

THE ULTIMATE FACTS - S.N. BOSE AND THE MISSED PHYSICS NOBEL PRIZE

RAJINDER SINGH*

The Nobel Prize is one of the most prestigious awards in the scientific as well as general community. The documents, such as, nomination letters, expert's and the Nobel Committee's reports obtained from the Royal Swedish Academy of Sciences, Stockholm are analyzed to understand - why Satyendra Nath Bose, the founder of Bose- or Bose-Einstein Statistics, did not receive the Physics Nobel Prize.

Introduction

The Nobel Prize, named after the Swedish inventor and industrialist Alfred Nobel, is one of the most prestigious awards. According to the will of the founder, they are awarded to persons for their contributions in the fields of chemistry, physics, physiology and medicine, literature and peace. India stands in the list of “top-twenty” so far as the number of proposals either received from or sent by a nation is concerned.¹ Documents related to selection of Nobel Prize awards were kept secret until 1974. It is only in 1974 that the Nobel Foundation decided to allow documents related to a prize open for public scrutiny which are older than fifty years. We find from the documents fifty years older that five Indian physicists and chemists were nominated for the Nobel Prize. Twenty Indians (10 chemists and 10 physicists) were asked by the Nobel Committees to send proposals. Their detail was explored in “Chemistry and Physics Nobel Prizes – India’s Contribution”.² The details of nomination for M.N. Saha and C.V. Raman are discussed on various articles published in different journals. However, before the publication of the book, S.N. Bose case was neither discussed by any other author including me. Only recently documents

regarding S.N. Bose are available for research purposes only.

S.N. Bose is a great physicist; there exists a number of articles and biographies which deal with various aspects of S.N. Bose’s life.³ However, none of them deals with S.N. Bose and the Nobel Prize. Unfortunately the book “Chemistry and Physics Nobel Prizes – India’s Contribution” is not available in India. Thus I think it will be worth while to write this article for the readers of the “Science and Culture” to show:

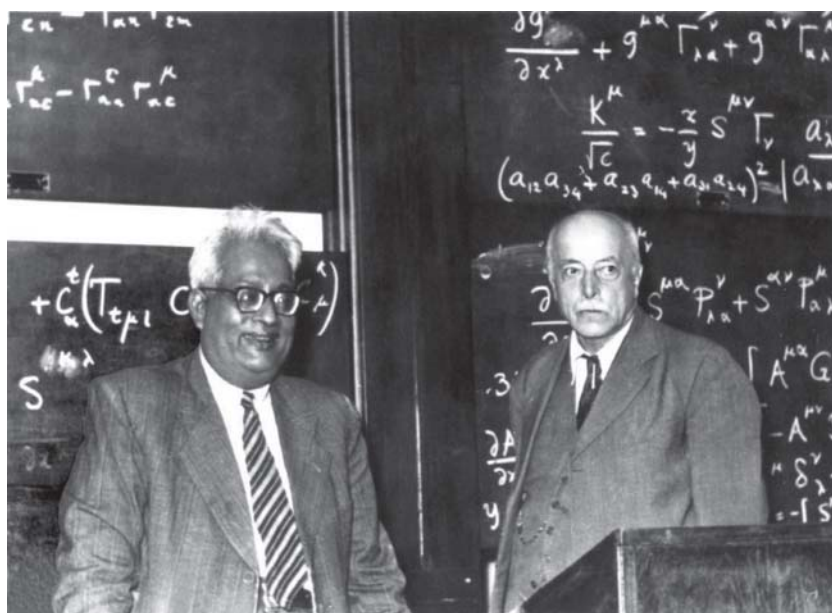
- (a) Who nominated S.N. Bose for the Physics Nobel Prize and for which achievements?
- (b) The opinion of the Nobel Committee and its expert about S.N. Bose’s nomination.

Nomination for the Physics Nobel Prize

It is a well-known fact that Bose sent an article to Albert Einstein, in which he derived Planck’s law of radiation by applying Einstein’s concept of light quanta. Einstein realized the potential of the idea. He translated the article and got it published in “Zeitschrift für Physik.”⁴ This led to the foundation of the Bose-Einstein statistics. For this work, Bose in 1958, was elected as a Fellow of Royal Society London. According to his nomination certificate, Bose is:

“Discoverer of the Bose statistics. This idea was

* Research Group – Physics Didactic and History of Science, Physics Institute, University of Oldenburg, Germany. E-Mail: rajinder.singh@uni-oldenburg.de



SN Bose and Max von Laue in Fritz-Haber Institute, Berlin. (22.10.1953). Credit: Archive for the History of Max Planck Society, Berlin.

put forward in 1924, at a time when no one had considered changing the classical statistics. The Bose statistics, together with the Fermi statistics discovered two years later, are now known to govern the whole of atomic phenomena. Bose has also made contributions to the motion of electromagnetic waves in the ionosphere and to various problems of atomic physics, and recently he has written a number of papers on unified field theory. ...”⁵

S.N. Bose was first nominated in 1956, by K. Banerjee, Head of the Physics Department, University of Allahabad. He remarked the following as justification:

“(1). He (Bose) made very outstanding contributions to Physics by developing the statistics known after his name as Bose Statistics. In recent years this statistics is found to be of profound importance in the classifications of fundamental particles and has contributed immensely in the development of nuclear physics.

(2). During the period from 1953 to date he has made a number of highly interesting contributions of far-reaching consequences on the subject of Einstein’s Unitary Field Theory.”⁶

K. Banerjee also sent a list of important publications of Bose, which contains six papers.

Two years later, in 1958, S.N. Bose was nominated by Daulat Singh Kothari, University of Delhi. About the scientific contribution of his candidate, D.S. Kothari wrote:

“Professor Bose’s contributions to theoretical physics have been of outstanding significance, in particular, the formulation which goes by the name of Bose Statistics which has proved of fundamental importance, both from the point of view of theoretical understanding of the properties of elementary particles and from the point of view of applications to matter in bulk.”⁷

In 1962 there were two nominations in S.N. Bose’s favour. S.N. Bagchi, Professor of Chemical Physics, University of Calcutta, wrote a long letter. He claimed that Bose deserves the prize for the Bose Statistics. The author wrote:

“The method that Bose introduced actually contradicted the dynamical concepts then in vogue. In fact, the true significance of the new thinking could be properly assessed only after the advent of the present-day quantum mechanics. It would not be an exaggeration to suggest that Bose’s work heralded the advent of quantum statistics”.⁸

Further he wrote:

“The real importance of Bose’s work, taken in conjunction with Fermi statistics which is naturally complementary to Bose statistics, is borne the corner-stone of elementary particle physics. The designation of the most elementary constituents of matter either as Bosons (after Bose) or as Fermions (after Fermi) fully bears out the extent of which Bose’s original work has contributed to the development of the extant physical theories.”⁹

And further:

“Besides, he has made important contributions in the theory of unified field. He has also made important contributions in other branches theoretical physics and mathematical theory of statistics (...). But his work on Bose statistics alone make him eminently suited for the award and I hope that the Committee would recognize his contribution in the field of quantum statistics by rewarding him the honour before it is too late.”¹⁰

In the same year, A. Dutta, University of Calcutta, nominated three candidates: S.N. Bose “for his work on Bose Statistics”, S. Tomonaga, Tokyo University, “for his

work on Quantum Field Theory” and S. Chandrasekhar, U.S.A., “for his work on Astro Physics.”¹¹

According to the Rules and Regulations of the Nobel Foundation, the Nobel Committee makes list of the nominated candidates, after receiving the proposals. The Committee prepares a general report in which all nominated candidates are reviewed and short-listed. Before that the Nobel Committee (N.C.) asks its experts to prepare detailed reports on the short-listed candidates. If the N.C. thinks a person, who was previously nominated, might be a “potential” candidate to win the award; his report is complimented.

Opinions of the Nobel Committee’s Expert on S. N. Bose’s Nomination

In the case of S.N. Bose, only in 1956, the Nobel Committee asked its expert Oskar Klein to evaluate Bose’s work. According to the translated summary of the report: “Professor S.N. Bose, Kolkata, has been proposed this year for the Nobel Prize in Physics by Professor K. Banerjee, Allahabad, for the quantum statistics named after him and for his contribution to Einstein’s unified field theory.”¹² According to O. Klein,

“In 1924, in two publications derivation of Planck’s heat radiation by Bose, inspired Einstein formulate a theory of the ideal gas degeneration at low temperatures; which in turn provided the background for Fermi treatment of the same problems on the basis of the Pauli Exclusion Principle (1926). The same year Paul A.M. Dirac showed that both forms of quantum statistics could be based on the rational quantum mechanics, which, as he and Werner Heisenberg showed, contains two classes of physically possible solutions, the symmetrical, corresponding to the Bose-Einstein statistics, and the anti-symmetric, corresponding Fermi statistics.”

O. Klein concluded that although Bose’s work of 1924 has been an important contribution; but it is not so distinguished as the work of other physicists. Thus it cannot be rewarded with a Nobel Prize.¹³

According to O. Klein - Bose’s contribution to Einstein’s theory of unified field theory would even fit less to spirit for the Physics Nobel Prize. It is on the mathematical contribution to Einstein’s long-standing attempt for a universal field theory - whose physical meaning as well as the whole Einsteinian program in any case, is still quite obscure.¹⁴

Opinion of the Physics Nobel Committee

In 1956 the Nobel Committee wrote that Professor K. Banerjee has suggested that prize should be awarded to Professor S.N. Bose, Kolkata, for the introduction of Bose-Statistics, named after him, in atomic and nuclear physics (1924); and for his contributions made to the development of Einstein’s field theory (1953). Report on this work was written by O. Klein. His investigations show that Bose’s contribution cannot be awarded with a Nobel Prize.¹⁵

Concluding Remarks

According to the Statutes of the Nobel Foundation, April 27, 1995, § 2.: “... the annual award of prizes shall be intended for works ‘during the preceding year’ shall be understood in the sense that awards shall be made for the most recent achievements in the fields of culture referred to in the will and for older works only if their significance has not become apparent until recently.” In 1920s, the significance of the idea (“discovery”) was evident to the scientific community. However, the community did not nominate Bose. The history of the Physics Nobel Prize shows that “no one can receive the prize in a given year without being nominated for that year.”¹⁶ Even if, he had been nominated in the 1920s, he had no chance, because in those days the Nobel Committee was not in favour of theoretical physics.¹⁷

What we also see is that S.N. Bose did not get international support. Even the prominent Indian physicists like C.V. Raman, who being a Nobel Laureate had the permanent right of nomination, Homi J. Bhabha, M.N. Saha, D.M. Bose and S.K. Mitra who were asked by the Nobel Committee did not send proposal in Bose’s favour.¹⁸

Only once, that is, at the time of the first nomination in 1956, special report was written on S.N. Bose’s achievements. After that it never happened. Clearly the Nobel Committee did not see in him a “potential” candidate who had chance to receive the Nobel Prize.

The concluding fact remains that neither the Physics Nobel Committee and its expert, nor the international and national community recommended that S.N. Bose’s work for a Nobel Prize.

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Notes and References

1. R. Singh, India's Nobel Prize Nominators and Nominees, - The Praxis of Nomination and Geographical Distribution, pp. 2-4, (2016) (Shaker Publisher, Aachen); R. Singh, Die Nobelpreise und die indische Elite, pp. 2-4, (2016), (Shaker Verlag, Aachen).
2. R. Singh, Chemistry and Physics Nobel Prizes – India's contribution, 2016 (Shaker Publisher, Aachen).
3. For S.N. Bose's scientific papers and biography, see, C.K. Majumdar, P. Ghose, E. Chatterjee, S. Bandyopadhyay, *et al.*, SN Bose: The man and his work - Part I: Collected scientific papers & Part II: Life, lectures and addresses, miscellaneous pieces, (1994) (SN Bose National Centre for Basic Sciences, Calcutta); J. Mehra, *Biogr. Mem. Fellows R. Soc. Lond.* **21**, 116 (1975); S.D. Chatterjee, *Biogr. Mem. Indian Nat. Sci. Acad.* **7**, 59 (1983); G. Venkataraman, Bose and his statistics, (1992) (University Press (India) Limited, Hyderabad); J. Stachel, Einstein und Bose, Preprint No. 4, (1994) (Max-Planck-Institut für Wissenschaftsgeschichte, Berlin); J. Stachel, Einstein from 'B' to 'Z', (2002) (A Birkhäuser Book, Birkhäuser).
4. S.N. Bose, *Zeitschrift für Physik* **26**, 178 (1924).
5. <https://collections.royalsociety.org/DServe.exe?dsqIni=Dserve.ini&dsqApp=Archive&dsqCmd=Show.tcl&dsqDb=Catalog&dsqPos=21&dsqSearch=%28%28text%29%3D%27bose%27%29,17-4-2016>.
6. K. Banerjee to the Nobel Committee, Jan. 12, 1956.
7. D.S. Kothari to the Nobel Committee, Nov. 25, 1958.
8. S.N. Bagchi to Nobel Committee, Jan 27, 1962.
9. S.N. Bagchi (*ibid.*)
10. S.N. Bagchi (*ibid.*)
11. A. Dutta to Nobel Committee, Jan. 25, 1962.
12. The Nobel Committee's Expert's Report 1956.
13. *ibid.*
14. *ibid.*
15. The Report of the Nobel Committee 1956.
16. H. Nielsen, K. Nielsen, (Eds.), The history of thirteen Danish Nobel Prizes – Neighbouring Nobel, p. 586, (2001) (Aarhus University Press, Aarhus).
17. R.M. Friedman, *Nature* **292**, 793 (1981).
18. R. Singh, India's Nobel Prize nominators and nominees – The praxis of nomination and geographical distribution, pp. 17-32, (2016) (Shaker Publisher, Aachen).