
Great Indian Scientist

Late Shanti Swaroop Bhatnagar

Shanti Swarup Bhatnagar played a significant part alongwith Homi Jehangir Bhabha, Prasanta Chandra Mahalanobis, Vikram Ambalal Sarabhai and others in building of post-independent S&T infrastructure and in the formulation of India's science and technology policies. Bhatnagar was the Founder Director of the Council of Scientific and Industrial Research (CSIR), which was to later become a major agency for research in independent India. He was the first Chairman of the University Grants Commission (UGC).



I have always been associated with many prominent figures eminent in other ways, but Dr. Bhatnagar was a special combination of many things, added to which was a tremendous energy with an enthusiasm to achieve things. The result was he left a record of achievement which was truly remarkable. I can truly say that but for Dr. Bhatnagar you could not have seen today the chain of national laboratories.

Pandit Jawaharlal

Bioscientists

Early Life

Bhatnagar was born on 21 February 1894 at Bhera, in the district of Shapur in Punjab (now in Pakistan). Bhatnagar belonged to an educated elite family both from the paternal and maternal side. His paternal grandfather Rai Bahadur Munshi Manohar Lal Bhatnagar held high executive post and was particularly noted for his piety and honesty. His father Parmeshwari Sahai Bhatnagar, who was a distinguished graduate of the Panjab University, refused to take up judicial or executive service which was the tradition of the family and became headmaster of a high school in Bhera. His mother Parbati Bhatnagar was the eldest daughter of Pearey Lal, who was a distinguished engineer (he was one of the first to qualify as an engineer from the Roorkee College of Engineering). Under the influence of his maternal grandfather the young Bhatnagar not only developed a taste for engineering and science but also became interested at a very early age in his grandfather's instruments, geometry and algebra and in making mechanical toys. Bhatnagar's interest in poetry and literature also came from his mother's side. It may be noted that his mother's family produced a number of poets, the most famous of them was Munshi Hargopal Tufta who got the title of Mirza from Mirza Ghalib the greatest Urdu poet. Bhatnagar's maternal family which adorned the Moghul courts was bestowed with the title of Khwaja-i-Khawaja.

Education

Bhatnagar's father was disinherited and thus lost his share of family property because of his refusal to follow the family tradition. Unfazed by this Parmeshwari Sahai Bhatnagar continued to serve the society but when he died he left his wife and young children in dire poverty.

Bhatnagar had his earliest schooling in a private 'Maktab' and then studied in A.V. High school in Sikandrabad in UP where his maternal grandfather worked. Rai Sahib Lala Raghunath Sahai, the famous headmaster of the Dyal Singh High School at Lahore and a friend of Bhatnagar's father persuaded his mother to send Bhatnagar for schooling at Lahore. While studying in the Dyal Singh High School Bhatnagar came in contact with two leading Brahmos namely Pandit Shiv Nath Sastry and Babu Abinash Chandra Mazumdar. Bhatnagar, whose father had joined Brahma Samaj, became highly interested in the activities of the Samaj. Raghunath Sahai, the head master, who later became Bhatnagar's father-in-law played an important role in shaping the views news of Bhatnagar. Besides the headmaster the other teachers who had influenced Bhatnagar were Rai Bahadur Lala Ram Kishore (who later became the Vice-Chancellor of the Delhi University), Lala Bishen Narain Mathur, Moulvi Talib Ali Paband and Mohd. Ashraf .

Bhatnagar passed the Matriculation Examination in the first division and secured a University Scholarship. In 1911 Bhatnagar joined the newly established Dyal Singh College. Here he became an active member of the Saraswati Stage Society, established by Mrs. Norah Richards, the wife of the English literature professor of the College, P.E. Richards. Bhatnagar earned a good reputation as an actor. With Mrs. Richards' encouragement Bhatnagar wrote in Urdu a one-act play called 'Karamati' (Wonder worker), the English translation of which earned him the prize and medal of the Saraswati Stage Society for the best play of the year 1912. Bhatnagar continued his interest in literary work in his later phases of life. After the death of his wife Bhatnagar wrote a collection of poems in Urdu in memory of his wife, which were published under the title Lajwanti.



Bhatnagar passed the Intermediate Examination of the Panjab University in 1913 in the first division and joined the Forman Christian College for the BSc degree. At the time of Bhatnagar's joining the college. Dr. J.C.R Ewing was the Principal. Dr. Ewing (who later became Sir James Ewing) was for many years Vice-Chancellor of the Panjab University. Here he studied physics and chemistry and took up on Honours course in physics. He was taught physics by J.M. Benade, who had done research with Arthur Holly Compton (1892-1962), the Nobel Laureate in physics. It may be noted here that Bhatnagar did his first research work with Benade for his MSc degree on the subject of surface tension). Chemistry was taught by P. Carter Speers who used to be regarded as father of technical education in the University

Mr. Welinker, Principal of Dyal Singh College, who later became Director of Public Instruction wrote: 'Mr. Shanti Swarup was one of the ablest students in that large class of about 100 students; indeed, I am of opinion that in all-round ability he was the ablest. He distinguished himself in every branch of the work of his class—literary, scientific, dramatic, social and he gave the most complete satisfaction to the Professor by the excellence of his behavior. He is a young man of more than usual ability and I feel sure that if he is given opportunities of developing his talent in some great European or American Centre of Scientific research he will do some remarkable work in science and will thus be in a position to render high service to his country.'

Career

After taking the Bachelor's degree in 1916 he decided to take up his first formal employment as Demonstrator in the Physics and Chemistry Department of the Forman Christian College. Later he became the Senior Demonstrator in the Dyal Singh College. The employment, however, did not hinder Bhatnagar's efforts in pursuing higher studies. He joined the MSc course in chemistry in the Forman Christian College and took the degree in 1919.

With the initiative taken by Ruchi Ram Sahni Bhatnagar was awarded a scholarship by the Dyal Singh College Trust for his studies abroad. Armed with this scholarship Bhatnagar left for America via England. But after reaching England he found that it was impossible to find berth on ships sailing to

America as all tickets had been booked for American troops which were then being demobilised. He informed the situation to the Trustees and the latter agreed to his doing post-graduate research in London. Bhatnagar presented himself with his research papers to Professor F. G. Donnan of the University College of London. Professor Donnan readily agreed to take Bhatnagar under his care for the DSc degree of the London University. In 1921 Bhatnagar received the degree. As a member of Donnan's school he was engaged in the study of adhesion and cohesion in emulsions. His thesis was entitled 'Solubilities of bi- and trivalent salts of higher fatty acids in oils and their effect on surface tension of oils.' While working in London he also had a fellowship of the value of 250 pounds a year from the DSIR, England.

Bhatnagar returned to India in August 1921 and he joined the Banaras Hindu University (BHU) as Professor of Chemistry. It may be noted that the BHU was founded by Pandit Madan Mohan Malaviya in 1916. Bhatnagar stayed for three years in BHU and during this short span of time he was able to create an active school of physico-chemical research. Bhatnagar wrote the 'Kulgeet' (University song) of the University. Justice N.H. Bhagwati, Vice-Chancellor of BHU said: "Many of you perhaps do not know that besides being an eminent scientist, Professor Bhatnagar was a Hindi poet of repute and that during his stay in Banaras, he composed the 'Kulgeet' of the University...Prof. Bhatnagar is remembered with reverence in this University and will continue to be so remembered till this University exists."

From Banaras Bhatnagar moved to Lahore where he was appointed as University Professor of Physical Chemistry and Director of University Chemical Laboratories. He spent 16 years in the Panjab University, Lahore and this period was the most active period of his life for original scientific work. While his major fields of study were colloidal chemistry and magneto-chemistry he did considerable work in applied and industrial chemistry. In 1928 Bhatnagar, jointly with K.N. Mathur, invented an instrument called the Bhatnagar-Mathur Magnetic Interference Balance. The balance was one of the most sensitive instruments for measuring magnetic properties. It was exhibited at the Royal Society Soiree in 1931 and it was marketed by Messers Adam Hilger and Co, London.

Industrial mind

Bhatnagar did considerable work in applied and industrial chemistry. The first industrial problem undertaken by Bhatnagar was the development of a process to convert bagasse (peelings of sugarcane) into food cake for cattle. One of the important achievements of Bhatnagar in applied and industrial chemistry was the work he did for Attock Oil Company at Rawalpindi (representative of Messers Steel Brothers & Co London). Attock Oil Company in their drilling operations confronted a peculiar problem, wherein the mud used for drilling operation when came in contact with the saline water got converted into a solid mass which hardened further. This solidification of the mud rendered all drilling operations impossible.

Bhatnagar realised that this was a problem in colloidal chemistry and developed a suitable method to solve it. 'The problem was elegantly solved by the addition of an Indian gum which had the remarkable property of lowering the viscosity of the mud suspension and of increasing at the same time its stability against the flocculating action of electrolytes.' M/s Steel Brothers was so pleased with the method developed by Bhatnagar that they offered a sum of Rs. 1,50,000/- to Bhatnagar for his research work on any subject related to petroleum. At the instance of Bhatnagar the company placed the amount at the disposal of the University. The grant helped to establish the Department of Petroleum Research under the guidance of Bhatnagar. Investigations carried out under this collaborative scheme included deodourisation of waxes, increasing flame height of kerosene and utilisation of waste products in vegetable oil and mineral oil industries. Realising the commercial importance of the collaborative scheme the Company increased the amount and extended the period from five years to ten years.

Bhatnagar persistently refused to receive any monetary benefit arising out of his applied/industrial chemical research for his personal ends on the ground that it may be utilised for strengthening research facilities at the University. His sacrifices drew wide attention. Meghnad Saha wrote to Bhatnagar in 1934 saying, 'you have hereby raised the status of the university teachers in the estimation of public, not to speak of the benefit conferred on your Alma Mater'.

Bhatnagar jointly with K.N. Mathur wrote a book 'Physical Principles and Applications of Magneto chemistry' and which was published by Macmillan publishers. This book was recognised as a standard work on the subject. Prafulla Chandra Ray wrote: "On turning over the pages of Nature my eyes chanced upon an advertisement of Macmillan's in which I find your book at last advertised. That the book is of a high standard is indicated by the most excellent review in Current Science by Professor Stoner, who is competent to judge. As far as I know Meghnad's is the only text book in physical sciences which has been adopted by foreign universities; and it gladdens my heart that another work in physical science is likely to occupy a similar place. My days are practically numbered; and my great consolation is that you, in chemistry, are raising the reputation, abroad, of Indian workers".

Bhatnagar's contribution in Indian Science

In 1930s there were no appropriate research organisations for the development of natural resources and new industries. Thus Sir Richard Gregory, then editor of Nature, who after visiting scientific departments and universities in India in 1933 drew the attention of Sir Samuel Hoare, Secretary of State for India, to the lack of appropriate research organisation equivalent to those of in DSIR in Britain for the development of natural research and new industries. He observed: "I knew that work of the Geological Survey of India, Botanical Survey of India, Meteorological Department, Forestry and so on; but I think something should be done to form an Indian Research Council to make use of the undoubted capacity of Indians for scientific investigations and its applications. Scientific activities, many of them having a direct bearing upon the development of resources of the country, are scarcely given the attention they deserve." Gregory was not alone in realising the need for appropriate research organisation. C.V. Raman, Lt. Col. Seymour Sewell and Dr. J.C. Ghosh had earlier proposed the creation of an Advisory Board of Scientific Research for India. Indian scientists at Calcutta and Bangalore initiated schemes to launch a National Institute of Sciences and an India Academy Science respectively. At the Fifth Industries Conference in 1933 the Provincial Governments of Bombay, Madras, Bihar and Orissa unanimously reiterated their demand to set up a co-ordinating forum for industrial research, Sir Hoare advised the Viceroy, Lord Willingdon to support the idea of an Indian version of DSIR. However, in May 1934 Willingdon informed Hoare in London that 'the creation of a Department of Scientific and Industrial Research in India to promote the application of research to natural resources does not appear to be necessary.' Having rejected an Indian version of the DSIR the colonial Government decided in 1934 to make a small concession. The Govt. agreed to create an Industrial Intelligence and Research Bureau and which came into operation in April 1935 under the Indian Stores Department. The Bureau had very limited resources (with a budget of Rs. 1.0 lakh per annum) and thus it was not possible for it to undertake any industrial activity. It was mainly concerned with testing and quality control.

After India's independence the CSIR was placed under the Prime Minister Jawaharlal Nehru himself who was equally enthusiastic in the development of science in the country. By the end of 1954 twelve national laboratories were established and a dozen more were at the planning stage.

In 1936 the British Government conferred on Bhatnagar the Order of British Empire (OBE) based on his excellent contribution to pure and applied chemistry. Bhatnagar was knighted in 1941 in recognition of his work for the war effort. In 1943 the Society of Chemical Industry, London, elected Bhatnagar as Honorary Member and later as Vice President. He was elected Fellow of Royal Society, London, in 1943. He was the President of the Indian Chemical Society, National Institute of Sciences of India and the Indian National Science Congress. He was awarded the title Padma Vibhushan by the President of India.