

Acharya Prafulla Chandra Ray: An epitome of scientific attitude and human values

Soumitro Banerjee *

The year 2010-2011 marks the 150th birth anniversary of the pioneer of Indian science, Acharya Prafulla Chandra Ray. Through this essay, we pay homage to the legendary scientist and humanist.

INDIA CAN perhaps boast of having the largest number of trained scientists among the developing countries. However, it is also a reality that the majority of our students look upon science just as a career option. And it is also quite common that many scientists in our universities and national laboratories—who may excel in expertise and knowledge in their research domains—betray an unscientific attitude and lack of rationality about other is-

ssues in their own life or in the life of the people. They may have earned name and fame for their research, but they harbour unscientific and even superstitious beliefs in their personal life; they practice science in their laboratories, but do not follow the scientific, logical method in tackling the diverse problems that regularly confront the individual and the society. The other commonly observed trait is that they are quite aloof about the contemporary social issues; they do not think that they have any role to play in addressing the burning problems before the society; and they are careful not to develop any link with socio-political

*Dr. Banerjee is the General Secretary of the *Breakthrough Science Society* and a member of the Editorial Board of this journal. He is a member of the faculty of the Indian Institute of Science Education & Research, Kolkata.

movements.

It is in this general context that remembering P. C. Ray (August 2, 1861–June 16, 1944) and learning from his life has become more relevant than ever. Acharya Prafulla Chandra Ray's life was the very antithesis of the attitudes we have just mentioned. He was totally devoted to science and teaching of science, and did scientific research of international standard. But at the same time he envisioned making India industrially self-sufficient using the knowledge of science; he took initiative to build up industries such as the Bengal Chemical and Pharmaceutical Works; he led relief work among people affected by natural calamities like floods and famines; he wrote books for children; he was the President of the Bengali Literary Society for many years; he was active in social reform movement, and was a great critique of the caste system in the Hindu society; he took to social service with a missionary zeal; and he did not keep himself aloof from the political struggle of that time, and had close links with leaders like Deshabandhu Chitta Ranjan Das, Netaji Subhas Chandra Bose, and Mahatma Gandhi. Essentially, Ray's activities were not confined to his laboratory and teaching; his activities covered all spheres of human interest—educational reform, industrial development, employment generation and poverty alleviation, economic freedom and political advancement of the country.

Even as a scientist, he was particularly keen to build up a band of students, rather young scientists, in body and mind to lead the advancement of science in India. Today, when we are witnessing an all-out degradation of human values, when the scientific community is obsessed with self-centred careerism, the need for remembering this great scientist can be hardly overstated.

Historical background

In the history of India, Renaissance ushered in from around mid-nineteenth century with its mission against the age-old feudal values, religious bigotry, blind faith, superstitions and a society torn with casteism to establish rational scientific thinking and humanist values. Raja Ram Mohan Ray lit the initial spark. It was carried forward and developed further through the untiring struggles of Iswar Chandra Vidyasagar, who fought to introduce a scientific education system in the country with emphasis on science, mathematics, and logic. Following him, people like Rajendra Lal Mitra and Akshay Kumar Datta worked to spread scientific bent of mind among the people. The Indian Association for the Cultivation of Science was founded by Dr. Mahendralal Sarkar in 1876 for conducting scientific research. This institution later presented the country with many luminaries in science including the 1930 Nobel Laureate C. V. Raman. Thus, just when the seed of a scientific culture that Vidyasagar sowed was germinating, two great men of science—Jagadish Chandra Bose and Prafulla Chandra Ray—started their journey in the Presidency College of Calcutta.

The initial years

Prafulla Chandra was born on 2nd August, 1861, in the village Raruli of the Khulna District of the undivided Bengal (now in Bangladesh) in a well-educated and cultured family. His father Harish Chandra was a landlord of declining fortune who spent much of his earnings on building up a library in his home. He was a man of taste, learning, and liberal views. He was an accomplished violin player. He was proficient in Persian and English languages and he had also workable knowledge of

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Sanskrit and Arabic. Harish Chandra was closely associated with the cultural and intellectual leaders of those days in Bengal. For his liberal views Harish Chandra was branded a *mlechcha* (foreign heretic) by his fellow villagers. Prafulla's mother, Bhubanmohini Devi was also an accomplished lady of enlightened views. Prafulla was exposed to this treasure from his childhood. Many learned men and musicians visited their home regularly. Harish Chandra started a school for girls and one for boys in his village. Such an education-loving and cultured family atmosphere influenced Prafulla Chandra's character greatly in its formative years.

Prafulla Chandra started his education in the school founded by his father. By the time he reached the age of nine, his elder brother completed his school education. Now he had to go for higher education which was possible only in a big city, and their father was eager to get his sons educated in the best possible way. In 1870 Harish Chandra decided to shift to Calcutta and Prafulla was admitted in the Hare School.

The teachers in the Hare School instilled a love for learning in this young boy. He loved literature (especially Shakespeare), history, geography, and biographies of great men. He read voraciously literature, history and biography—whatever came his way, and the range of his interest was not limited to school textbooks. He took to the habit of studying long hours into the night. But the excessive strain that he subjected himself to took its toll on his digestive system: He got afflicted with a virulent type of dysentery, and was forced to discontinue his studies to return to his village in 1874.

It took a couple of years for him to recover, but he was forever left with a frail body, chronic digestive disorder, and insomnia. It is interesting that Prafulla saw

this illness as a blessing in disguise. In his memoirs he later wrote, "Freed from the routine studies of dry school textbooks, I got the opportunity of studying as per my own will and interest." He was already acquainted with his father's rich library, which he now put to good use.

After two years he came back to Calcutta, and was admitted to the Albert School. He passed the Entrance Examination in 1879 and started higher studies at the Metropolitan College (at present renamed as the Vidyasagar College). The patriot Surendra Nath Banerjee, who taught English in this college, instilled in him a sense of nationalism.

In those days, chemistry was included in the curriculum, but there was nobody to teach chemistry in his college. So Prafulla Chandra had to attend chemistry classes in the Presidency College which were taught by Prof. Alexander Pedler. Pedler was a legendary teacher, who could catch the imagination of his students by his lucid exposition and conduction of experiments in the class. Prafulla got so much excited by this exposure that he built up a small laboratory in his home and started doing experiments. Though literature was his first love, through this influence Prafulla decided to take up the study of chemistry.

By the time he passed the F.A., his father's economic condition had deteriorated seriously. Seeing that his father will not be able to support further studies, Prafulla appeared in the test for the Gilchrist scholarship offered by the Edinburgh University. That year only two students from India passed the test: one was a Parsee student called Bahadurji from Bombay, and the other was Prafulla Chandra.

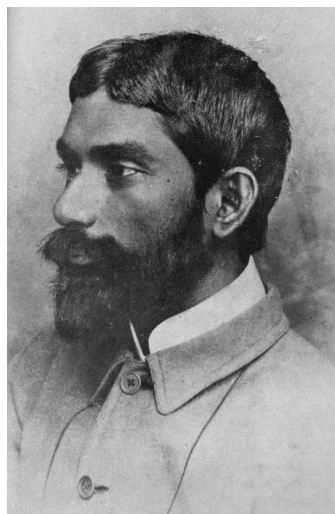
He sailed to Britain in 1882, and took admission in the Edinburgh University. He passed the B.Sc. examination in 1885, and continued to do research. In 1887 he was

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awarded the D.Sc. degree for his thesis on “Conjugated Sulphates of Copper Magnesium Group: A study of Isomorphous Mixtures and Molecular Combinations.” Since this thesis was judged the best in that year, he got the “Hope Prize” which allowed him to carry on research for one more year.

During his student years in Edinburgh, his depth of thought, sense of responsibility, and cordial behaviour were so much appreciated by his fellow students and professors that he was elected the Vice-President of the Chemical Society of the University. This was indeed a very rare distinction for a student coming from a subjugated country.

Another event from his Edinburgh years is worth mentioning. In 1885, the Rector of the University Sir Stafford Northcourt announced a prize for the best essay on the subject “India Before and After the Mutiny.” Prafulla Chandra entered the contest and submitted an essay in which he showed how the British are perpetuating colonial exploitation in India neglecting the development and education of its people. Naturally the essay did not win the prize, but it won acclaim of the judges for its high standard and satirical language. Prafulla Chandra then got it printed and sent to the Indian students, with an appeal to take steps to free India from colonial bondage. Not only that, he also sent the essay to the parliamentarian John Bright, who was known for his open-mindedness and progressive views, for his comments. Bright wrote a letter commending the article, and permitted him to use the letter to publicize the content of the essay. Prafulla lost no time to send the article and the letter to newspapers, many of which printed excerpts from the essay and Bright’s letter the next day. This initiative to expose the nature of colonial exploitation before the general public of Britain is quite noteworthy.



Prafulla Chandra in 1896.

Prafulla Chandra, the teacher

Prafulla Chandra returned to India in 1888 with a hope to get an opportunity of pursuing teaching and research. But as a part of colonial rule the British education department had created two types of posts — the imperial service, and the provincial service. The imperial service was more prestigious and higher paid, and was for all practical purposes reserved for Europeans. Even though Prafulla Chandra had the highest degree from a British university, he did not get a job under the imperial service. After being jobless for more than a year, he joined the provincial service at a salary of Rs. 250 a month and started teaching at the Presidency College, Calcutta.

While teaching he was in his elements. He would start the class with some humorous comments, and then would go deep into the subject. He would explain the difficult topics in a style that even the weak students would find easy to understand. He would perform experiments before the students to illustrate certain points. Sometimes he would take a piece of bone, heat

it in a Bunsen burner, and then suddenly drop it inside his mouth—all this to show that it was just calcium phosphate, and that it did not matter which animal the bone came from. This way he would not only teach chemistry, but would also try to build a scientific bent of mind free from all prejudices. Naturally, the students were attracted to him.

Prafulla Chandra, the research scientist

Even though chemistry was taught at the Presidency College for quite some time, no research was done in that subject anywhere in India. Prafulla Chandra realized that if India is to prosper as a country in future when it succeeds to come out of the colonial bondage, it must build a strong base of scientific research. To achieve this, one not only has to set examples by doing research of international standard; one also has to train a band of students who would carry forward the torch.

So he proceeded to build the first research laboratory at the Presidency College from scratch. The conditions were quite unfavourable. Funding was scanty. The colonial administration did not appreciate the basic necessities of a chemistry laboratory. For a long time he had to work without a basic necessity like a fume hood. Still this laboratory became the cradle of chemistry research for the whole country.

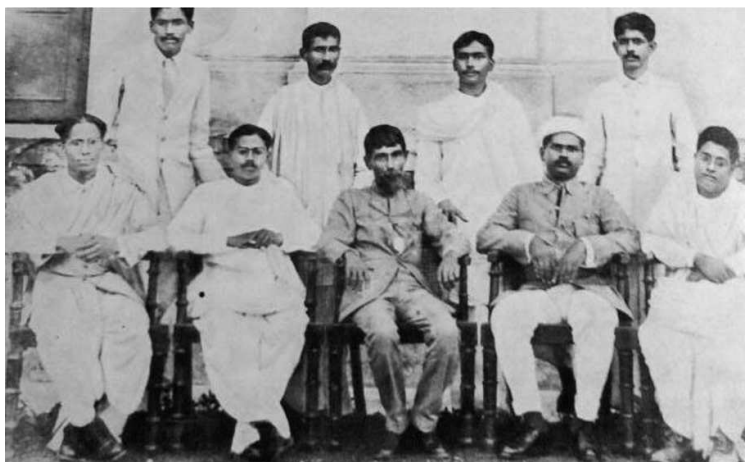
He also realized that the country needs a band of highly educated and capable researchers dedicated to the service of science—who will play a vital role in building the scientific edifice of the country facing tremendous odds. This cannot be done by the so-called “good boys.” He later wrote “Good boys are like dolls: they have eyes, but they cannot see; they have ears, but cannot hear. They have no personality, individual character. They cannot think for themselves. They do what everybody else does.”

He believed that one should not engage in research for the sake of money and a secure future, unless one has an internal urge and attraction for finding the unknown.

Slowly he gathered around himself a group of dedicated students who learned the art of scientific investigation, and undertook research with him. In the later years, they spread across the country in different universities to build the foundation of teaching and research in chemistry. This included Jnan Chandra Ghosh (Director of IISc Bangalore and the founding Director of IIT Kharagpur), Panchanan Niyogi (founding Principal of the Raja Manindra Chandra College in Calcutta), Nil Ratan Dhar (who started physical chemistry research in the Allahabad University), Priyada Ranjan Ray (famous researcher and Professor of Chemistry, Calcutta University), Biresch Chandra Guha (founder of biochemistry research in India), etc. The famous scientist S. S. Bhatnagar was the student of Prof. Atul Chandra Ghosh, who was in turn a student of Acharya P. C. Ray.

Prafulla Chandra’s own scientific contribution can be judged from around 150 research papers that he published in scientific journals. Most people know only about the discovery of mercurous nitrite. But actually he conducted research in many directions, which can broadly be divided into three categories. One concerned the nitrite and hyponitrite compounds and their properties; the second concerned the organic compounds containing sulfur; and the third concerned double salt, homomorphism and fluorination. The discovery of mercurous nitrite falls in the first category. But the other works like the preparation of ammonium nitrite, the investigations on the reaction of thiols and thioethers with metals, and on mono-fluoro-acetone were no less important. About 60 per cent of his papers were published in famous journals like *Na-*

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Profulla Chandra with his colleagues at the Calcutta University. Seated at the extreme right is Satyendra Nath Bose, and standing to the extreme left is Meghnad Saha.

ture, and the *Journal of the Royal Society*.

He took retirement from the service of Presidency College in 1916, and immediately Sir Ashutosh Mukherjee, the then Vice Chancellor of the Calcutta University, requested him to take charge of building the chemistry department in the newly constructed University College of Science at Rajabazar. He joined the University and worked for more than 20 years. He lived in a room in the college building, amidst his students. Here also he built up and trained a group of students.

When a few groups of active chemists developed in different parts of the country, the need was felt for creating a forum of exchange of ideas and views among them. Profulla Chandra then took the initiative to create the Indian Chemical Society, of which he was the founder President. This society published the first research journal in India, the *Journal of the Indian Chemical Society*. It became the prime medium of publication for chemists in India.

Profulla Chandra's unique contribution: the history of chemistry in India

From his childhood, Profulla Chandra was interested in history, and as a chemist it was natural to be curious about the history of chemistry. In studying this aspect from books by European authors, he noticed that they wrote about the developments in chemistry in ancient Egypt, Syria, Arabia and China, but there was almost no mention of India. From his knowledge of the history of ancient India, Profulla Chandra knew that there had been many significant developments in chemistry in India, but at that time there was hardly any systematic research to find out exactly what was known in what period in the Indian history. Profulla Chandra decided to take up that gigantic task.

Today it may be difficult to figure out how difficult the task was. The ancient manuscripts that might contain concrete information of this aspect are mostly destroyed; some were still there, but are hidden moth-eaten somewhere in the personal collections of wealthy Rajas and zamindars; some were there in the collections of Euro-

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“Prafulla Chandra became many in the minds of his pupils by diffusing and thereby reactivating himself in many younger minds. But this would hardly have been possible unless he had the capacity to give himself away fully to others.”

— Rabindranath Tagore
(Quoted in P. C. Ray by J. Sen Gupta,
National Book Trust, 1972)

pean museums. It was a Herculean task to collect these, which Prafulla Chandra did over a long period of about 12 years. He had to learn Sanskrit and Pali to read these (he also took help from scholars of ancient Indian languages like Acharya Brajendranath Sil and Pandit Nabakanta Kabibhusana). But a bigger challenge lay somewhere else. At that time the learned community was divided into two poles in their views of ancient India. The anglophiles belonged to one camp, which were all praises of the language, literature, culture, and science of the British and could see nothing good in ancient India. In the other camp were those who, out of their nationalistic sentiments, sang praises of an imaginary glory of ancient India. For them, the mention of “pushpak vimana” was an incontrovertible proof of the discovery of aeroplane at the time of Ramayana; the mention of the word “taranga” made them believe that electromagnetic waves were discovered in India millennia before Maxwell. In such a cultural atmosphere it was very difficult to do a proper analysis of India’s scientific heritage.

This is exactly what Prafulla Chandra did in his book “The History of Hindu Chemistry” (Vol. 1 was published in 1902, and Vol. 2 in 1908). In this book he showed,

from an unbiased scientific standpoint, how much the knowledge of acids, alkali, metals, and alloys proceeded in different epochs of Indian history. He showed that, the science of metallurgy and of medicine had advanced significantly in ancient India; when Europe was practising alchemy, India was not far behind. In doing so, he had to face the question: Why did science in India decline and disappear, so that there was no cultivation of science after Bhaskara?

Acharya Ray identified three causes behind this. The first was the introduction of the caste system. “The caste system was established de novo in a more rigid form. The drift of *Manu* and of the later *Puranas* is in the direction of glorifying the priestly class, which set up most arrogant and outrageous pretensions”, wrote Acharya Ray. “The arts being thus relegated to the low castes and the professions made hereditary, a certain degree of fineness, delicacy and deftness in manipulation was no doubt secured, but this was done at a terrible cost. The intellectual portion of the community being thus withdrawn from active participation in the arts, the how and why of phenomena—the coordination of cause and effect—were lost sight of, and the spirit of enquiry gradually died out among a nation naturally prone to speculation and metaphysical subtleties, and India for once bade adieu to experimental and inductive sciences. Her soil was rendered mortally unfit for the birth of a Boyle, a Descartes or a Newton and her very name was all but expunged from the map of the scientific world.”

The reason for the decline of the rich culture of medicine and surgery (of *Charaka* and *Susruta* tradition), according to Acharya Ray, was the introduction of the code of conduct by *Manu*. Acharya Ray writes, “According to *Susruta*, the dissection of dead bodies is a *sine qua non* to the student of surgery and his high au-

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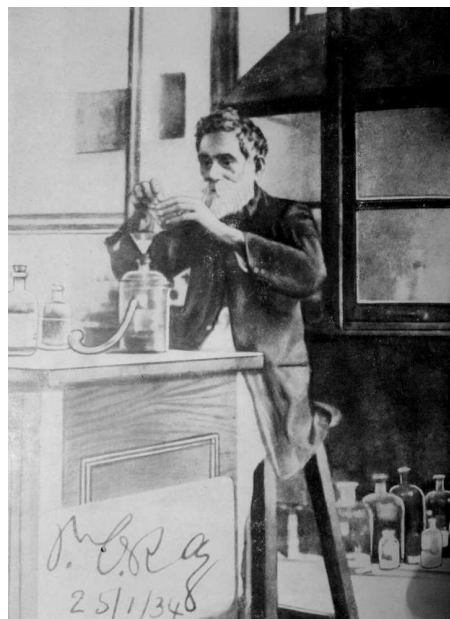
thority lays particular stress on knowledge gained from experiment and observation. But *Manu* would have none of it. The very touch of a corpse, according to *Manu*, is enough to bring contamination to the sacred person of a Brahmin. Thus we find that shortly after the time of *Bhagavata*, the handling of a lancet was discouraged, and anatomy and surgery fell into disuse and became to all intents and purposes lost sciences to the Hindus.”

The third reason identified by him was the spread of the Vedanta philosophy among the educated section: “The Vadanta philosophy, as modified and expanded by *Samkara*, which teaches the unreality of the material world, is also to a large extent responsible for bringing the study of physical science into disrepute.” Science asks questions about the material world, and seeks the answers. Acharya Ray felt that if one believes that the material world itself is unreal or “*maya*”, it is impossible for him to harbour curiosity about it, let alone seeking truth about it.

In the later years many people including the historian Joseph Needham and the scientist J. D. Bernal, have written authentic books on the history of science. But “*The History of Hindu Chemistry*” was the first book on the history of chemistry, and Acharya Prafulla Chandra was the first person to boldly state that the Advaita philosophy, which was held in high esteem by the learned section of Indians, and the Hindu custom of casteism were hurdles in the pursuit of truth.

Prafulla Chandra's initiative in creating industries

Under the British rule, the Indian market was completely dominated by commodities produced in Britain. The Indian mineral resources and the Indian working class were also ruthlessly exploited by the colonial eco-



P. C. Ray working in the BCPW Laboratory.

nomie machinery. Naturally, resentment had been building up among the Indian people, especially among the rising Indian traders and manufacturers, which found expression in the movement to boycott the British goods.

But even at the height of that movement, people could not boycott British medicines and other chemical products, because there was no chemical and pharmaceutical industry in India. Acharya Prafulla Chandra realized that economic independence is as important as political freedom, and for that, it is necessary to make India industrially self sufficient. He knew that in Europe and America, industry advanced by utilizing the knowledge gained through scientific research. He wrote, “In Europe industry and scientific pursuits have gone hand in hand ... one helping the other ... the gigantic progress in industry achieved in Europe and America is a history of the triumph of researches in the laboratory ...

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These thoughts were weighing heavy on me at the very threshold of my career at Presidency College. How to utilize the thousand and one raw products which Nature in her bounty has scattered in Bengal? How to bring bread to the mouths of the ill-fed ...”

He made a modest beginning by creating a laboratory in his own home at 91 Upper Circular Road (now Acharya Prafulla Chandra Ray Road) in Kolkata, and started experimenting with indigenous medicines. Once some experiments were successful, he invested his small savings and proceeded to produce and market these as products. The professor himself went from shop to shop with samples in his bag, and tried to convince the sellers about the efficacy of his products. He had no hesitation about that. Slowly sales began to pick up. Thus was born the “Bengal Chemical & Pharmaceutical Works,” which became a limited liability company in 1902. Seeing this exemplary struggle to establish a nationalist industry, a few like-minded doctors and pharmacists like the Dr. Amulya Charan Basu came forward to help him. Later, people like Chandra Bhusan Bhaduri, Radha Gobinda Kar, Kulbhusan Bhaduri, and Suresh Prasad Sarbadhikari joined hands. Nationalist leaders like Chittaranjan Das and Subhas Chandra Bose also helped in different phases of the industry. Owing to the courage, single-minded devotion, and hard work of Acharya Ray, the industry slowly grew in size and was shifted from his home to a new site at Maniktala. Later another factory was added at Panihati. The products diversified. He also competed with the British products and managed to replace many of them. Slowly the BCPW established itself as a leading medicine and chemicals manufacturer of the country.

Acharya Prafulla Chandra was also instrumental in creating many other industries including the Calcutta Pottery Works,

Bengal Enamel Works, National Tannery Works, Bengal Steam Navigation Company, etc. It is noteworthy that he took no money from these successful industries, and spent his shares in the welfare of the workers.

However, in a capitalist country industries do not function on the basis of ideology. They function on the basis of maximization of profit and personal gain. For Prafulla Chandra, the establishment of industry was like a dream. Naturally, his ideas came in contradiction with those of the investors. Finally the contradiction reached such a stage that Acharya Ray had to dissociate himself from the BCPW, the industry of his dreams.

Prafulla Chandra's role for people affected by natural calamities

Though Acharya Ray was an active scientist, his mind was not closeted inside his laboratory. He recognized his social obligations and actively participated in such activities. In the year 1921 there was a famine in the Khulna district (now in Bangladesh). Repeated requests from all sections of the people fell on deaf ears of the colonial government, which refused to take any relief measures. Prafulla Chandra could not sit idle in that hour of crisis. He created a Khulna Relief Committee, and led a sustained relief effort over many months to collect money to feed the poor people of the famine-affected district.

The next year, in 1922, a devastating flood occurred in North Bengal. In this case also, the government played the role of a mute spectator. Netaji Subhas Chandra rushed to the affected areas to assess the situation firsthand. Upon his return, a meeting was called at the Indian Association Hall, and the Bengal Relief Committee was formed. Prafulla Chandra was elected President of that Committee. He appealed to his students to come out of the labo-

ratory in this hour of crisis. Attracted by the character of this great humanist, many students and youths toiled from morning to evening to collect flood relief fund under the leadership of Meghnad Saha (who later became a leading astrophysicist). A correspondent for Manchester Guardian wrote: "In these circumstances, a professor of Chemistry, Sir P.C. Ray, stepped forward and called upon his countrymen to make good the Government's omission. His call was answered with enthusiasm. The public of Bengal, in one month gave three lakhs of rupees."

In 1923, Northern Bengal suffered a flood which made millions of people homeless and hungry. Prafulla Chandra organised Bengal Relief Committee, which collected nearly 2.5 million rupees in cash and kind and distributed it in the affected area in an organised manner.

In the year 1931, flood again struck North Bengal. At that time Prafulla Chandra was an old man of 70. Even at that age he braved all odds to form a "Sankat Tran Samity" and led the relief effort from the Calcutta University. For many years he helped the flood affected people by forming cooperatives. The direct participation in relief work and helping the poor shaped the character of many of his students. Meghnad Saha was so touched by the experience of misery of the flood affected people that, after India's independence, he spent a considerable time and energy in river planning, and gave shape to the Damodar Valley Corporation.

Prafulla Chandra's struggle to develop a scientific bent of mind in the people

Acharya Prafulla Chandra worked at a time when there was practically no scientific culture in India. The people, from among whom his students came, were sunk in a sea of unscientific beliefs and customs.

Casteism was still very prevalent among the educated sections. Acharya Ray realized that he cannot serve the purpose of science without fighting the unscientific beliefs and superstitions.

We have earlier illustrated how he tried to inculcate a scientific bent of mind among his students even through classroom teaching. Through personal contact also he tried to ensure that his close students were free from all prejudices and beliefs. In many cases his attempt was successful. It is also true that in many cases he failed. In the essay "Search for truth" he lamented, "I have been teaching for half a century; in this period I have told thousands of students that solar and lunar eclipses are not caused by the demons *Rahu* and *Ketu* devouring the sun and the moon; and that eclipses do not end due to the prayers of the humans and the demons releasing the sun and the moon; that these beliefs are false and products of imagination. For half a century I have told this to the students. They listened, and agreed. But during the eclipses, the moment conch shells are blown in the houses, the moment prayer processions come out in the streets, these educated people also join the processions and throw away their food." He said that emancipation of the nation is impossible if the people engage in this type of hypocrisy, if they cannot accept truth openly.

On the issue of casteism his pen was even more scathing, "Are we humans? All those *haris*, *doms*, *chamars*, *malis*, *bagdis*, and *maithals*—who live like animals around your house in the darkness of ignorance—what have you done for them over the centuries? You do not touch them, do not allow them to come close, you drive them away like dogs. You can take your pet dog on your lap, but if the healthy child of a cobbler crawls up your stairs, you roar in the name of your caste and religion." "If

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a *chamar* comes to our door begging for food, it is true that we have not always shooed him away, we have given him food, but before that we have told him a thousand times: you are a cobbler, an untouchable, go away and wait under a tree in the garden—when we are through with eating you will get the leftovers. This way we have trodden millions of Indians under our feet for centuries.” (Search for Truth)

He realized before many others that the compromising attitude of the Congress leadership on the matter of casteism will stand in the way of creating a national identity. In a scathing criticism he wrote, “In our country, we need 500 stoves for 500 Congress delegates. Even that is not enough; the delegates from Madras would talk of sight-pollution: If a man from a lower caste looks at the cooked food of a Brahmin, the food becomes polluted. Would these pundits tell me if the food will become polluted if one looks from a distance with a telescope?”

Prafulla Chandra’s simple life-style

Even though Acharya Ray had substantial earning, he lived a very simple life and spent the maximum amount possible in various social works, helping the poor and the needy. For the last 20 years of his life he lived in a room in the university building. This room is still maintained in the form it was when he died, and one can see what a Spartan life he led. He even considered a ceiling fan an element of luxury and did not allow one to be put in his room.

He was a frail and sick man with chronic dyspepsia and indigestion. So he understood better than anyone else the necessity of a healthy body for the service of the nation. Many students, mainly the poor and needy ones, lived with him. He kept a keen eye on what they ate, whether they did daily physical exercise or not, etc. He wrote

“It is difficult to believe that the man in simple Indian dress wearing simple manners could possibly be the great scientist and professor.”

— M.K.Gandhi

books on vitamins, and on the science of nutrition to educate the youth on the ways of healthy life.

A few incidents would illustrate the simplicity of his character. In those days, before a professor came to a class, it was a custom that a bearer would come and clean the blackboard and the table. One day the students saw the bearer come wearing a coat. After he finished his job, Acharya Prafulla Chandra came in, and the students saw with astonishment that he was wearing the same coat. It was later revealed that at the onset of winter Acharya Ray had bought warm cloth for a coat. Seeing that the bearer would also need warm clothing, he bought enough cloth and got two coats stitched out of the same cloth—one for himself and one for the bearer!

He ate a couple of bananas everyday. One day a student of his, Nadia Bihari, saw some very good bananas in the market, and bought a few him. Professor Ray was very glad to see such healthy bananas. But when he learned that they cost three paisas a piece instead of one paisa as usual, he got very angry, and slapped the student. The student thought the teacher as a very miserly man. A few minutes later he had a visitor, Dr. Prafulla Chandra Ghosh, who asked for help to run an orphanage. Acharya Ray asked Nadia Bihari to write a cheque of Rs. 3000, signed it, and gave it to Dr. Ghosh. The man who would not spend two extra paisas for himself had no hesitation in giving Rs. 3000 for charity!

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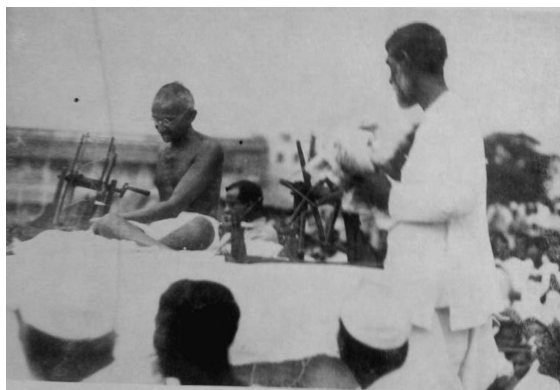
Prafulla Chandra gave away most of his earnings in charity. According to one estimate he spent nine-tenths of his income on charity. In 1922 he made an endowment of Rs. 10,000 for an annual prize in chemistry, named after the great Indian alchemist Nagarjuna. He also made an endowment of Rs. 10,000 in 1936 for a research prize in zoology and botany named after Asutosh Mookerjee. He supported many poor students. On the first Sunday of every month, they came and queued up in the balcony of the Calcutta University to collect the monthly stipend. At the time of his retirement, Acharya Ray donated Rs. 1,80,000 to the Calcutta University for the extension and development of the Chemistry Department.

Prafulla Chandra, the patriot

It is true that he did not take part in active politics, but he did not keep himself aloof from the freedom struggle sweeping through the nation at that time. He participated in the meetings and other programmes organized by the Congress, even presided over many district- and state-level meetings.

In 1919, the country was aflame against the infamous Rowlatt Act. A meeting was organized in the Town Hall of Calcutta. Deshbandhu Chittaranjan Das was the main speaker. During the meeting, Chittaranjan noticed that Prafulla Chandra was standing at a corner. He called him to the stage and requested him to speak. In an emotional voice Prafulla Chandra said, "... There are occasions that demanded that I should leave the test tube to attend to the call of the country ... Science can wait, Swaraj cannot."

He actively participated in the Non-Cooperation Movement of 1920 and campaigned in favour of boycotting foreign goods. He began to spin khaddar cloth in



Prafulla Chandra with Gandhi at the memorial meeting after the demise of Deshbandhu Chittaranjan Das.

a *charkha* in his Calcutta University room. But when he had differences of opinion with Gandhi on the issue of supporting the Khilafat movement, he did not hesitate to air his critical views.

When the British rulers started the norm of separate elections of Hindus and Muslims to the legislative forums, the Congress remained indifferent to it. But Prafulla Chandra opposed nationalism on the basis of religion. A few Congress leaders also quit in protest, started a new party, the "Nationalist Congress," and convened a conference in Calcutta on 18 August 1934. Prafulla Chandra spoke in that meeting and exposed the opportunist policy of the then Congress leadership, which would lead to communal divide. When the Congress was divided on the question of electing Netaji Subhas Chandra Bose to the President's post the second time in 1938, Acharya Prafulla Chandra gave a public statement supporting the election of Subhas Chandra.

During the ascent of fascism in Europe, a peace conference was convened in Brussels in 1935 under the leadership of the humanist writer Romain Rolland. A supporting letter was sent from India in which

Acharya Ray was a signatory along with the litterateurs Rabindranath and Sarat Chandra. When Nazi Germany attacked Russia, a meeting was called in the Town Hall of Calcutta on 21 July 1941. At that time Prafulla Chandra was an old man in his eighties. The meeting issued a statement in support of the Soviet Union's war effort against Nazi Germany, under the title "Soviet Achievements—Indian Intellectuals' Manifesto". The statement said, "Over the past 20 years, overcoming great odds, the Soviet Union has created a new society. When that society is under attack, the Indians cannot remain indifferent. We are helpless and subjugated; but we express our best wishes. We shall wait for the day when the Soviet Union will defeat the enemies and will come victorious". Prafulla Chandra was the first signatory in that statement.

The way to pay respect to the great scientist-humanist

Reviewing his life's work, Acharya Ray wrote "I have no sense of success on any large scale in things achieved ... but have the sense of having worked and of having found happiness in doing so." Acharya Ray passed away on June 16, 1944. The British science magazine *Nature* of July 15 wrote in a requiem, "Sir Prafulla was more than anyone else, responsible for the great development of scientific research in India during the past fifty years ..."

It is noteworthy that Acharya Jagadish Chandra Bose and Acharya Prafulla Chandra Ray were the first scientists in India after a large gap. The earlier scientists like *Aryabhata*, *Barahamihira*, and *Brahmgupta* lived in the fifth and sixth centuries. There was some development in mathematics at a later time, but after *Bhaskara* (11th century) we find no further progress in any field of science. Thus Acharya Jagadish Chandra and Acharya Prafulla Chandra had no

body to follow; they had to be the pioneers.

Acharya Prafulla Chandra not only excelled in research, but also created a school of chemistry, trained an army of students, created industries using the knowledge in science, and thus laid the foundation of the onward march of science in India. He was also a pioneer in the struggle against unscientific beliefs and superstitions. In the character of this great man we see a socially conscious scientist with great love for fellow human beings. He was the product of the renaissance movement that was initiated through the efforts of Rammohan and Vidyasagar.

The way to pay respect to this great man is to follow his footsteps—in practising science of the highest international standard, in discharging the social responsibility of a scientist, in fighting unscientific belief and superstitions that exist in our society even today, in doing everything for the society and mankind; in summation—in developing as a man in its entirety, character and activities, committed to the cause of science, knowledge, people, and society.

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