Homi J. Bhaba: A portrait

by Abhigyan Ray - Friday, October 30, 2020

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Today marks the 111th birth anniversary of the pioneering Indian nuclear physicist, Homi Bhabha widely hailed as the "Father of Indian Nuclear Programme". Born to a rich Parsi family, closely related to the Tatas, he was educated initially in Bombay. With his family wanting him to become an engineer, he enrolled for the Mechanical Sciences Tripos at Cambridge. But Bhabha's interests soon shifted to theoretical physics and mathematics.

Bhabha joined the legendary Cavendish Laboratory, from where he obtained his PhD in physics with R.H. Fowler as his thesis supervisor. Bhabha's important contributions during the Cambridge period include the explanation of relativistic exchange scattering (Bhabha Scattering); the theory of the production of electron and positron showers in cosmic rays (Bhabha -Heitler theory); speculation about the Yukawa particle related to which was his suggestion of the name meson; and prediction of relativistic time dilatation effects in the decay of the meson. Bhabha was the first to do a proper quantum theoretic calculation of the process of electron-positron annihilation and creation – one of the basic processes in quantum electrodynamics using Dirac's theory. This process, known as the Bhabha Scattering, is even today used as a luminosity monitor in electron-positron collider physics experiments.

Returning to India in 1939, he was thirty years old and at the peak of his scientific career. He was accomplished, peer-recognized, and deeply engaged in path-breaking research in an emerging area of science. Due to WWII, he was unable to return to Cambridge and thus took up a reader position at the Indian Institute of Science (IISc), Bangalore, under the helm of the legendary Physics Nobel Laureate, CV Raman. Bhabha initiated and guided research on cosmic rays, setting up a Cosmic Ray Research Unit and organizing a group of young researchers in experimental and theoretical aspects of research. He also continued his work on relativistic equations of higher spin, known as 'Bhabha-Corben equations'. One of the main motivations to develop and generalize the Dirac equation was to treat the effect of a large number of soft radiation quanta (photons, mesons, etc) using a classical wave field. In modern parlance, the classical wave field is related to the coherent state of the radiation quanta. Bhabha's work on meson theory led him to predict isobar states of the meson-nucleon system. This work was a precursor to later developments in strong coupling theory of the meson-nucleon system.

Yet the vision of a modern India, at the cusp of independence, led the young scientist along a new direction as a builder of great institutions. His IISc years gave him a renewed sense of identity with the land of his birth. The acute sense of isolation that he felt as a scientist in India, cut off from the enriching intellectual environment of Europe, only made him more determined to create such an atmosphere in India. The vision of a self-confident and modern India, compelled Bhabha to chart out this new course for Indian scientific research. In this endeavour, he found a trusted partner in Jawaharlal Nehru, the first prime minister of India. Throughout Bhabha's efforts, he had the firm support of Nehru. Common ideals

and aspirations for the young nation had forged a deep bond between the two men who were towering figures in their respective fields. To Bhabha, Nehru was his dear “Bhai”, and it was his encouragement that Bhabha drew upon repeatedly while building the Tata Institute of Fundamental Research (TIFR) into an institution of international repute, as well as in the setting up of the Atomic Energy Commission, and the Atomic Energy Establishment at Trombay. He also served as the member of the Indian Cabinet's Scientific Advisory Committee and provided the pivotal role to Vikram Sarabhai to set up the Indian National Committee for Space Research.

Within two decades, Bhabha had transformed the scientific landscape of the nation. His leadership had inspired the generations of scientists and engineers who worked with him at TIFR and at the Atomic Energy Establishment and soon they, too, had embraced his vision of a new India, developing a new sense of optimism and confidence in their abilities that had never been seen in the country before. From the beginning, Bhabha’s vision for scientific research in India was closely linked to his vision for India itself. Scientific progress was, in Bhabha’s mind, a cornerstone of nation-building. He was also aware that this scientific progress could only be achieved by bringing together the talent scattered across the country onto a common platform that enabled vigorous research into the fundamental principles of the universe as well as its practical applications. This became his life’s mission. From research in the basic sciences and the development of the atomic energy programme, to the industrial applications of that research and the emergence of electronics in India, from setting architectural standards and inculcating an appreciation of the aesthetic to encouraging the spirit of self-reliance and establishing forward-looking social structures in the institutions that he built, his vision touched every aspect of a modernising India.

Bhabha was truly a Renaissance man. Professionally, he was a trained engineer turned physicist of international stature, but equally, a serious painter; a lover of music and literature; a great collector and patron of the arts. He was an avid art collector and landmark works of some of India’s great masters of modern art like Jamini Roy, MF Husain, NS Bendre, FN Souza, B Prabha, VS Gaitonde and many others are housed at TIFR, which is the only scientific institution in the world with such a priceless collection of art under its roof. Bhabha himself was fond of sketching, and made tender compositions of luminaries like Sir CV Raman, scientist Niels Bohr, Pipsy Wadia or Shergill. In the words of J.R.D. Tata himself, “Scientist, engineer, master-builder and administrator, steeped in humanities, in art and music, Homi was truly a complete man.”

On January 24, 1966, an Air India Boeing 707 crashed on the Mont Blanc in the Alps, killing everyone on board. Homi Bhabha, on his way to Vienna to attend a meeting of the Scientific Advisory Committee of the International Atomic Energy Agency, was one of those who lost their lives in the crash. It was a tragic and most untimely death. It deprived the scientific world of a great physicist and leader, and snatched away from India one of its most dedicated heroes and inspiring visionaries, who had always worked to harness the advancements of science and technology for the development of the country. He had been awarded the Padma Bhushan by Government of India in 1954. After his death, the Atomic Energy Establishment at Bombay was renamed as the Bhabha Atomic Research Centre and the Homi Bhabha National Institute and Homi Bhabha Centre for Science Education, Mumbai were named in his honour.
