



Bidhu Bhushan Ray: Interaction with Yoshio Nishina and Werner Heisenberg

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Abstract: Bidhu Bhushan Ray, unsung hero of Indian science, did research under the Nobel Laureates Manne Siegbahn, Sweden, and Niels Bohr, Denmark. In contrast, the Japanese Yoshio Nishina is considered as the founding father of modern physics research in Japan. The German Werner Heisenberg was one of the founders of the quantum mechanics. With the help of their correspondence, in the present short communication, their interaction is explored.

1. Introduction

Bidhu Bhushan Ray (abb. BBR) was one of the pioneer of the X-ray spectroscopy in India [1]. He received the Elliot Prize for Science - Asiatic Society of Bengal; the Silver Medal - University of Calcutta; became a Premchand Roychand Scholar; and was awarded the Palit Foreign Scholarship, and the Mahendra Lal Sircar Research Gold Medal [2]. He was Fellow of the National Institute of Sciences of India (today known as Indian National Science Academy, INSA). To the best of my knowledge, “Bidhu Bhushan Ray - A Pioneer of X-Ray Spectroscopy” is the only biography, which deals with his life and science [3]. Unfortunately, the book is not available in India. The present article, based on various parts of the book, explores relation between B.B. Ray, Werner Heisenberg, and Yoshio Nishina.

To start with a summary of B.B. Ray's life is given.



Figure 1: Bidhu Bhushan Ray [Credit: B.B. Ray's family members]

2. Bidhu Bhushan Ray – A short Life History

Bidhubhusan Ray was born on July 1, 1894, in the village of Khandarpara in District Faridpur in East Bengal, now known as Bangladesh. His father, Basanta Kumar Ray was a postmaster, and his mother, Bamasunderi Devi, was a house-wife.

Bidhubhusan was only 14 when his father passed away at the age of 49. This led to a hard life for his wife and children. BBR passed the Matriculation Examination in 1911 with distinction, and graduated

with an Intermediate Science degree from Ravenshaw College. He did B.Sc. from Presidency College Calcutta in 1915, and in 1918, obtained M.Sc. degree from Calcutta University. Ray was offered a job in the Bengal Civil Service. He declined, because Sir Asutosh Mukherjee inspired him to pursue research.

B.B. Ray started his research career under C.V. Raman, Palit Professor, at the University of Calcutta. The Board of Examiners of the University of Calcutta appointed G.C. Simpson, J.W. Nicholson and E.H. Barton as the examiners to evaluate Ray's D.Sc. thesis. On 1st November, 1922, they submitted a report and stated that they examined Bidhubushan Ray's thesis. According to their opinion, it is "sufficient merit to warrant the conferment upon Mr. Bidhubushan Ray of the Doctorate." The thesis: "The scattering of light by liquid droplets and the theory of coronas, glories and iridescent clouds" deals with an interesting branch of meteorological optics. The results obtained by the candidate are new and valuable [4].

In 1922, BBR was appointed as Lecturer in Physics. In the beginning of 1923, for higher studies abroad, he was given Palit Travelling Scholarship for two years. He wrote to Niels Bohr on March 23, 1923, and expressed his desire to work in his Laboratory. With the letter, he sent the reprint of his already published paper in "Nature" of Feb. 10, 1923 [5]. Bohr suggested to postpone the visit to Copenhagen until January 1924, because he (Bohr) had planned a visit to the U.S.A. [6]. BBR decided to travel to Sweden for a short time and work with Manne Siegbahn, who was known for his experimental research on X-ray spectroscopy. BBR stayed for two and a half years in Europe, where he worked in Manne Siegbahn's laboratory in Uppsala, and at the newly founded Niels Bohr Institute in Copenhagen.

After returning back to Kolkata, he established a laboratory for x-ray spectroscopy. For a short time he was appointed Khaira Professor. On April 5, 1940 his term expired, but he was reappointed on permanent bases on a salary of Rs. 800 per month [7].

BBR married to Asha Sen (Fig. 2), daughter of Nishi Kanto Sen, Registrar, University of Delhi, who had contact with the great poet (Fig. 3). Asha Sen had an M.A. in English. Later she became a lecturer at Visva Bharati, Santiniketan, an institution founded by the great poet Rabindranath Tagore. Unfortunately, Asha Ray only had a short period of happily married life, as her husband died at the young age of 49. Their daughter, Uma Sen was brought up by her mother.

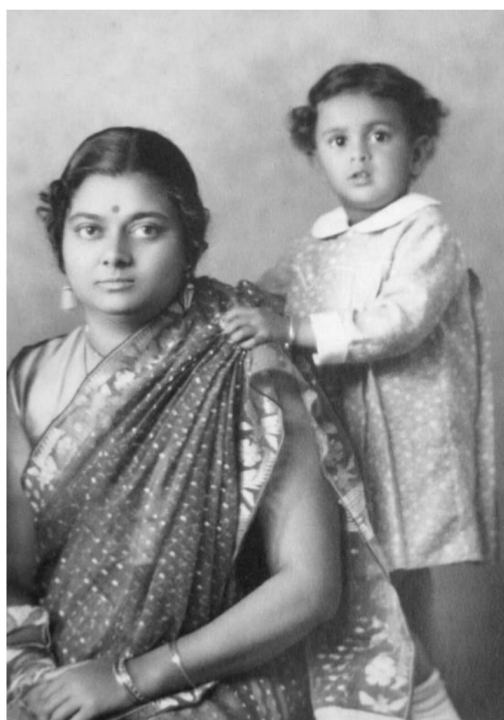


Figure 2: Ray's wife Asha Ray with her daughter Uma [Credit: B.B. Ray's family]

On Sept. 7, 1935, the great poet wrote to the father of BBR's wife: "I was rather unwell when your daughter's wedding card came. I could not send my blessing. Kindly excuse me. I shall be glad if the newly married couple can visit me. Then I shall bless them." [8]

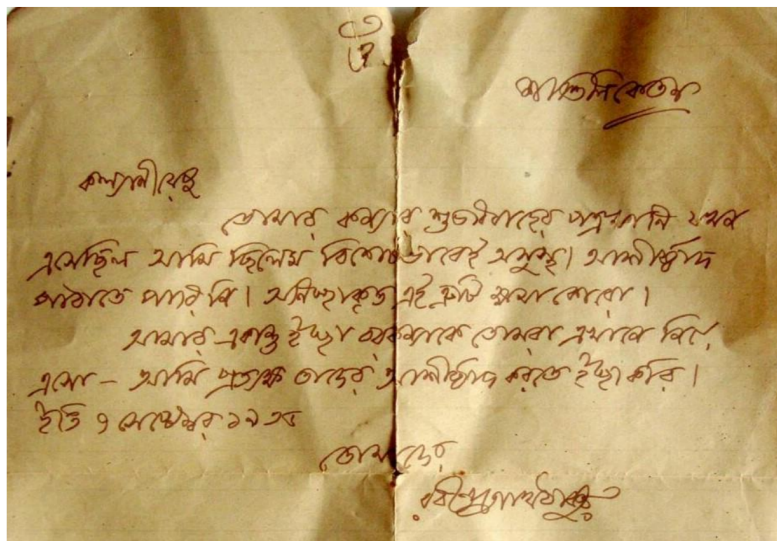


Figure 3: Rabindranath Tagore's handwritten letter [Credit: B.B. Ray's family]

BBR took his last breath in his home in Calcutta on July 29, 1944. His successor was the legendary S.N. Bose, who took over the X-ray laboratory and an active group of research workers [9].

3. Bidhubhusan Ray in Copenhagen

In Copenhagen Ray came in contact with Yoshio Nishima (Japan), Samuel Goudsmit (Holland), Ralph Fowler (England), Friedrich Hund (Germany) and others (Figure 4).

1925	Yoshikatsu Sugawara	from Japan
1925	Takeo Kono	" "
1925	Ralph Fowler	" England
1925	John Charles Foster	" Canada
1925	Frisvold	" Norge
1925	Friedrich Hund	" Sydhland
1926	David Dennison	" U.S.A.
1926	Kenjiro Kimura	" Japan
1926	Lojarna	" "
1926	F. Hartree	" England
1926	James Dewey Clark	" U.S.A.
1926	Sam Goudsmit	" Holland
1926	Charles Darwin	" Holland
1926	P. A. M. Dirac	" England
1926	Erwin Teller	" Sydhland
1926	J. Waller	" Sverige
1926	Oskar Klein	" "
1926	Julius Roselland	" Norge
1927	Erwin Hüllthirn	" "

Figure 4: Some of the guest scholar's at Bohr Institute during B.B. Ray's stay [Credit: Niels Bohr Archive, Copenhagen]

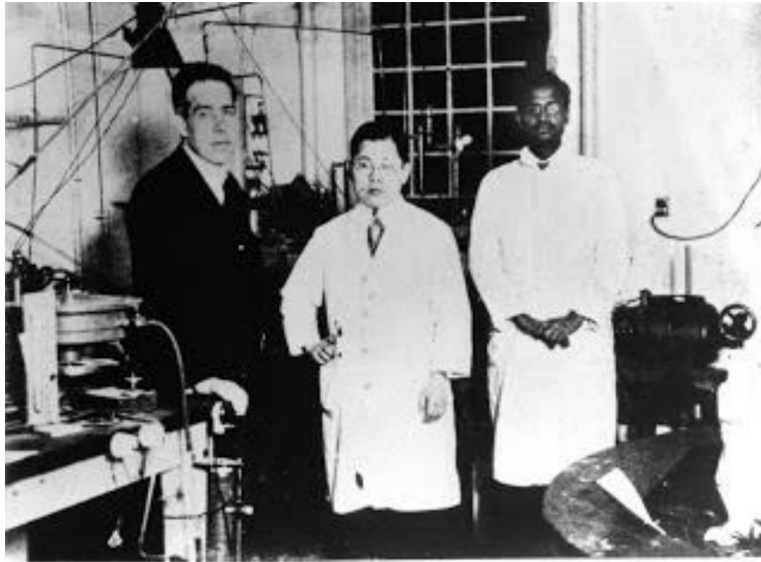


Figure 5: Niels Bohr, Yoshio Nishina and B.B. Ray [Credit: Niels Bohr Archive, Copenhagen]

4. Sharing political and private life

4.1 Politics

On Feb. 29, 1928, BBR wrote a long letter to Y. Nishina. In part it reads: “You know, I was once interested politics, and I did a little bit when I came back here, but I have found out that the politicians are as a rule scoundrels, and I have given it up as hopeless, and have returned to my laboratory, only to find it also a horrible mess” [10].

BBR had also written to N. Bohr that India is passing through bad time. Due to political activities, more than 50,000 persons are in prisons. “My house was searched and my younger brother & two cousins were arrested. After being detained for about a month & a half, they are all now released” [11], wrote Ray. He was not arrested. Obviously, he distanced himself from the active politics.

In 1929, Werner Heisenberg visited Japan and India. After returning to Germany, he informed about his impression of the Himalayas [12]. Later, Ray’s younger brother, Shashi Bhusan Ray [13], went to Germany for higher studies, he met Heisenberg [14].

It is almost unknown to the political and scientific world that BBR had close contact with Netaji Subash Chandra Bose. There is rumour that due to BBR’s contact with the physicist Werner Heisenberg, S.C. Bose met the German dictator Adolf Hitler. Netaji’s contact with Ray are explored elsewhere [15].

4.2 Private communication

In the late 1920s, BBR was going through hard life. He had trouble with his heart. On Feb. 29, 1928, he wrote to Y. Nishina that he has consulted the both Europeans and Indian doctors; but without success for his health. Also, his mother, after suffering for a long time, was cured. His heart breaking letter continues: “Now for the last 3 or 4 months my only sister is suffering from Tuberculosis and I do not know whether she will recover at all.” Then he told about his meagre salary, 30 Pounds per month. As even today, most of the young people think that the solution of their financial problem is to go abroad; so was BBR’s case. He asked Y. Nishina to talk to N. Bohr and explore an opportunity for getting a scholarship abroad. Bohr indeed helped him. As we see from Fig. 6, Ray was in Bohr’s laboratory again, for about a year.

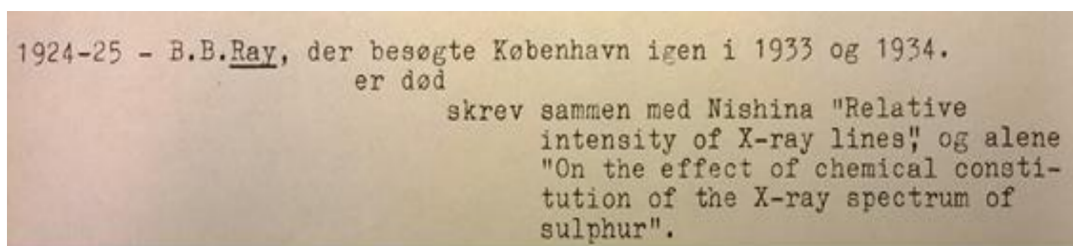


Figure 6: B.B. Ray stay time and research work at the Niels Bohr Institute [Credit: Niels Bohr Archive, Copenhagen]

As far as Ray's publications at the Bohr Institute are concerned, Nishina and Ray published a short article in "Nature" on the "Relative intensity of X-ray lines". Their results were not satisfactory. The authors promised to write more on the experimental detail and further measurements [16]. However, the work was not continued, as BBR left Copenhagen. He alone wrote paper, which was communicated by Bohr [17]. In the article, he (BBR) acknowledged: "Mr. Y. Nishina for his unfailing friendly help and interest during the work, and to Professor G. Hevesy [a future Nobel Laureate] for kindly supplying me with the sulphur compounds for this investigation" [17]. The relevance of the work can be judged by the fact that in the middle of the 1960s, A. Meisel in a review article referred to Ray's article 'The influence of the chemical bond on X-ray emission and absorption spectra' and other works [18].

5. Conclusions

B.B. Ray's life story could be an interesting example for younger generation, in particular for students with poor family background. Due to his passion for research, he decided for scientific career. Though, he lived short life, during this short period he became Editor of the renowned journal "Science and Culture". He was elected as the Fellow of the Indian National Science Academy (in those days Indian Institute of Sciences of India). After his death M.N. Saha established B.B. Ray Memorial Lecture under the title: 'Professor Bidhu Bhushan Ray Memorial Lectureship' on Experimental and Mathematical Physics and allied subjects. A Committee collected Rs. 8332 as fund. The ceremony of unveiling of the portrait of B.B. Ray was performed on January 28, 1946 before a gathering of colleagues, research workers, friends and admirers of Professor Ray in the Pure Chemistry Lecture Theatre [3].

Today neither his portrait nor his laboratory exists. The X-ray Laboratory made by him, was taken over by S.N. Bose. Today we know Bose's name better than Ray. Why so? The answer is very simple, namely, we Indians give too much importance to "discoveries" and "inventions", and entirely ignore the achievements of scientists like B.B. Ray who established a new field of science and technology. On the long run, such acts had more impact on the society than a "discovery".

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References:

1. M.S. Hegde, Book Review - X-Ray Spectroscopy and Allied Areas. S.K. Joshi, B.D. Shrivastava and A.D. Deshpande (Eds). Narosa Publishing House, 6 Community Centre, Panchsteel Park, New Delhi 1998, Curr. Sci. **78** (2000) 102.
2. University of Calcutta, Minutes of the senate and the faculties for the year 1927, Calcutta University Press, Calcutta (1927), p. 84 & p. 801.
3. R. Singh, Bidhu Bhushan Ray - A Pioneer of X-Ray Spectroscopy (Shaker Publisher, Aachen, 2017).
4. Minutes of the syndicate 1923 – Part I & II, Calcutta University Press, Calcutta (1923), p. 320.
5. B.B. Ray to N. Bohr, March 23 (1923).
6. N. Bohr to C.V. Raman, May 18 (1923).
7. Minutes of the senate and the faculties for the year 1940, University of Calcutta, Calcutta (1940), pp. 277-278.
8. R. Tagore to N.K. Sen, September 7 (1935).
9. K.C. Wali (Ed.), Satyendra Nath Bose – His life and times, Selected works with commentary (World Scientific Publishing Co. Pvt. Ltd., New Jersey 2009, p. xxxi).
10. B.B. Ray to Y. Nishina, February 29 (1928).
11. B.B. Ray to N. Bohr, undated (1930).
12. W. Heisenberg to N. Bohr, December 20 (1929).
13. W. Heisenberg to B.B. Ray, January 31 (1938).
14. D. Ray to R. Singh, November 26 (2016).
15. R. Singh, Netaji Subhash Chandra Bose, Bidhu Bhushan Ray and ‘*Science and Culture*’ - History of Science vs. Political history, Sci. Cult. **84** (2018) 103.
16. Y. Nishina and B.B. Ray, Relative intensity of X-ray lines, Nature **117** (1926) 120.
17. B.[B.] Ray, On the effect of chemical constitution on the X-ray spectrum of sulphur, Phil. Mag. (1925) 505.
18. A. Meisel, Der Einfluß der chemischen Bindung auf die Röntgenemissions und absorptionsspektren, Phys. Stat. **10** (1965) 365.