

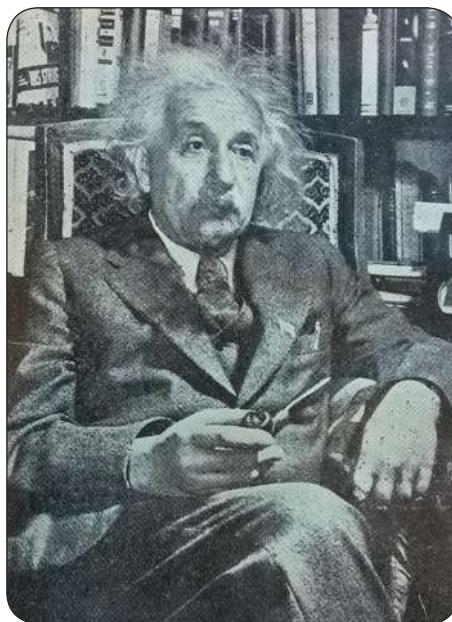


The beginning of the Albert Einstein's contact with M N Saha and S N Bose

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Albert Einstein (**Fig 1**) is one of the most famous physicists of the 20th century. His name is associated with the quantum nature of light and the theory of relativity. He communicated not only with India's politician Mohandas Karamchand Gandhi, but also with Indian physicists S N Bose and M N Saha. Details of Einstein's interaction with Indian scientists are explored in a separate article. In the following, I show how the interaction between Saha-Einstein and Bose-Einstein began.



March 14, 1879 at Ulm, In 1921, he was awarded the Nobel Prize for Physics; Einstein died on April 18, 1955 at the age of 76.

Fig 1. Albert Einstein. Credit: "Science and Culture", Kolkata.

In the second decade of the 20th century, due to the efforts of Bengali nationalists under the guidance of Asutosh Mookherjee (also written as Mukherjee) – a jurist and educationist, in 1914, the University College of Science and Technology was established [1]. In 1916, two young Bengalis – M N Saha and S N Bose (**Fig 2**) were appointed as Research Fellows at a monthly salary of Rs 200/- each. In 1919 they were Lecturer in the Department of Physics [2]. They were fascinated by the modern physics topics, such as the

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quantum nature of energy as proposed by Max Planck; Einstein's quantum nature of light, and theory of relativity. They translated Einstein's and H. Minkowski articles and publish: "The Principle of Relativity: Original Papers by A. Einstein and H. Minkowski (Fig 3) [3].



Fig 2. Front row: Middle J C Bose. To his right side – M N Saha. S N Bose standing behind Saha. Credit: Bose Institute, Calcutta.

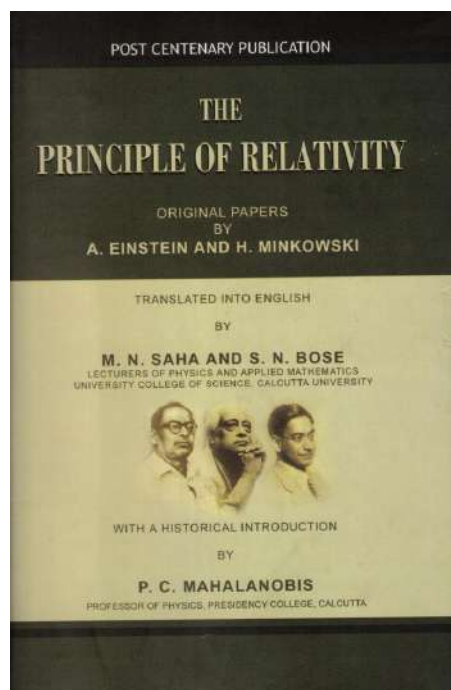


Fig 3. Cover of the book (reprinted in 2006): A translation of A Einstein's and H Minkowski's original papers by M N Saha and S N Bose. Credit: University of Calcutta.

PHYSICS DEPARTMENT,
Dacca University.

Dacca, 160 4th June 1924.

Respected Sir. I have ventured to send you the accompanying article for your perusal and opinion. I am anxious to know what you think of it. You will be that (I have tried to deduct the coefficient $\frac{8\pi}{3} \frac{v^2}{c^2}$ in Planck's law independent of the classical electrodynamics) only assuming ~~that~~ ~~finite~~ that the ultimate elementary regions in the Phase space has the (infinite) Ω . I do not know sufficient German to translate the paper. If you think the paper worth publication, I shall be grateful if you arrange for its publication in *Zeitschrift für Physik*. Though a complete stranger to you, I do not feel any hesitation in making such a request. Because we are all your pupils through profiting only by your teachings through the ~~the~~ ~~your~~ ~~workings~~. I don't know whether you still remember that some time from Calcutta asked your permission to translate your papers on Relativity in English. You acceded to the request. The book has since been published. I was the one who translated your paper on Generalised Relativity.

Yours faithfully,
S. N. Bose

Fig 4. S N Bose's letter to A Einstein. Credit: S N Bose National Centre for Basic Sciences, Kolkata, India

M N Saha and A Einstein

In 1919-1920, M N Saha wrote a series of articles. He gave an expression to explain the structure of stars. This later came to known as the Saha ionisation. Due to his achievements, the University of Calcutta granted Saha a scholarship for higher study in Europe. He went to England, but found that in the laboratory of his host, A Fowler, there were not adequate facilities to experimentally prove his ionisation theory. At the advice of his British adviser, he went to Berlin and worked in the laboratory of the German chemist Walther Nernst. While in Berlin, Saha got a letter from his mentor, A Mookherjee, in which a new position at the University of Calcutta was offered to Saha. Before returning back, on Aug 20, 1921, he wrote a letter to Einstein; and asked for a recommendation letter, so that a rich Indian businessman gives him grant for the required research apparatus. Saha's letter of Dec 6, 1922, to A Mukherjee indicates that Einstein supported Saha's case. However, Saha never got grant or research facilities at the University of Calcutta; and in the end of 1923 joined the University of Allahabad.

S N Bose and A Einstein

As seen above, Bose started his career at the University of Calcutta. Before Bose wrote his “classical paper” (that is the derivation of Planck’s law using light quanta) from Dhaka, he mainly read Einstein’s and P Debye’s articles that were published in German journals [4]. In 1921, S N Bose left for Dacca to take newly created position as Physics Professor. His interest in statistics is reflected from his early papers [5]. In Dacca, by applying quantum nature of light, he derived Planck’s radiation law. For that he reasoned: “In all cases it appears to me that the derivations are not sufficiently justified from a logical point of view. On the other hand, the light-quantum hypothesis combined with statistical mechanics (...) appears sufficient for the deduction of the law independently of classical theory. In the following I shall sketch the method briefly” [6]. However, before the publication of the article, Bose sent a letter to Einstein and requested him to see the worth of the article, to be published (Fig 4); and if so, to get it published in a German Journal. Einstein not only translated Bose’s article; but also in a footnote stated: According to my opinion the deviation of Planck’s law by Bose is an important step. Therein given method gives the quantum theory of ideal gases; as I shall show elsewhere [7].

On July 10, 1924, in a session of the Prussian Academy of Sciences, Berlin, Einstein presented his paper “On the quantum theory of monoatomic ideas gas”. “Clearly, Bose’s work triggered a creative outburst in a mind already well-primed to respond to it” [8]. The combination of the two ideas led to the foundation of Bose-Einstein statistics.

To close with this section, it is to be mentioned that on June 15, 1924, from France, Bose wrote second letter to Einstein and sent another manuscript, with similar request. This was also translated by Einstein and got published in “*Zeitschrift für Physik*” [9].

Acknowledgements

Thanks are due to Prof V K Rastogi, Editor-in-Chief “*Asian J Physics*” for editorial work. I heartily acknowledge the following organisations for supplying the documents used in this article: Asiatic Society of Bengal, Kolkata; Bose National Centre for Basic Sciences, Kolkata; Saha Institute of Nuclear Physics, University of Calcutta, and Bose Institute, Kolkata. Last but not the least, I am grateful to Prof. Michael Komorek – Head Physics Didactics and History of Science, University of Oldenburg, Germany; for providing research facilities.

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[Received:18.4.2018]