

ACHARYA PRAFULLA CHANDRA RAY THE PIONEER OF MODERN INDIAN CHEMISTRY: A REVIEW

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ABSTRACT:- Acharya Prafulla Chandra Ray (1861–1944) is not an easy figure to sum up in a line. Chemist, yes, but also teacher, historian, industrialist, and something of a public conscience for science in colonial India. He came up at a moment when India barely had the institutions to call chemistry a discipline in its own right, and he spent much of his working life trying to fix that — building up laboratories, training students, and insisting that experiment, not just textbook learning, was the point. His inorganic chemistry work, centred on mercury nitrites and the compounds around them, put him squarely in conversation with the chemical problems of his generation, and his papers on mercuric and mercurous nitrites found their way into the major journals of the day. He was also, somewhat unusually for a working chemist, a serious historian: he went back to Sanskrit sources and other old texts to piece together India's own chemical past, arguing against the then-common notion that chemistry in India began only when Europeans brought it. Bengal Chemical Works was where he put his convictions into practice — the idea that scientific training ought to build something, that it should feed industry and self-sufficiency rather than stop at the classroom door. What follows looks at why these strands of his work — heritage, indigenous knowledge, entrepreneurship grounded in research, institution-building — still matter. Taken as a whole, they argue for Ray as more than a skilled chemist. He was one of the people who built the shape of modern Indian science.

KEYWORDS :- Acharya Prafulla Chandra Ray; Indian chemistry; inorganic chemistry; nitrites; mercurous nitrite; History of Hindu Chemistry; Bengal Chemical; chemical education; Indian scientific heritage; indigenous knowledge; scientific entrepreneurship; Indian Knowledge Systems.

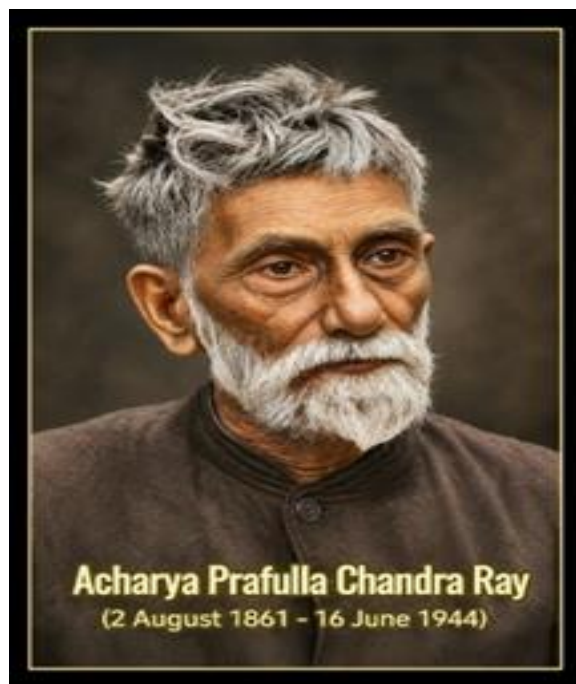
INTRODUCTION:-

You cannot really explain how modern chemistry grew in India just by listing compounds discovered or labs opened. There is a slower story underneath that — of a scientific culture forming piece by piece, research and teaching and training and industry all pulling in roughly the same direction. **Dr. P.C. Ray** belongs near the middle of that story, and part of what makes his career worth studying is that he was doing several of these things at once, not one after another. He was born on **2 August 1861 in Raruli- Katipara**, in what was then the Jessore district of the Bengal Presidency and is now in Bangladesh. School came in Calcutta — Hare School first, then the Metropolitan Institution that Ishwar Chandra Vidyasagar had founded, a place that mixed a modern syllabus with a strong dose of Indian values and reformist thinking. It was there that chemistry first caught his attention. From there he went to Edinburgh to study the subject properly, finished his D.Sc., and came back to India in 1887. He joined Presidency College, Calcutta, and later moved to the University College of Science at Calcutta University — the two institutions where his teaching and research would leave their mark for decades.

Formative Years and Early Education-

His first lessons came at home, in a household where reading and language and a sense of obligation to society mattered a great deal. He fell seriously ill as a child and missed a stretch of regular schooling because of it — but that time away turned out to be useful in its own way, since it left him free to read on his own terms. The habit stuck. Independent reading, and the sceptical turn of mind that comes with it, stayed with him for the rest of his scientific life. Once he was well again he went back to school in Calcutta, Hare School and then the Metropolitan Institution, and it was here, gradually, that

the sciences — chemistry specifically — pulled ahead of everything else he was interested in.



The pull toward chemistry eventually took him to Edinburgh University. A Gilchrist Scholarship, won in 1882, paid for the passage to Britain. At Edinburgh he studied under some well-regarded European chemists of the time and worked hard in the laboratory, finishing his B.Sc. in 1885 and, two years later, his D.Sc. — for which he received the Hope Prize. Those Edinburgh years shaped him more than almost anything else in his early life: he learned what disciplined experimental work actually looked like, and he came away trusting evidence built on observation over received wisdom. He also saw, first-hand, what a properly equipped European laboratory required, which gave him a working template for what India still lacked. None of it made him want to stay abroad, though. If anything, seeing what other countries had built only made him more determined to build something comparable at home. He returned in 1888 and, the following year, joined Presidency College as an Assistant Professor of Chemistry — the beginning of a career that stayed tied, from that point on, to chemical education, research, and Indian industry.

Principal Contributions to Chemistry-

Ray's inorganic chemistry work broke real ground, and most of it grew out of patient, methodical study of nitrites, nitrogen compounds, and mercury compounds. What made it matter was not only the individual compounds he pinned down, but the larger point it proved — that serious, original chemistry could in fact be done in India, colonial constraints notwithstanding.

Ray's Work on Nitrite Chemistry-

Nitrites — the salts and derivatives of nitrous acid, HNO_2 — formed one of the main threads running through Ray's research. This was still a fairly young corner of chemistry in the late 1800s, and a lot about how these compounds behaved was simply not settled yet.

He set about studying inorganic nitrites carefully and systematically, with particular attention to metal nitrites, working out how they could be made, how they could be identified, and how stable or reactive they turned out to be. The work pushed forward what was known, at the time, about inorganic nitrogen chemistry generally.

What set his approach apart was a mix of exacting method and genuine curiosity about the overlooked. He was not satisfied working only with what chemists already understood well; he went looking for compounds that were strange or under-studied. By the end, this nitrite work had become one of the threads that defined his whole career as a scientist.

The Discovery of Mercurous Nitrite-

His single most famous result in inorganic chemistry was mercurous nitrite, $\text{Hg}_2(\text{NO}_2)_2$ — first prepared and reported by Ray in 1896, a result that would go on to define how people remembered his research. The compound behaved strangely and connected in interesting ways to the broader chemistry of mercury and nitrous acid. Simply working out how to make it, and how it reacted once made, showed that careful experimental persistence could still turn up compounds nobody had described before. The discovery brought him attention well outside India, put him on the radar of chemists elsewhere, and confirmed his standing as a real contributor to inorganic chemistry. Just as importantly, it

was proof that original research could come out of an Indian laboratory and hold up internationally.

Nitrogen chemistry more generally kept drawing his attention too, which makes sense — nitrogen sits at the centre of compounds across a huge range of oxidation states, and its chemistry is genuinely intricate.

His research touched nitrogen compounds across several of those oxidation states — nitrites, nitrates, ammonium salts, and other related substances — and by tracking their reactions and transformations methodically, he added real depth to what was understood about inorganic nitrogen chemistry at the time.

But the significance of all this nitrite and nitrogen work reached further than the compounds themselves. It helped seed a tradition of experimental chemistry in India at a moment when Indian higher education leaned almost entirely toward teaching to the exam. Ray, mostly by example, made the case that laboratory research and publication were worth doing in their own right.

Ray as Historian: A History of Hindu Chemistry-

Outside the lab, Ray also built a reputation as a historian of Indian science. He had a genuine, sustained curiosity about India's scientific past, and he spent years working through old texts, manuscripts, and whatever physical evidence still survived, trying to reconstruct how ancient Indian chemical practice had actually worked. In doing this he was, deliberately, arguing against a common colonial-era assumption — that science in India started only once Europeans arrived.

That work culminated in *A History of Hindu Chemistry*, published in two volumes, the first in 1902 and the second in 1909. It leaned heavily on Sanskrit sources and other historical material touching medicine, metallurgy, alchemy, pharmacy, and chemical practice, tracing the development of Indian chemical knowledge back to antiquity. Ray was careful not to reduce Indian chemical tradition to pure philosophy — he pushed hard on its practical, experimental side instead. His autobiography, *Life and Experiences of a Bengali Chemist* (1932/1935), is probably his best-known non-scientific work, and it appeared in both English and Bengali.

Science in the Service of Swadeshi and Nation Building-

Science, for Ray, was never purely academic. He treated it as a genuine lever for social change, economic independence, and national progress. His working life ran alongside a period of growing political and intellectual ferment across India, and he was convinced — deeply, as far as one can tell — that modern science and indigenous industry needed to advance together if the country was going to become economically self-reliant.

Science as an Instrument of National Development-

Dr.P.C. Ray held firmly to the idea that scientific knowledge is only worth something if it actually serves the society around it. Under colonial rule, India was leaning on imported goods for most of its industrial and chemical needs, while its own manufacturing base lagged well behind — a state of affairs Ray saw not as an unfortunate detail but as one of the real obstacles standing between India and genuine economic progress.

Dr.P.C. Ray pushed, consistently, for scientific education, laboratory research, technical training, and homegrown industry, treating the four as parts of a single project rather than separate goals. In his view, that combination was how science actually built a nation — not through abstract prestige, but by producing people with real skills and technologies suited to what India specifically needed. Long before *Atmanirbhar Bharat* became a modern catchphrase, Acharya Prafulla Chandra Ray (P.C. Ray) was already living and breathing the reality of a self-reliant India. Known to the world as the "***Father of Indian Chemistry***," Dr.P.C. Ray was much more than a brilliant mind trapped in a laboratory. He was a visionary who looked at a colonized, economically drained India and realized a harsh truth, political freedom means absolutely nothing without economic independence. He saw that the British Empire wasn't just ruling India through guns—they were ruling it through markets, systematically crushing local trade and making Indians dependent on imported goods. Dr.P.C. Ray refused to stand by. For him, science wasn't just a career; it was a weapon for social justice and national liberation. He fiercely believed that if Indians

wanted to hold their heads high, they had to master technology, build their own industries, and manufacture their own goods from scratch.

At a time when the Indian market was largely dependent on imported chemicals and medicines Dr. P. C. Ray believed that the country had both the talent and the resources to build its own chemical industry. So, he took his first step towards the journey where Ray and his students experimented with the preparation of chemicals and pharmaceutical formulations using indigenous resources they started as a small scientific initiative gradually evolved into a well-organized manufacturing enterprise. Among Acharya Prafulla Chandra Ray's many contributions to India's scientific and industrial progress, At the cost of just 700 rupees the establishment of Bengal Chemical and Pharmaceutical Works stands as one of his most enduring achievements, the company began to supply laboratory reagents, medicinal preparations, and other chemical products, proving that high-quality manufacturing was possible under Indian leadership, He believed that scientific knowledge should not remain confined to classrooms and laboratories but should contribute directly to improving people's lives. In his view, a nation aspiring for self-reliance needed a robust domestic chemical industry capable of producing essential goods such as medicines, fertilizers, dyes, laboratory chemicals, soaps, and other industrial products which are still manufactured and are in use by Indians. Acharya Prafulla Chandra Ray firmly believed that chemistry could become one of the strongest foundations of India's economic and technological progress.

CONCLUSION:-

Ray's contribution can be described as a form of 'scientific nationalism', in which modern science and indigenous development were brought together. He did not reject Western science; rather, he believed Indians should master modern scientific methods and use them to build institutions and industries in India. Ray's vision reflected a seamless blend of modern scientific thinking, India's rich intellectual traditions, indigenous industrial development, and an unwavering commitment to social welfare. Dr. Prafulla Chandra Ray's vision of "Science,

Swadeshi and Nation Building" extended far beyond his laboratory research. He believed that science should become a foundation for economic development, industrial self-reliance, and social progress. Through his research, teaching, historical scholarship, promotion of indigenous industry, and support for scientific education, Ray demonstrated that scientific advancement could become a form of national service. His legacy continues to be relevant to discussions on scientific self-reliance, indigenous innovation, entrepreneurship, and the role of science in national development.

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