

BIBHA CHOWDHURI: AN UNKNOWN INDIAN WOMAN SCIENTIST

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This is a pre-view of the book to be published on the life and works of Dr. Bibha Chowdhuri by these authors soon. Her life showed a lady with determination, with high intellect, devoted research worker and ready to accept challenges for the sake of science. In spite of her commendable research in cosmic rays, she is unknown to many including scientists. She was marginalized even by many of her professional colleagues.

Introduction

Bibha Chowdhuri (BC) was born at a time when higher education among women was almost non-existent in India. Having M.Sc. degree in physics and choosing a career to conduct research in physics at that time going against the normal flow of women of the society, required enough courage and conviction. No doubt, Bibha Chowdhuri (BC) had both the qualities. She obtained her Ph.D. degree from the University of Manchester in England working on the cosmic ray air shower in late forties. In spite of her significant work on cosmic rays at Bose Institute under the guidance of D.M. Bose, at Manchester with a Nobel Laureate P.M.S. Blackett, at University of Michigan, and at TIFR in Bombay and PRL at Ahmedabad after her return to India, she did not receive the recognition she deserved. Although while talking about cosmic rays and in particular about mesons her name pops up automatically, she was marginalized in the page of science in a male-dominated society.

Bibha Chowdhuri and Her Family

Almost nothing is known or available about Bibha Chowdhuri's life, except a brief life sketch published in a



Figure 1: Bibha Chowdhuri at the Bose Institute. Credit: Bose Institute, Calcutta

Bengali magazine by Ranatosh Chatterjee.¹ Most of the information about Bibha Chowdhuri and her family presented in this article has been obtained from Ms. Rita Sarkar (*nee* Palit), wife of one of the authors' (Roy) physicist friend Dipak Sarkar. Rita Sarkar had been in close association with the family of Bibha Chowdhuri for a long time.

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We found a variation in the spelling of her name: Biva Chaudhuri, Bibha Chowdhuri, B. Chowdhury/Choudhuri/Chaudhuri. We have followed the spelling Bibha Chowdhuri (abbreviated as BC) throughout this book as we found the same on the title page of her Ph.D. thesis (Figure 2), which can therefore be considered as her authentic spelling.

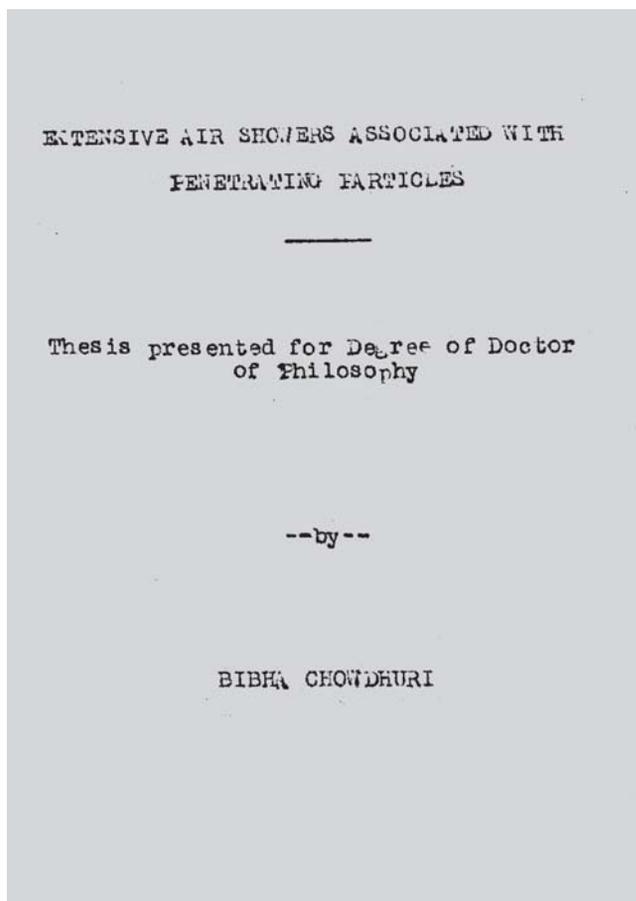


Figure 2: Cover page of Bibha Chowdhuri's Ph.D. thesis submitted in 1949 at Manchester University, UK. Credit: Manchester University, U.K.

Bibha Chowdhuri was born in 1913. Her father Banku Behari Chowdhuri was a doctor by profession. They were zamindars of Bhandarhati in the district of Hooghly in Bengal. Banku Behari married Urmila Devi, daughter of a Brahma missionary of Barisal (now in Bangladesh).² Nirmala, Urmila's elder sister, was married to Sir Nilratan Sircar (1861- 1943), a famous doctor, after whose name the Campbell Medical School at Sealdah, Kolkata was renamed. The eldest daughter (Nalini) of Nilratan Sircar was married to a famous physicist Debendra Mohan Bose³ who became the Director of Bose Institute of Kolkata after the demise of Sir Jagadish Chandra Bose. From this we see that D.M. Bose's mother-in-law and Bibha Chowdhuri's mother were sisters and therefore BC was sister-in-law of D.M. Bose.

In order to marry Urmila, whose family was a staunch follower of Brahma doctrine which discarded multi-god Hindu beliefs, idolatory and Hindu rituals. Banku Behari accepted the Brahma doctrine and became a Brahma. This conversion to this new doctrine displeased the orthodox Hindu family of Banku Behari. The family could not accept this conversion which costed him to lose the right on the property of his parents. Banku Behari worked in Mayo Hospital in Kolkata, incidentally where Nil Ratan Sircar was a house surgeon during 1888-89. In Kolkata Banku Behari rented a house in Upper Circular Road (now Acharya Prafulla Chandra Road) very close to Bose Institute and University College of Science at Raja Bazar.

Banku Behari had five daughters and one son. Eldest daughter Roma Choudhuri was a teacher at Brahma Balika Vidyalaya (Brahma Girls' School) in Kolkata. His second daughter died at an early age. His third daughter was Bibha Chowdhuri born in 1913. The fourth daughter of Banku Behari was Leela Chaudhuri who worked in Tea Board in Kolkata for a while. Later she went to England to be trained in the Montessori system of education. She retired as Principal of Jadavpur Vidyapith (Junior Section) in Kolkata. The youngest daughter of Banku Behari was Uma Chaudhuri who did post-graduation in psychology from Calcutta University and did her Ph.D. in social psychology from the USA. After her return from the USA, she took a job in the Health Department of West Bengal Government. She worked on the social aspects of aborigines like *jarwas* in Andaman, *santhals* etc. Ranjit Chaudhuri was the only son and youngest of all, who obtained his engineering degree from Jadavpur University in Kolkata. He was Sales Manager in English Electrics. It is not a mere speculation that the entire family of Banku Behari was well-educated due to the influence of Brahma Samaj.

All her siblings and she herself remained un-married. One probable reason, as we feel, is that Brahmans were a small community and they preferred to make matches within their own community. As because they were alienated from the main stream Hindu society, getting a proper match within the Brahma community sometimes became difficult. However, we have heard that BC was an unusually simple person compared to normal females, little oblivious to usual earthly pleasures except reading books. Interestingly, it has been found that, in general, "The proportion of women scientists who never married (14%) is higher than that of similar male scientists (2.5%), ...".⁴

BC's upbringing was influenced by her mother who belonged to a Brahma family. The Brahma Samaj was known for its movement advocating a social, political and

religious reform and took a liberal position and encouraged women in attending schools and college which was a no-no for average Indian women. Raja Rammohun Roy was the first person who questioned the multi-God Hindu belief and worship of images which are against the teachings of the Vedas. On this spirit he established Brahma Samaj in 1828 and opened his Church in 1830 which was a meeting ground for those who discarded idolatry and worshipped one true God.

After the establishment of Hindu College in Calcutta in 1817, many schools and colleges were built in the next forty years. Three universities at Calcutta, Bombay and Madras were established in 1857.

Bibha Chowdhuri received her school education at Bethune School in Kolkata.⁵ Incidentally, Bethune school was one of the oldest female schools of Asia. It was established in 1849 as a secular Native Female School by John Elliot Drinkwater Bethune which was taken over by the government and renamed it as Bethune School. The female college named as Bethune College was established in 1879, the first women's college of India. She obtained her B.Sc. degree with Honours in Physics from Scottish Church College in Kolkata.⁵ Scottish Church College was established in 1830 by Alexander Duff, the first overseas missionary of the church of Scotland to India. Originally this institution was known as General Assembly's Institution. Many eminent persons like Swami Vivekananda, Netaji Subhas Chandra Bose were students of this college. BC obtained her M.Sc. degree in Physics from Calcutta University in 1936 (1934-36 batch). After obtaining her M.Sc. degree she joined Calcutta University to do research in physics under the guidance of D.M. Bose who was then Palit Professor of Physics.

Bibha Chowdhuri at the Bose Institute

When D.M. Bose joined Bose Institute as its Director in late 1937, all his research students, including BC, also joined Bose Institute. According to M.S. Sinha, her colleague at Bose Institute and batch-mate of M.Sc. class, she worked at Bose Institute during the period 1939-42.⁶ As we shall see later, at the beginning of the year 1938 she started research at the Bose Institute.

She made a significant contribution towards the discovery of mesons using photographic plates while in Bose Institute and published three papers consecutively in "Nature"⁷. BC and D. M. Bose could not continue investigations due to the non-availability of more sensitive emulsion plates during the war years. Seven years after

this discovery of mesons by D.M. Bose and Bibha Chowdhuri, C.F. Powell made the same discovery of pions and muons and further decay of muons to electrons using C2 and G5 electron sensitive plates using the same technique as was used by D.M. Bose and BC and won the Nobel Prize. Since getting materials to continue high quality research became difficult during the war period, D.M. Bose decided to discontinue the field of cosmic ray research. Bibha Chowdhuri left Bose Institute at this point and joined the cosmic ray research laboratory of P.M.S. Blackett at the University of Manchester in 1945. There she started working on the extensive air showers in cosmic rays at Manchester.

Bibha Chowdhuri in Manchester

Bibha Chowdhuri joined the cosmic ray laboratory of Nobel Laureate P.M.S. Blackett in 1945 (Blackett was awarded Nobel Prize in 1949) at a time when studies on extensive air showers in cosmic rays were one of the most important investigations in particle physics.



Figure 3: Bibha Chowdhuri's photograph published in "The Manchester Herald." (Credit : Prof. A. K. Ganguly)

For instance, a local newspaper "The Manchester Herald" reported her work under the title: "Meet India's New Woman Scientist – She has an eye for cosmic rays." The article was written by Birgit Maxwell based on an interview taken on her.

About her research work, it was noted:

"Bibha Chowdhuri's particular programme is the study of extensive air showers caused when cosmic rays enter the earth's atmosphere from the interstellar spaces. A cosmic ray touching a nuclear particle

produces a shower, which extends itself by scattering in lower altitudes.”

And further:

“Miss Chowdhuri is trying to discover the how, why and wherefore of this process; ultimately she hopes to estimate the exact extent of scattering and the number of particles involved. ...The extensive air showers Miss Chowdhuri is investigating, contain both kinds, though mainly soft ones; she hopes to find out in exactly what proportions.” (emphasis in original).

BC submitted her thesis in early 1949. The thesis was examined by Lajos Janossy (external) and J G Wilson (internal) in March 1949. “The minutes of the General Board of Faculties confirm she successfully defended her thesis” and she obtained her Ph.D. degree in 1952.

Return to India

Homi J. Bhabha was looking for young scientists for the newly established Tata Institute of Fundamental Research (TIFR) in Bombay. He “had asked John Wilson, one of her thesis examiners, for his frank and confidential opinion of Bibha Chowdhury who had worked in Manchester”⁸ prior to her appointment as the first female researcher to work at the TIFR. It seems that his recommendation was positive, as BC was offered a job at the TIFR.

Prof. B.V. Sreekantan of National Institute of Advanced Studies, Bangalore, who worked at the TIFR, wrote to us that BC joined the Institute in 1949 and was there till 1957 or so. After leaving TIFR she spent a year abroad and then spent several years at Physical Research Laboratory, Ahmedabad before going back to Kolkata.⁹

While she was in TIFR, she attended the 2nd International Conference on Elementary Particles held in Pisa, Italy in 1955 (Figure 4). She had her brief stint as a visiting lecturer at the Physics Department of the University of Michigan.

Bibha Chowdhuri left TIFR and joined Physical Research Laboratory (PRL) in Ahmedabad when Dr. Vikram Sarabhai was the Director. She became involved in detecting high energy muons associated with extensive air showers. Dr. Y.C. Saxena, a Ph.D. student of Dr. Bibha Chowdhuri, who retired as a senior professor from Institute for Plasma Research, Gandhinagar, Gujarat, recalled

“My first meeting with Dr. Bibha Chowdhuri was during the course work, which I was taking as a

Research Scholar, at Physical Research Laboratory (PRL), Ahmedabad in the year 1964. She gave us a course on Interaction of High Energy Particle and Matter and I was highly impressed by the way she taught.”¹⁰

Prof. Saxena recalled:

“At that time there was a feeling in the Research Scholars at PRL that she was a tough person to work with, which turned out to be totally misplaced as I discovered during my work with her for next several years.”

Saxena continued: “She was quick to apprise me of the experimental program, gave me task of reading the appropriate literature and promptly put me to work on the new detector system which she was developing for the experiment. This included a Scintillator Detector together with arrays of neon flash tube to detect the particles passing through the detector. The neon tubes were being made in the glass blowing section of PRL and she put me to work with the glass blower who was making these tubes. She used to visit us often to track the progress.”

As far as her teaching qualities were concerned, Prof. Saxena writes:

“She was a very good teacher and took care that I kept up with the required studies while doing the experiment and collecting data and she provided the books and papers for that. She had a very good understanding of the subject and was of great help in analyzing and interpretation of the experimental data. In addition to the Cosmic Rays and High energy Physics, she taught me French language, which was part of the Ph.D. Curriculum at Gujarat University at that time.”

BC had published a good number of papers in reputed foreign journals while she was in Bose Institute, Manchester and TIFR, but while working in PRL, she preferred to publish her scientific work in the journal published by the Indian Academy of Science. Saxena commented that though the scientific work of BC was of high quality, “she submitted most of her papers from this work to Indian Academy Journal for publication”.

BC was intensely involved with the Kolar Gold Mine experiment using an indigenously developed detector to be placed at a depth of 700 ft. and to be operated in conjunction with the Extensive Air Shower array of TIFR



Figure 4. The well-known scientist Dr. Bibha Chowdhuri is on the left and Dr. Sukumar Biswas on the right at the International Conference in Pisa, Italy (1955). (Taken from the book *Cosmic Quests* by Sukumar Biswas; courtesy: Noopur Biswas)

on the ground. She worked out the modalities of the experiment with TIFR group and arranged the site underground as well as rented a bungalow for her and her assistants.⁹

Back to Kolkata

After the Kolar Gold Mine experiment, she had a plan to set up a new experiment at Mount Abu on radio frequency emissions associated with Extensive Air Showers. She had discussed these plans in detail with Prof. Vikram A. Sarabhai before his untimely demise. After the appointment of new director, the direction of the research programme was changed. “PRL did not permit her to take up that experiment. She took a voluntary retirement ... and moved to Kolkata to continue her pursuit of High Energy Physics”, writes Saxena. In Kolkata she continued her research work as a visiting scientist in collaboration with scientists of Saha Institute of Nuclear Physics, University of Calcutta and Indian Association for the Cultivation of Science. Her main collaborators were Professors A.K. Ganguly of University of Calcutta, B.B. Baliga of Saha Institute of Nuclear Physics (SINP) and D.P. Bhattacharya of Indian Association of the Cultivation of Science (IACS). The investigations were aimed in understanding the nucleus-nucleus interaction at relativistic energies (that is, energy from 1-2 GeV/nucleon¹⁰); using solid state nuclear track detectors (SSNTD) like CR 39, because they were supposed to give information regarding astrophysical and cosmic ray phenomena. It was expected that the precise knowledge of the projectile fragmentation could help to understand the nature, acceleration mechanism, origin and source of

cosmic rays. In the experimental work iron and aluminium metals played major role due to pragmatic reasons: (i) ^{56}Fe constitutes a significant part of the primary cosmic ray charged particle intensity. (ii) aluminium in large quantities was being used to cover the detector assemblies in space experiments. Consequently, the precise knowledge of ^{56}Fe and ^{27}Al interaction at relativistic energies was of importance to determine the background effects of the cosmic ray charged particle spectrum, their intensity and composition.¹¹

In 1983 she participated in a national conference in Amritsar, Punjab where prominent cosmic ray researchers were invited. Until her death on June 2 1991, she was an active researcher.

Conclusion

From this brief biography of Bibha Chowdhuri presented here, it is clear that Bibha Chowdhuri was not an ordinary scientist. Her contribution to science was in an area of contemporary research of that period and was highly significant. It is our attempt to present a biography of this unrecognized scientist in a society where discrimination of women was more than natural. Readers interested more about her may look forward to the book to be published soon.

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