

A Virtual Exhibition on Life Journey of
Homi Jehangir Bhabha
(Homi J. Bhabha)



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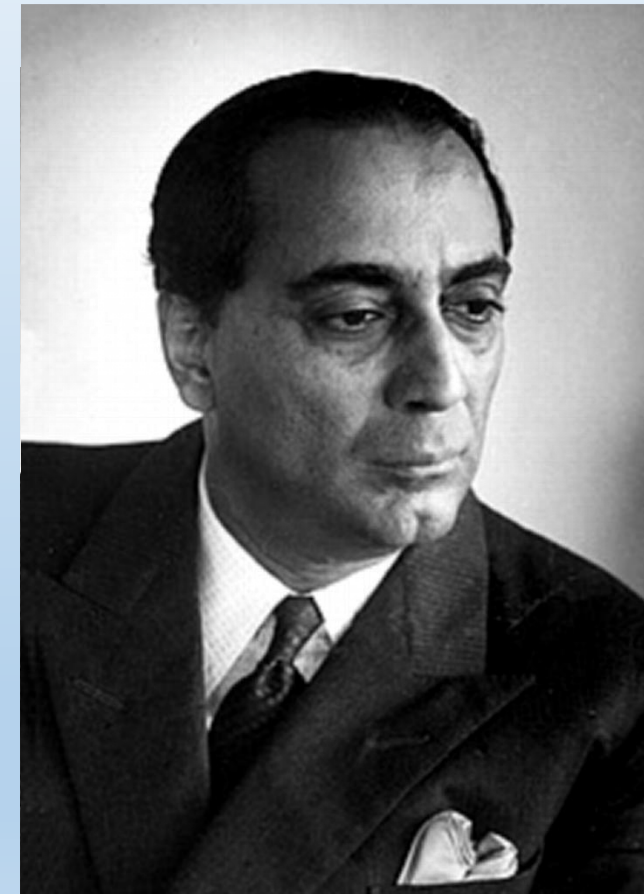


The Great Scientist Homi J. Bhabha Physicist, India



Homi Jenhagir Bhabha (1909-1966) was an Indian physicist who is often considered the father of the Indian nuclear program.

Colloquially known as "father of the Indian nuclear programme", Bhabha was also the founding director of the Atomic Energy Establishment, Trombay (AEET) which is now named the Bhabha Atomic Research Centre in his honour. TIFR and AEET were the cornerstone of Indian development of nuclear weapons which Bhabha also supervised as director. Bhabha was awarded the Adams Prize (1942) and Padma Bhushan (1954). He was also nominated for the Nobel Prize for Physics in 1951 and 1953–1956





Introduction of Homi J Bhabha



- **Born - 30 October 1909**
- **Bombay, British India (present-day Mumbai India)**
- **Died - 24 January 1966 (aged 56)**

Mont Blanc, Alps

- **Cause of death - Air India Flight 101 crash**
- **Nationality - Indian**
- **Alma mater - University of Cambridge (BS, PhD)**
 - Known for Indian nuclear programme**
 - Cascade process of Cosmic radiations**
 - point particles Bhabha Scattering**
 - Theoretical prediction of Muon**
- **Awards - Adams Prize (1942)**
 - Padma Bhushan (1954)**
 - Fellow of the Royal Society**
- **Fields - Nuclear Physics**
- **Institutions - Atomic Energy Commission of India**
 - Tata Institute of Fundamental Research**
 - Cavendish Laboratory**
 - Indian Institute of Science**
 - Trombay Atomic Energy Establishment**





Homi J Bhabha

Early Life & Education



- Homi Jehangir Bhabha was born on 30 October, 1909 to a wealthy Parsi family in Mumbai that was very influential in the west of India. His father was Jehangir Hormusji Bhabha, a lawyer.
- Initially Bhabha attended Cathedral School and he then enrolled for studies at Elphinstone College at the age of fifteen. This was followed by further studies at the Royal Institute of Science in Bombay.
- Bhabha's father and uncle, Sir Dorab Tata, wanted him to study engineering at university so that Bhabha could take up a senior position at the Tata Iron and Steel Company on completion of his degree.
- In 1927, Bhabha began his studies at Cambridge University, studying mechanical engineering according to his family's wishes. Soon, however, Bhabha became more interested in theoretical physics, being influenced by physicist Paul Dirac.
- After passing the Mechanical Engineering Tripos with first class Bhabha remained at Cambridge and with his family's approval began studying theoretical physics.
- In 1932 he passed the Mathematics Tripos, again with first class and he received his doctorate degree in nuclear physics from the University of Cambridge in 1934.



Homi J Bhabha

Career and Achievements



- This nuclear physicist who made vital contributions to quantum theory and cosmic radiation was the first chairman of the Atomic Energy Commission of India set up in 1948.
- As a true visionary who foresaw the need for high quality facilities in the country to conduct research on nuclear power, Bhabha envisioned a three-stage nuclear power programme focused on extracting power from thorium instead of uranium reserves, on the basis of its large reserves of the former as compared to those of the latter. He was awarded the Adams Prize in 1942 and the Padma Bhushan in 1954 for his contributions.
- In 1937, Bhabha was awarded the Senior Studentship of the 1851 exhibition.
- With the outbreak of the Second World War in 1939, Bhabha returned to India accepting a position of reader of physics and establishing the Cosmic Ray Research Institute at the Indian Institute of Science in Bangalore.
- In 1941, Bhabha was elected Fellow of the Royal Society. He also established the Tata Institute of Fundamental Research in Mumbai, becoming their director in 1945. He was a skillful manager and it was due to his prominence, devotion, wealth and comradeship with Jawaharlal Nehru, Prime Minister of India that he gained a leading position for allocating the scientific resources of India.
- Bhabha become the first chairperson of India's Atomic Energy Commission in 1948. It was under his direction that the scientists of India made their way into making an atomic bomb and the first atomic reactant was operated in Mumbai in 1956. Bhabha also led the first UN Conference held for the purpose of Peaceful Uses of Atomic Energy in Geneva, 1955.



APSARA (India's First Nuclear Research Reactor)



On 4 August 1956, Nuclear Research Reactor APSARA was commissioned by Bhabha Atomic Research Centre (BARC). APSARA was the first Nuclear Research Reactor in India and also Asia. This article will help in understand the journey of India's Strategic Nuclear Program and how it is helping in the development of current generation Nuclear Reactors.

Background – India's Nuclear Program

- On 4th August 1956, the nuclear reactor APSARA attained criticality at 3:45 PM. Criticality refers to the state of a nuclear reactor when the nuclear fission reaction becomes self-sustaining. This means that each fission reaction releases enough neutrons to sustain the chain reaction. This is an important milestone in the commissioning of a reactor.
- APSARA was the first nuclear research reactor in India and also Asia.
- Its design was conceptualized by Dr Homi Bhabha (the Father of Indian nuclear programme) in 1955.
- The reactor was named APSARA and dedicated to the nation in 1957 by the then Prime Minister of India, Pandit Jawaharlal Nehru.
- The reactor was built with assistance from the United Kingdom who provided the initial fuel.
- APSARA was a pool-type reactor and uses 80% enriched uranium fuel.



Background – India's Nuclear Program



- **APSARA was a pool-type reactor and uses 80% enriched uranium fuel.**
- **With the commissioning of this reactor, India started producing radioisotopes. The knowledge and experience gained thereof has helped in the current infrastructure for producing and applying radioisotopes. Radioisotopes have found many applications in the field of medical diagnosis and therapy, sterilization of medical products, pipeline inspection, food preservation and so on.**
- **Radioisotopes have also found use in agriculture. Scientists have been able to study growth simulation, storage effects post-irradiation, the role of induced radioactivity, the combined effects of neutron irradiation and chemical mutagens. This has significantly helped in developing disease-resistant and high-yielding crop varieties.**
- **Experiments with APSARA on neutron-induced fission, reactivity measurements, diffusion kinetics of fission product gases, neutron radiography, two-phase flow visualization, radiation shielding and neutron detector development have led to major design inputs for the current generation of Prototype Fast Breeder Reactor, Pressurized Heavy Water Reactors and Advanced Heavy Water Reactor.**
- **APSARA has also been instrumental in studies in basic sciences such as neutron scattering, neutron activation analysis and neutron and gamma-ray emission studies. This has aided in the characterization of materials and in forensic investigations.**
- **APSARA is located at BARC, Mumbai. It was permanently shut down in 2009.**



“APSARA” Nuclear Reactor Details



- **Reactor type: Swimming pool type/ Thermal Reactor**
- **Date of criticality: August 4, 1956**
- **Reactor power: 1 MW**
- **Fuel material: Enriched uranium – aluminium alloy**
- **Fuel element: Plates**
- **Fuel cladding: Aluminium alloy**
- **Total weight of fuel: 4.5 kg**
- **Core size: 560 mm X 560 mm X 615 mm(H)**
- **Moderator: light water**



Bhabha Atomic Research Centre



The full form of BARC is the Bhabha Atomic Research Centre. BARC is India's leading nuclear research centre with the main office in Trombay, Maharashtra, Mumbai. BARC is a different disciplines research centre with comprehensive, advanced research & development infrastructure including the whole range of engineering, nuclear science & related fields.

BARC 's fundamental objective is to preserve secure nuclear energy activities, mainly for energy production. It handles all aspects of atomic energy, including theoretical reactor technology to computerized modelling and simulation, new reactor fuel materials development, risk analysis & evaluation, etc.

BARC is indeed researching various field including,

- Using nuclear fuel recycling
- Medicine field
- Agricultural sector
- It is also accountable for the country's smooth operation of the numerous nuclear reactors.
- Nuclear waste management process and so on.



History of Bhabha Atomic Research Centre



- Dr Homi Jehangir Bhabha began the nuclear program in India. He founded TIFR (Tata Institute of Fundamental Research) in 1945 for the research in nuclear science.
- Dr Bhabha set up AEET (Atomic Energy Establishment, Trombay) in January 1954 to strengthen the nuclear facilities and leverage nuclear energy for the country's improvement.
- Dr Bhabha also set up numerous BARC training centres to meet the energy demands of research & development activities in the field of atomic energy.
- AEET was designated as BARC (Bhabha Atomic Research Center) in 1966 after Dr Bhabha 's death on 22 January 1967.
- The BARC expertise proceeded the nuclear research programmes, intending to make India independent in the field of electricity generation.



Legacy



- **After his death, the Atomic Energy Establishment at Mumbai was renamed as the Bhabha Atomic Research Centre in his honour. In addition to being an able scientist and administrator, Bhabha was also a painter and a classical music and opera enthusiast, besides being an amateur botanist. He is one of the most prominent scientists that India has ever had. Bhabha also encouraged research in electronics, space science, radio astronomy and microbiology.**
- **The famed radio telescope in Ooty, India was his initiative, and it became a reality in 1970. The Homi Bhabha Fellowship Council has been giving Homi Bhabha Fellowships since 1967. Other noted institutions in his name are the Homi Bhabha National Institute, an Indian deemed university and the Homi Bhabha Centre for Science Education, Mumbai, India.**
- **At Bhabha's death, his estate including Mehrangir, the sprawling colonial bungalow at Malabar Hill where he spent most of his life, was inherited by his brother Jamshed Bhabha. Jamshed, an avid patron of arts and culture, bequeathed the bungalow and its contents to the National Centre for the Performing Arts, which auctioned the property for Rs 372 crores in 2014 to raise funds for upkeep and development of the centre. The bungalow was demolished in June 2016 by the owner, Smita-Crishna Godrej of the Godrej family, despite some efforts to have it preserved as a memorial to Homi Bhabha.**



Conclusion of Homi Bhabha



Bhabha was killed when Air India Flight 101 crashed near Mont Blanc on 24 January 1966. Misunderstanding between Geneva Airport and the pilot about the aircraft position near the mountain is the official reason of the crash.

Many possible theories have been advanced for the air crash, including a claim the Central Intelligence Agency (CIA) was involved in order to paralyse India's nuclear program. An Indian diplomatic bag containing calendars and a personal letter was recovered near the crash site in 2012.

Gregory Douglas, a journalist who taped his interviews with former CIA operative, Robert Crowley, for four years, published their transcripts in a book called Conversations with the Crow. Crowley writes that CIA was responsible for assassinating Homi Bhabha. He said that a bomb in the cargo section of the plane exploded mid-air, bringing down the commercial Boeing 707 airliner in Alps with little traces left to be retrieved. He also claimed that the US was aware of Indian nuclear progress.



Quotes of Homi J Bhabha



"I know quite clearly what I want out of my life. Life and my emotions are the only things I am conscious of. I love the consciousness of life and I want as much of it as I can get. But the span of one's life is limited. What comes after death no one knows. Nor do I care. Since, therefore, I cannot increase the content of life by increasing its duration, I will increase it by increasing its intensity. Art, music, poetry and everything else that consciousness I do have this one purpose - increasing the intensity of my consciousness of life."

"My success will not depend on what A or B thinks of me"

"For, each man can do best and excel in only that thing of which he is passionately fond, in which he believes, as I do, that he has the ability to do it, that he is in fact born and destined to do it."



Some Glimpse of Homi J Bhabha



Bhabha (right) at the International Conference on the Peaceful Uses of Atomic Energy in Geneva, Switzerland, 20 August 1955



Bhabha on a 1966 stamp of India



Bust of Bhabha at Birla Industrial & Technological Museum, Kolkata



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