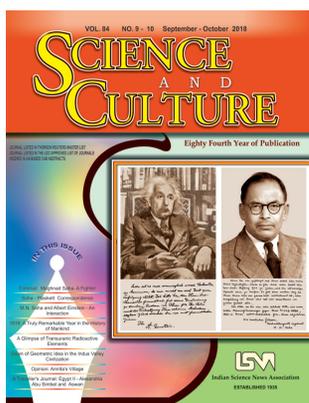


## MEGHNAD SAHA- A FIGHTER



According to Meghnad Saha, “the first astrophysical work of any importance in India was by the French astronomer Jansen who, in 1868, observed a total solar eclipse of the sun passing over Guntur in the Madras Presidency and applied the spectroscope to the sun during the moments of totality.” He observed a line

close to and on the violet side of the yellow line of sodium. This line was also observed independently by Lockyer who named it as ‘Helium’. Thirty years after that the total solar eclipse passing over Buxar was observed by Lockyer, Evershed and Naegamvela. Evershed became the director of Kodaikanal Laboratory in 1911. These observations led him to the discovery of radial motion in sunspots and concluded simultaneously with Fowler, Hale, Mitchell and Adams that the spectra of spots was similar to that of the K-class of stars

The next important contribution in astrophysics from India was made by Meghnad Saha himself in 1917. He was a self-taught physicist. Within a year of his M.Sc. degree in Applied Mathematics he started working on his own on astrophysics being encouraged by reading Agnes Clarke’s popular book on astrophysics. Saha was one of the first in India who understood the importance of Bohr’s quantum theory introduced in 1914 and took up its study seriously.

Saha sent a long essay on ‘Selective Radiation Pressure’ at the end of 1917 for publication in the *Astrophysical Journal* which was accepted for publication on condition that if a payment in dollars (in three figures)

be made to defray a part of the printing cost of such a long article. Unable to pay the printing cost, he published a short note in the *Astrophysical Journal* in 1919 and published his full essay in a little known *Calcutta Journal* (journal of the Department of Science, Calcutta University) in the same year. This was his first published paper in an international journal. He published two more papers titled ‘On Ionization in the Solar Chromosphere’ and ‘Elements in the Sun’ in *Philosophical Magazine* in succession in 1920 and 1921. The first paper contains the famous ‘thermal ionization formula’ in which he showed that the enhancement of the chromosphere spectrum was due to a lowering pressure in the chromosphere.

The other paper ‘On a Physical Theory of a Stellar Spectra’, although done in India, was completed when he was visiting Prof. Alfred Fowler’s laboratory at the Imperial College of Science in London. During this period he had an intimate interaction with Fowler about his work and he came up with some new ideas. The paper originally submitted to the *Philosophical Magazine* for publication was withdrawn and the improved paper incorporating the new ideas with a new title as given above was communicated to the Royal Society by Prof. Fowler himself for publication.

Publication of high quality papers by Saha, while he worked in the laboratory of a renowned physicist like Fowler and later working in Nernst’s laboratory in Berlin, led to the conviction in a section of British scientists that these would not have been possible if Saha was not associated with Fowler’s laboratory. This pained Saha a lot. In Saha’s words, there has been a persistent effort ‘to minimize my early contributions to astrophysics’. Saha was not unfamiliar with such humiliation. In a sense he was a born fighter. Born to the lowest tier of Hindu caste system

(*shudra*) in a poverty-stricken family having a grocery shop in a village in Dacca (in Bangladesh), he had to fight hard against poverty and social stigma to get himself educated at the first place. In later years while he was a student of Presidency College, Kolkata, he experienced a similar excruciating discrimination when some students of Eden Hindu Hostel objected to having meals with a low caste fellow student in the same dining hall. This type of unkind behavior probably made Saha more sensitive to his own prestige and respectful to his position.

Prof. Harry Hemley Plaskett, FRS in April 1946 commented “Saha, working in Fowler’s laboratory after the end of the last War, then demonstrated that the successive appearances of these different spectra could be interpreted as being due to the temperature and pressure prevailing in the stellar atmosphere”. Saha was irked by the remark made by Professor Plaskett, another astrophysicist of repute and there was an exchange of mails between them on this issue. Saha clarified his position of his early astrophysics work by writing in details (close to an autobiography) in his letter to Plaskett.

Interestingly, Prof. Plaskett was of the same age as that of Saha, both born in 1893, Saha being a few months younger than Plaskett. Prof. Plasket was born in Toronto, Canada, worked at the Imperial College with Fowler and returned to Canada to join Dominion Astrophysical Observatory in Victoria, British Columbia. Both Saha and Plaskett were FRS and both were some what associated with Fowler’s laboratory. In 1928, Plaskett was appointed as a professor of astronomy at Harvard University and later joined as Savilian Professor of astronomy at the University of Oxford.

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*Sir Arthur Eddington, in the 14th edition of Encyclopedia Britannica, designates Saha’s theory as one of the ten outstanding discoveries of astronomy and astrophysics since the discovery of the telescope, in 1608, by Galileo.*

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The exchange of mails between two scientists of equal repute and honour, one (Saha) explaining the circumstances under which he had done his work without any help from outside while the other (Plaskett) acknowledging his ignorance that the work done by Saha “had been done in India, not Germany, before you came to Fowler’s laboratory” is an important historic document by its own right. In spite of his accepting that Saha’s pioneer investigations had a “place in the history of the subject is secure for all time”, readers may still sense a kind of incredulity in the text. This precious historic exchange of letters, which are not commonly available, were handed over to me by Professor Arnab Rai Choudhuri of Indian Institute of Science, Bengaluru, permitting me to publish them in *Science and Culture*.

Readers will find this correspondences in this issue.

Meghnad Saha being the founder of the journal *Science and Culture* and Indian Science News Association (ISNA) which publishes this journal, we have decided to publish a special issue to celebrate his 125 years of birth. Sir Arthur Eddington, in the 14<sup>th</sup> edition of Encyclopedia Britannica, designates Saha’s theory as one of the ten outstanding discoveries of astronomy and astrophysics since the discovery of the telescope, in 1608, by Galileo. The upcoming special issue (Nov-Dec issue of Science and Culture) will focus on our current understanding of the plasma state with an emphasis on what is happening in India in this field which will help us to understand how Saha’s work on thermal ionization paved the way to the development of modern astrophysics. □

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