

# S S Bhatnagar: Life and Times

*Rajesh Kochhar*



**Rajesh Kochhar is the Director of National Institute of Science, Technology and Development Studies, New Delhi. His research interests include science policy as well as history and sociology of science.**

Shanti Swarup Bhatnagar (1894-1955) was, in a way, a bridge between two cultures and two eras. He came at a time when science was greeted with a sense of mission, but literature was still valued. Encouragement and recognition were sought from the colonial empire, not as an end in itself, but as a prelude to nation building. An internationally acclaimed chemist, Bhatnagar wrote Urdu poetry under the aptly chosen pen-name of Seemab (meaning mercury) and went on to compose, in Sanskrit, the ceremonial hymn for Benaras Hindu University. Notwithstanding his knighthood and the official position of director (since renamed Director-General) of Council of Scientific and Industrial Research, Bhatnagar had the courage to publicly touch the feet of the Congress president on his release from jail. If chemical industry today is an important part of Indian economy it is in no small measure due to the scientific and managerial efforts of Bhatnagar who half in jest claimed intellectual lineage from the pioneering Indian modern chemist P C Ray, Bhatnagar's teacher having been Ray's early student. Chemistry was rather a laboured link with Bengal; what exercised great influence on the course of Bhatnagar's life was the Bengal-born Brahma Samaj movement.

Shanti's father, Parameshwari Sahai, became a Brahma, preferring the idealist vocation of a teacher to the family's favourite practice of taking well-paying middling jobs in revenue and judiciary. Leaving college half-way through on his father's death and estranged from his uncles because of his religious beliefs, Sahai became second master at Anglo-Sanskrit High School, Bhera, district Shahpur, Punjab, from where, in 1893, he went to Lahore to serve as a volunteer of the Indian National Congress. In 1894, on 21 February, Shanti was born; in March Sahai privately sat for his BA examination, which he passed with distinction in history and English. Sahai however died

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when Shanti was barely eight months old. Cut off from her husband's side and without any means of her own, Sahai's young widow and her three children (one yet unborn) were received by her father, Munshi Pyare Lal, one of the earliest products of Roorkee Engineering College who had now "retired with ample means" to his ancestral house in Sikandarabad, district Bulandshahar, UP. The old house was the repository of a rare collection of Persian books and manuscripts by an ancestor, Mirza Ghalib's junior contemporary and friend, Munshi Har Gopal Tufta, himself a well-known poet. The collection came down to Bhatnagar who, in 1919, passed it on to the University library, Lahore. One of the rarities was "a Persian version of the Mahabharata for which Shanti Swarup received a small sum from the library authorities."

In the comfortable, albeit shattered and secluded, atmosphere of his grandfather's house, Shanti spent his first thirteen years. Henceforth he would pay for his education himself, by winning scholarships and giving private coaching. In 1908, Lala Raghunath Sahai, Parameshwari Sahai's childhood friend and soulmate and Shanti's future father-in-law took the young lad under his wings. Shanti came to Lahore to join Dyal Singh High School of which Raghunath was the headmaster. (Dyal Singh, a prominent landowner, was the leading Brahma leader of Punjab. He also founded the influential English paper '*The Tribune*'.) At school, Shanti developed an absorbing interest in science, "delighting in scientific experiment". He "contrived for himself a crude laboratory in one of the galleries of the School Hall and had stocked it with old tubes, broken flasks, batteries and any useful thing that by hook or by crook could be got hold of." The teachers often complained to the headmaster that Shanti "was a great trouble to them, perpetually plying them with questions; that he was restless in the classroom and always too ready to retort when admonished". In 1911, the schoolboy Shanti published a letter to the editor in '*The Leader*' (Allahabad) on how to make a substitute for carbon electrodes in a battery, by using molasses and carbonaceous matter under pressure and heat.

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When he sat for his BSc examination in 1915 he flunked, in the subject his name is now associated with: chemistry. One of the questions dealt with the nature of X-rays, discovered ten years previously. Bhatnagar, on the authority of the books he had read, wrote that X-rays could be reflected, refracted and polarized just as ordinary light. This however went against what was written in the textbook, the examiner's touchstone.

Significantly, 31 years later, Bhatnagar returned to the problem in his laboratory when material for making electrodes could not be imported because of the second World War.

On matriculation in 1911, he moved on to the newly opened Dyal Singh College on a University scholarship. A lasting influence on him here was the theatre personality, Irish-born Norah Richards, whose husband Philip Ernest Richards came as the Professor of English literature and whose duties included “free-thinking religious discourse.” (Norah Richard’s affectionate and leisurely biography of Bhatnagar, published in 1948, remains the primary source of information on him.) Participating in an intra-college competition Bhatnagar wrote a prize-winning one-act play, *Karamati* (pronounced ‘karaamaati’, miracle-worker). “It satirized the superstitious healing of a *Bhagat* (here meaning imposter) who was also a rogue, and showed the superiority of the healing that was scientific.” The play was however banned by the Principal lest it gave offence. Bhatnagar was greatly inspired by his professor, N N Godbole, whose enthusiasm for indigenous industrial products he imbibed. Bhatnagar in fact contributed an article on “Fermentation phenomena of pomegranate juice,” in a magazine aptly called *Raushani* (light) brought out by the Society for Promoting Scientific Knowledge launched by Lahore Medical College students.

In 1913, after finishing his intermediate examination in first division, Bhatnagar joined Forman Christian College, “where he did not allow any distractions from his studies in Science”. His unexceptional quest for knowledge produced rather unexpected results. When he sat for his BSc examination in 1915 he flunked, in the subject his name is now associated with: chemistry. One of the questions dealt with the nature of X-rays, discovered ten years previously. Bhatnagar, on the authority of the books he had read, wrote that X-rays could be reflected, refracted and polarized just as ordinary light. This however went against what was written in the textbook, the examiner’s touchstone. (Did the examiner know that Bhatnagar was right



but felt that he himself was dutybound to go by the textbook? Or did he genuinely believe that the textbook was right?)". Bhatnagar eventually got his degree next year, with honours in physics.

In retrospect, the incident of Bhatnagar's flunking the BSc examination looks mildly amusing. But in its time it increased his difficulties. Having got married in 1915, supporting his studies for another year was not a mean task. In fact the whole of his college days he had been in straitened circumstances. As an undergraduate he had earned his examination fees by making an inventory of the contents of the Forman Chemical Laboratories. During this period, financially and professionally rewarding was the consultancy work he did for a leading Lahore stationer who could not import gelatin duplicating pads from Germany because of the war. The problem was referred to Bhatnagar by his chemistry professor and the solution fetched him the welcome sum of Rs.150.

After completing his BSc in 1916, Bhatnagar took up a job as demonstrator in physics and chemistry in Forman Christian College, moving on to Dyal Singh College as a senior demonstrator in chemistry. In 1917, he studied for his MSc as a private student. Then for the next two years he worked from the Forman College, receiving instruction under the scheme of inter-collegiate post-graduate teaching from professors of the Government College. He obtained his MSc degree in 1919, taking three years as he had done for the BSc. As part of his degree requirements, he studied the surface tension of water.

The next two years 1919-1921, Bhatnagar spent at the University of London earning his DSc degree on surface tension of oils, under the supervision of Prof. F G Donnan, FRS. This was made possible by the award of a scholarship by Dyal Singh Trust, thanks to the efforts of Prof. Ruchi Ram Sahni, a science professor at the Government College and a member of the Trust. (Sahni was the father of the well-known botanist, Birbal Sahni.) "It was during Bhatnagar's first years in London that His Royal

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Highness, the Prince of Wales visited University College and was shown the Ramsay Laboratories by the Director. The Indian students, five in number were at the time busy cooking their mid-day meal. HRH looked closely at the preparations and asked if he might have a taste. The students, thereupon, invited him and Professor Donnan to share their meal which they did.”

A travel grant from the British department of scientific and industrial research enabled Bhatnagar to visit France and Germany. He was in the group of fourteen research students from London University that went to meet Prof. Walther Hermann Nernst (1864-1941, Chemistry Nobel Prize, 1920) in his laboratory in Berlin with a letter of introduction from Donnan, each name accompanied by nationality and research topic. Nernst himself came out to say ‘no’; he “would not like any Britishers to go round.” Later on a note came addressed to Megh Nad Saha saying that Nernst would allow the Indian students to see the laboratories because “the last blow to the British empire would come from India”. (Ironically, the same Nernst took shelter in England in 1935 after fleeing Nazi Germany.)

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In 1924, 30-year old Bhatnagar was appointed the Director of



the newly opened University Chemical Laboratories, Lahore, in preference to his rather ineffectual European competitor who had been Bhatnagar's teacher. Bhatnagar remained here till 1940. The laboratories addressed problems in industrial and applied chemistry brought in by agriculturists and industrialists, ranging from Sir Ganga Ram, an engineer-turned neo-agriculturist, to Lala Shri Ram of Delhi, J K Mills at Kanpur and Tata Oil Mills.

The most celebrated consultancy, of course, was the solution of the mud problem brought in by Messrs Steel Brothers & Co., London. The company, prospecting for oil in Punjab, used mud to lubricate its drilling jigs. However as soon as the mud came into contact with the underground salt deposits, it coagulated, bringing the operations to a halt. The other experts from the University, consulted by the company, suggested several "chemical" and "mechanical" methods, which were all impractical. But "the theoretical chemist – Dr. Bhatnagar – insisted from the beginning that it was a simple problem in Colloid Chemistry". He added an Indian gum to the mud so that it would not harden on contact with salt. The company was so pleased with the result that it offered Bhatnagar the substantial sum of Rs.1,50,000. Consistent with the spirit of the times and his own idealism, Bhatnagar converted this personal offer "largely to the benefit of the University and research", in the form of six research scholarships for five years. (Synergy with research has been the strength of Indian chemical industry ever since.)

The First World War had given a chance to Bhatnagar to do a bit of consultancy on his own. The Second World War provided him with an opportunity to build scientific infrastructure for the country. In December 1939, the Viceroy of India, on the advice of the commerce member of his council, (Sir) Arcot Ramaswami Mudaliar, asked Punjab to transfer Bhatnagar to the Government of India as adviser in scientific and industrial research. Bhatnagar stipulated that he should have laboratories for research and that his Steel Scholars (i.e. those funded by

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Steel Brothers & Co.) be permitted to be brought along. This was accepted. In April 1940, the Government set up a Board of Scientific and Industrial Research, in place of the old Bureau of Scientific Research. "The Board will coordinate the work of the existing organizations already employed in this field... and make recommendations to the Government, who will prescribe from time to time the general lines on which industrial research should be undertaken and pursued." In August 1940, Bhatnagar took over as Director of Scientific and Industrial Research, dividing his time between Delhi and Calcutta where he had his laboratories in Government Test House, Alipore.

In January 1942, "when threats of the Japanese invasion became more intense, "Bhatnagar's headquarters were shifted to Delhi, in the University buildings. To give scientific research more freedom within the Government set up, an autonomous Council of Scientific and Industrial Research was set-up, on 26 September 1942 (celebrated as CSIR foundation day). Bhatnagar remained its head for 12 years, from its inception till his death in 1955. The foundation stone of as many as five laboratories was laid before independence itself: Central Glass and Ceramic Research Institute, Kolkata (December 1945), Central Fuel Research Institute, Dhanbad (November 1946), National Metallurgical Laboratory, Jamshedpur (also November 1946), National Physical Laboratories, New Delhi (January 1947) and National Chemical Laboratories, Pune (April 1947). Bhatnagar's tenure saw the establishment a total of 12 laboratories. (The number now stands at 39, manned by about 5000 scientific and 3000 technical staff.)

Bhatnagar concurrently held a number of posts in the Government. In 1948 and 1949 he worked as Secretary to the ministry of education, and educational adviser to the Government of India. He was chosen to become the first secretary to the ministry of natural resources and scientific research, which was set up in 1951. He was also Secretary of Atomic Energy Commission and later became the Chairman of the University Grants Commission.



He received a number of honours. In 1936, the British Government conferred on him the Order of the British Empire. Norah Richards reprints a delightful ditty which runs like this:

There was a young man of 23  
Who got a job with a fat M.P.  
Not caring much for the infantry,  
And he, thank God, is an O.B.E.

I had a friend – a friend – and he  
Just held the line for you and me.  
He kept the Germans from the sea  
– and died, without the O.B.E.  
Thank God! without the O.B.E.

Bhatnagar was consoled by his friends that in his case OBE stood for Oil Borer of the Empire. A bigger honour came his way in 1941, when he was made the Knight Bachelor. From a scientific point of view, great recognition of his work came with the 1943 election as a fellow of the Royal Society of London. Independent India honoured him with a Padma Vibhushan in 1954.

From his childhood, thanks to the literacy atmosphere in his grandfather's house, Bhatnagar enjoyed listening to poetry and took to writing himself. Mostly while travelling or on holiday he would write verses on scraps of paper and pocket them. His wife collected them and kept them safely. His collection of Urdu poems, titled *Lajwanti* after his wife, was published in 1948. "On the whole his verses are topical, humourous and reflective. Those written after the loss of his wife (in 1946) bear a tender wistfulness and the stamp of loneliness."

*Address for Correspondence*

Rajesh Kochhar  
Director  
National Institute of Science,  
Technology & Development  
Studies  
Pusa Gate, K S Krishnan Marg  
New Delhi 110 012, India.  
Email: rkk@nistads.res.in  
rkochhar2000@yahoo.com

