not give any importance to the ancient hand-

spinning machine 'Charkha'. But, when Mahatma Gandhi gave a call at national level to boycott imported clothes and invited the attention of Indians to turn towards hand-spinning, Dr. Ray realized the importance of this machine and started campaigning with sincere effort.

He said that he became a chemist by mistake. History, biographies and literature were his favourite subjects. In fact, we get this message in all of his writings where he has quoted from all of the above areas. . He always used to criticize about the University degree-philia mentality of the youths. He often said that only the meritorious students should pursue higher study, and the students with merit of mediocre and below average standard should opt, after passing Matriculation, for going into business or any sort of self employment.

During his student life as well as in later life, when he went to his native village, he used to take part in works associated with cultivation. He often called himself a businessman as well as an educationist. In his book "Atmacharit" (an autobiography written in Bengali), he devoted the maximum of its space in discussing the problems related to the education, economics, industries, business, history and the then social status of the country, and he also suggested the ways to cope with the problems and proceed on the path of progress and development.

In his presidential address at the annual session of Indian Science Congress held at Nagpur in 1920, he explained the need of the growth and development of industries and science education and their impact in the overall progress of the country. He also felt that through the Science education, the non-scientific culture and beliefs, which are injurious to the Society could be removed from the mind of the people. In conclusion, he said, " Considered from every point of view the progress of scientific knowledge is imperatively necessary to our individual and national growth. For the accomplishment of this object the whole-hearted cooperation of both the Government and the people is indispensable. While the Government must be more liberal in its grants for the cultivation of science, our public-spirited and patriotic countrymen have also a duty to perform. Science owes a great deal to the millionaires of the world. In our country too, the examples of Tata, Palit and Ghosh are not wanting. I stand on the platform of a city, which is the home of a thriving cotton industry. Here we have merchant princes and successful mill-owners and businessmen. The great philanthropist Andrew Carnegie, himself a self-made man, acted on the motto that "to die rich is to die disgraced" and gave away more than 100 crores mainly for workingmen's reading rooms and research institutes. I appeal to our wealth and eminence to follow in the footsteps of the great benefactors of men, and I am sure that with their help the cause of Science will flourish. The colleges where at present, Indian votaries of Science carry on their modest and humble researches have got to be multiplied many times over. More attention should be given in each university now existing in the country to the cultivation of Pure Science, particularly Physics and Chemistry, and more colleges and institutes should be establish all over the country for the study of Applied Science. It must not be forgotten that the present industrial paralysis of the West offers a golden opportunity to the East to wake up. And if India, by the grace of God, will avail herself of this opportunity to rise equal to the occasion, if her men of Science and industrial pioneers will put their shoulders to the wheel

together, if the study of Physics and Chemistry, of Mining and Engineering, of marine and Aerial Navigation and of the Biological Sciences will succeed in enlisting on their behalf the energy and enthusiasm of thousands of votaries, if the young men of the middle classes will crowd in great numbers the science colleges and the technological institutes more than the law colleges, if the scientific services of the State be thoroughly Indianised, if her rich men will award more scientific scholarships and establish technical schools, India will not take a long time in coming to the forefront of nations and making her political renaissance not a dream but reality."

Having been born in a Zaminder family, Prafulla Chandra led a simple life. He was a life bachelor. During his train journey, he always traveled in third class for keeping personal touch with the common people. He was against the caste system that was in practice for long. He had no attraction for wealth and money. He donated two lakhs of rupees to the Calcutta University for the improvement of teaching and research in Chemistry. He started Bengal Chemical and Pharmaceutical Works by the investment of his meager savings of Rupees 800 only. Out of the income and profit made from this Company, he used to distribute a certain fraction of this profit to the workers of the Company and keep the rest in a reserve fund from which the money was being spent in social welfare. For all these benevolent components of his character, the politician Gopal Krishna Gokhale called him a 'Scientist Saint'. Considering his monumental contributions in the social welfare and in the development and progress of science and industries in the country, the British Government selected him as the 'Companion of the Indian Empire' and Knited him in 1919.

During the period of his association with Science College as a Professor, he used to stay in a small room attached to his laboratory. By the magic of his fatherly at the same time friendly relationship with his students, he could transmit his endless mental force into them and help change the work habits of the students into those of a KARMAYOGI. Rabindra Nath Tagore has rightly said, 'I congratulate Prafulla Chandra at that high level, from where he could ignite the minds of his students, by which he not only transmits his knowledge to them, but also he gifted away himself and by such gift he has got himself back.' His renowned student, Sir J. C. Ghosh said, "With his scientific attitude and view, love and self-confidence, he has been the main architect of the problems of thousands of life. His ever thin body could not reduce the rate and amount of his work. He never felt tired in fulfilling the commitment". It is surprising to think as to how this thin body could be a storehouse of such huge amount of energy! In fact, he himself gave the clues to the answer to this question in his own statements, which spelled like "to love and enjoy work". Besides, he had great love and national feelings for the country. All these together, possibly, contributed to his endless energy in work, where thin physique could never hinder. This person of versatile personality passed away from this material world on June 16, 1944 in the small room of Science College. On the occasion of his birth centenary celebration in 1961 in the Asiatic Society Hall, Calcutta, many scientists from within and outside the country came to show respect to this self-made man. We hope that his 150th birth anniversary celebration will infuse into the present youths with the philosophy and ideals of this great man.