



A Jewel Unearthed: Bibha Chowdhuri - The Story of an Indian Woman Scientist by Rajinder Singh and Suprakash C. Roy, published by Shaker Verlag GmbH, Germany, 2018. Paperback 178 pages. Price 21,90• / 27.40 SFr

This could be a question in a science quiz: “Apart from the Saha ionization equation and the Bose statistics, what was the other work done in India in the first half of the twentieth century that came close to winning a Nobel Prize in physics?” The mystery deepens when we come to know that one of the two authors of this work was a young woman in her twenties – at a time when women rarely ventured into the domain of physics, either in India or even elsewhere in the world. The mystery deepens still further when we come to realize that this unusual woman is virtually unknown even among the professional physicists of the present-day India – at least till now, although the situation may change with the publication of the book under review.

After Yukawa proposed that the nuclear force may be mediated through a particle having a mass between the masses of an electron and a proton, a search for such a

particle began in the late 1930s. That was an era before large man-made particle accelerators and the best place to look for such a particle was in the cosmic rays. D.M. Bose, Director of Bose Institute, and his student Bibha Chowdhuri carried on a study of cosmic rays using photographic emulsion plates kept at the high altitude of Sandakphu in the Himalayas. They found evidence for such a particle and their best estimate for its mass was about 186 times the mass of the electron, as reported in *Nature* in three papers published during 1940-42. Because of the difficult wartime conditions, they were unable to import high-quality photographic emulsion plates and carried on the work using low-quality half-tone plates, as a result of which there were large uncertainties in their results. C.F. Powell reported the discovery of the pi-meson with mass 273 times the electron mass in 1947 using high-sensitivity photographic emulsion plates and won the 1950 Nobel Prize in physics. Powell acknowledged in his publications that he used the same technique as D.M. Bose and Bibha Chowdhuri. As Indrani Bose pointed out in her Foreword, this story involves the tragic case of another neglected woman scientist: Marietta Blau. She was the first person to develop the technique of using photographic emulsion plates for the detection of cosmic ray particles. Although Schrodinger nominated her unsuccessfully for the Nobel Prize, she never even succeeded in having a proper academic job.

D.M. Bose’s name would be known to many persons in the Indian scientific community – primarily because he held such important positions of that era as the Palit Professorship of Physics at Calcutta University (just after C.V. Raman) and the Directorship of Bose Institute (just after Jagadis Bose). But most people who know D.M. Bose’s name would have no clue what his most important scientific work was and that this work was done in collaboration with a young woman. In a mystifying case of collective amnesia on the part of the Indian scientific community, the fact that an experimental work done in colonial India came close to winning a Nobel Prize – and the name of Bibha Chowdhuri along with it – seemed to have been completely forgotten. We Indians are notorious for not being history-conscious. But, even going by this Indian standard, I cannot think of another such example of a complete memory loss on the part of the Indian scientific community. The uncomfortable question which crops up is whether this mysterious memory loss has something to

do with the fact that Bibha Chowdhuri was a woman. When I first started a serious study of the history of science in colonial India a few years ago, I heard vague murmurs in some circles that such a work was done in India and a young woman who never got her due recognition was involved in this work. Since the three papers reporting this work appeared in the pages of *Nature*, I could look at them. But it was impossible to find any other reliable information about Bibha Chowdhuri – even answers to such basic questions as to what she did after this work done at a very young age and where she worked in later life. To my amazement, I now find from this book under review that Bibha Chowdhuri had worked for years in such prominent places as TIFR (Tata Institute of Fundamental Research) Mumbai and PRL (Physical Research Laboratory) Ahmedabad and was still publishing papers when I had joined IISc as a young faculty member! I find it incredible that I never even heard her name in those years. It has been so difficult to find any information about Bibha Chowdhuri before the publication of this book that she seemed a distant mythical figure like Hypatia or Lilavati.

Bibha Chowdhuri (BC) and none of her five siblings married. Since no close family members of BC are living today, it was not easy to find information about her. The authors of this book had to do some real detective work to find a few facts about BC's life. One of the authors managed to trace a lady whose family lived for many years in a house next to the house in which BC's family lived in Kolkata. They also got some information from B.V. Sreekantan, who was BC's colleague at TIFR, and from Y.C. Saxena, who did PhD at PRL under the supervision of BC. Luckily, the authors also managed to obtain a copy of BC's PhD thesis from Manchester University, where she had worked under the supervision of the would-be Nobel laureate P.M.S. Blackett. Based on such sources, the authors have put together an incomplete, but highly intriguing story of BC's life and scientific career.

Born in 1913 in a highly educated and cultured Brahma family, BC was the third woman to complete MSc degree in physics from Calcutta University. After MSc she started research under the supervision of D.M. Bose, who was related to her (her mother and D.M. Bose's mother-in-law were sisters). It is believed that D.M. Bose was initially very reluctant to accept a woman for PhD in physics. We know that C.V. Raman and M.N. Saha also had similar reservations against women doing PhD in physics. Presumably, D.M. Bose finally could not refuse the request from his sister-in-law and that is how BC came to work at Bose Institute where she did her famous work.

Very surprisingly, even after doing a work which came close to winning a Nobel Prize, BC was not able to get her PhD degree from Bose Institute and had to leave for Manchester to work under Blackett. The authors suggest that BC might not have been able to complete her PhD at Bose Institute because of the wartime difficulties 'in securing chemicals, photographic and glass material'. This hardly appears a convincing explanation. Was the work she had already completed not considered good enough for a PhD degree? While the importance of the work might not have been apparent at once, she had published three papers in *Nature* during her tenure at Bose Institute.

At Manchester BC studied different aspects of the statistics of Extensive Air Showers caused by energetic cosmic ray particles, leading to two single-author papers (one being in *Nature*). Surprisingly, although BC's PhD thesis was submitted in 1949, she was given the degree only in 1952. On contacting Manchester University about this delay, the authors got the reply that this delay 'is not obviously explicable. . . There is nothing to suggest that this was due to problems with the thesis.' Afterwards, BC worked at TIFR and PRL for many years, taking part in the Kolar Gold Field experiments to study neutrinos. At some stage, BC took voluntary retirement to settle in Kolkata. While she did not hold an official position in any organization in Kolkata, she interacted with some research groups and published papers even in the late 1980s – though in low-impact journals. BC never received any important national honour and was not elected a Fellow of any of the three science academies of India. She died in 1991 in obscurity and neglect.

One fact becomes obvious from a close reading of the book, although the authors never state it explicitly. By any reasonable yardstick of academic assessment, BC's research output during her long tenure at TIFR and PRL was not impressive either in quality or quantity. The authors write that 'Bhabha did not regard Bibha Chowdhuri as a first class physicist' – presumably because she did not fulfill the expectations with which Bhabha had offered her a job at TIFR. So, it is not entirely clear whether BC's not getting any national recognition can be taken as a straightforward case of gender discrimination. One can, of course, raise the question whether BC should have received the national honours and Fellowships because of the extraordinary work she did at a very young age, although her later career was undistinguished. Perhaps a more pertinent question to ask is why an obviously gifted and dedicated woman scientist, who had such a brilliant start in the early life, never fulfilled that early promise. Was there something in the leading institutes of India of

that era that was not conducive for the intellectual growth of a woman scientist? Presumably, BC worked in TIFR at a time when there were no faculty quarters. We do not know how she lived. At that time when social mobility in India (especially for women) was very limited, it must have been extremely hard for a single woman to rent a house in an unknown city far from her home state, if that is what BC had to do. She was the only woman faculty member in TIFR – at least at the time of her joining. Even if we accept that there was no conscious discrimination at the workplace, did her male colleagues fully accept her as one of them? After office hours, all the male colleagues would leave for home to spend time with their families. Did BC have enough social life? Did she feel lonely and depressed in the evenings and weekends? From what we know of Bhabha, he was perfectly capable of communicating his low opinion of BC to her quite bluntly. Had he done that, how would that have affected the morale of a sensitive woman who had sacrificed so many other things in life to dedicate herself solely to physics? It is worth noting that BC did her famous work at Bose Institute when she must have had a comfortable home – surrounded by loving family members and friends. Although the authors analyze

BC's scientific work in considerable detail, there is very little written about her personal life – obviously because it has not been possible to find much information about that.

The authors are to be congratulated for this important book on perhaps the most enigmatic and puzzling figure among the pioneers of modern physics in India. The authors have always tried to stick to hard facts and avoided speculations when they are unable to find fact-based answers to many questions. Written in a sober scholarly undertone without hyperboles, this book makes the life story of BC come out poignantly. Although the authors have managed to put together a reasonably coherent account of BC's life, the book raises many more disturbing questions than it answers. Perhaps this book will encourage other scholars to probe deeper in search of the answers to these questions, although some of these questions are likely to remain unanswered forever. □

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