STUDY OF SCIENCE IN PUNJAB : A HISTORICAL PERSPECTIVE

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India's present state of development of science and technology has a long history and the seeds of study of science have been sown in different parts of the country in different forms at different time-periods. A brief account of the beginning of science study in its embryonic form in north-western part of India is presented here which may be of use to those interested in the overall history of development of science in India. Presently, science education and research are nourished and developed by the government in any country ; however since the mid-nineteenth century scientific research was carried out as purely personal interest even in the Western world. Work related to science by two persons who initiated the study of science in the Punjab since the mid-nineteenth century days is noted below. One such person is Ramachandra and the other is Ruchi Ram Sahni.

Mid-Nineteenth Century Punjab Scenario

In 1849† , there was not even a single degree college to teach European science in the Punjab. The education was imparted through traditional system of madresas, pathshalas, chatsalas or religious seminaries set up in mosques, temples and gurdwaras. Oriental College, Lahore, was set up in 1864

† In terms of historical process, this is the period when the British annexed the Punjab after defeating the Khalsa army of Maharaja Ranjit Singh.

for teaching of Indian classical languages only. Teaching of science started during late seventies when Government College, Lahore, was established, which became the nucleus of the Punjab University.

Another degree college which introduced modern science was set up at Patiala, known as Mahendra College, during 1872 by Maharaja Mahinder Singh of Patiala State on the advice of his former tutor and the reputed mathematician of the Punjab, Professor Ramachandra. Mahendra College, Patiala came up prior to the foundation of the Punjab University, Lahore, and was affiliated to Calcutta University for almost two decades. Modern science, which was introduced in Bengal during 1855 after Calcutta University was set up, travelled to the Punjab within two decades. Since there was no tradition of teaching of science in the Punjab, all the teachers came either from Europe or Calcutta. By the end of the nineteenth century, the capital of the Punjab State, Lahore, could boast of better educational facilities and infrastructure for teaching of science than Delhi, the future capital of India.

Ramachandra

Ramachandra was born into a middle-class faimly in 1821 at Panipat. His father, Rai Sundar Lal Mathur, was an employee of the revenue depariment of the East India Company. His father died in 1831, when Ramachandra was just nine. Consequently, he was brought up and educated by his mother under severe economic hardships and social pressures. He had his early education at home and was admitted to an English school at Delhi in 1833. Ramachandra excelled at school and earned a merit scholarship. He pursued mathematics on his own, since there was no special arrangement to teach this subject at school. This early interest laid the foundation for his future reputation as a mathematician.

In 1841, Delhi English School was upgraded to a college. Ramachandra won a merit scholarship of Rs 30/- per month in the Entrance Examination and joined newly set up Delhi College. As a student, he started translating European scientific works into Urdu under the guidance of Principal Boutros. These activities were formalised under the aegis of the Vernacular Translation Society in 1843. In 1844, Ramachandra was appointed teacher of European Science in Oriental Departmet of Delhi College. Ramachandra started a weekly 'Qiran-us-Sadain' which carried articles on new inventions, discoveries and researches in modern science and technology. Some of his popular writings on science and society were published in his Urdu journal Fawaid-ul-Nazrin between 1845-1852. Thus he was a founder father of Urdu science journalism in India.

Ramachandra wrote his famous book on mathematics *A Treatise on the Problems of Maxima and Minima* in 1850, when he was just twentynine years old. This book was referred to the famous English mathematician, Prof Angustus De Morgan, who wrote an introduction and got its second edition published in London in 1859. "Court of Directors" (East India Company) gave an award of Rs. 2000/- to Professor Ramachandra on his unique contribution to mathematics. Thus he was acknowledged as a mathematician of repute all over Europe. In 1861, he published his second treatise *A New Method of the Differential Calculus*. He published Urdu translations of algebra, trigonometry, analytical geometry, elements of mechanics and some treatises on various branches of physics, biographies of eminent scientists, popular science articles, commentaries on the holy Quran and the holy Bible. In his articles, Ramachandra based his arguments on experiments and observations, tried to demolish the superstitions through rational arguments and advocated scientific rationality and realism. He was confronted in the debates with repositories of traditional learning, the pundits and the maulavis, who condemened Ramachandra as infidel and irreligious. He was appointed as tutor of Maharaja Mohinder Singh of Patiala State. The young Maharaja was highly impressed by his intelligence and administrative acumen. Ramachandra was appointed Director of Public Instruction in Patiala State. During his tenure, the idea of setting-up of Mohendra College for teachihg of European science was conceived and the plan was executed accordingly. He got it affiliated to Calcutta University. In 1875, he left Patiala and went back to publish his scientific works in Calcutta. After the death of Maharaja Mohinder Singh, he was again called to serve as tutor for the new Maharaja (Rajinder Singh). He continued in the service of Patiala State till 1879. He was bestowed with a *Khilat* and *Jagir* by the Maharaja. Ramachandra got an attack of paralysis and he was confined to bed. He died on 11 August 1880 in Delhi at the age of fiftynine. Ramachandra's contribution to Urdu journalism, promotion of education in general and science education in particular in the vernacular medium, his role to modernise educational system in Patiala State by starting Mohendra College, Patiala, deserves to be noted.

Ruchi Ram Sahni

Ruchi Ram Sahni (RSS) was born on April 5, 1863 in Dehra Ismail Khan, a small town and a riverine port on the Indus in the Punjab. He got his early education in this town and passed middle school examination securing first position. He passed his high school examination of Calcutta Board from Lahore securing a position among the top ten. He passed the

BA examination from Government College, Lahore, in 1884 securing the top position in the Punjab University. Ruchi Ram was a great debator and took part in extra-curricular activities. He got admission to MA course in Government College, Lahore, and took up physics and chemistry as his subjects of study. He was deeply impressed and motivated by Professor Oman, an experimentalist who built up science departments. RRS took up assignment as Assistant Reporter in the Meteorological Department of India at Calutta. Professor Oman advised him to complete his Master's degree in Presidency College, Calcutta, which had the excellent facilities for science education. RRS got his training as Assistant Meteorologist, attended the required number of classes in Calcutta University. He had the chance to meet and interact with top Indian scientists, like Professor J C Bose, working in Presidency College. His interest in teaching and research got a boost while in Calcutta. He served the Meteorology Department for two years under Sir H F Blanford in Simla and prepared daily and monthly weather reports. During his tenure, he made a remarkable forecasting of a storm in the Bay of Bengal and saved many ships from destruction by sending a timely warning to all the sea ports in the region.

RRS left Simla in March 1887 and took over charge as Assistant Professor of Science in the Government College, Lahore. When Professor J C Oman returned to England, he was given the full charge of Chemistry Department. RRS proved to be a dedicated teacher and prepared his lectures in advance. His classroom lectures were supported by experimental demonstration which made him a very popular teacher of science in the college. However his relation with the head of the Chemistry Department became strained and he decided to resign from the College. He even challenged RRS to a teaching competition. When RRS boldly accepted his challenge, he withdrew. RRS was a man of courage and conviction and never took things lying down.

A Trip to Europe : In the beginning of 1914, he left for Europe to carry out research investigations in the emerging field of radioactivity. RRS reached Heidelberg and then moved to Karlsruhe to work in the laboratory of Dr Kasimir Fajan, an authority in the field of radioactivity. Dr Fajan interviewed RRS and remarked that both of them were working on the same hypothesis. Dr Fajan had solved the problem of finding correct atomic weight of lead and he suggested RRS to work on the problem related to bismuth. However, before he could reach some conclusion, the First World War started in Eurpoe and he had to escape to England.

In England, RRS was very fortunate to work in the laboratory of Lord Ernest Rutherford,

at Manchester. He published two research papers on scattering of alpha particles with photographic emulsions under joint authorship with Rutherford. He returned to India as the situation was critical in the war time England. On reaching Bombay, he found that the packet of emulsion plates was destroyed in the ship during transit. As a consequence, he could not continue his research investigations at Lahore.

The Punjab Science Institute (PSI) : The idea of the PSI was conceived by Professor J C Oman of Governement College, Lahore, when RRS was still an M A student. During his Calcutta posting, RRS had the chance to study the functioning of Indian Association for the Cultivation of Science (IACS) set up by Mahendra Lal Sircar. The original aim and object of PSI was the popularisation of all kinds of scientific knowledge throughout the Punjab by means of lectures illustrated with experiments and lantern slides, as well as the publication of tracts. Later on, encouragement of technical education and setting up of chemical industries in the Punjab was also included. Pamphlets were written and circulated on the manufacture of soap, indigo and other products of common use. Some cash prizes were offered for writing short papers and pamphlets.

Professor Oman delivered several lectures on Electricity and Magnetism. Dr C C Caleb of the Medical College dealt with the buildup of the human body and common diseases. Dr Grant was a gifted speaker and made his lectures interesting by charts, illustrations and projections. RRS joined PSI as Joint Secretary from the very beginning and took full charge of its activities after Professor Oman left for England. In fact, RRS started his popular science lecture series while being posted at Simla in 1886 and the theme was weather forecasting.

Popularization of Science in the Punjab : The interest and enthusiasm generated all over the Punjab province (its boundaries then extended from Delhi to Peshawar and included the present-day Haryana, Himachal Pradesh and Pakistani Punjab) by popular science lectures of RRS under the aegis of PSI, could be gauged from the demands received by PSI from all over the state to send lecturers, and from the fact that it was even decided to charge a small entrance fee ranging from one to two annas (nearly 10 paise at present) to cover at least part of the expenses incurred in sending out lecturers generally accompanied by laboratory assistants and the necessary apparatus to illustrate the lecture. In 90 percent of the cases, it was Professor Ruchi Ram Sahni who was called upon to respond to these requests for popular lectures, the reason being that he had delivered so many lectures at Lahore and in other towns of the Punjab that he was never at a loss for a topic for the lecture, or the appropriate apparatus to illustrate it. According to a rough estimate, Professor Sahni must have delivered some 500 such popular lectures in the Punjab.

The most interesting feature of popular science lectures was the audience which

consisted of rural and urban folk, shopkeepers with just a sprinkling of English-speaking clerks in the offices. There was no special lecture theatre or auditorium used for delivering these lectures, RRS used the compound of the Baoli Sahib Gurdwara in Lahore to deliver an annual course of some twenty lectures in the Punjabi language to the general public. Whenever RRS found himself hunting for a correct Punjabi word or expression for a technical term, someone from the audience came to his rescue by providing an equivalent term already in common usage in the local dialect. Thus an unwritten dictionary of technical terms was created in Punjabi. The themes of his popular lectures covered a wide spectrum of topics devoted to common, everyday subjects, such as soap-making, the water Lahoris drank before 1880, pure and impure air, electricity in the service of man, electroplating, glass-making, how does the telegraph speak, the Punjab and its rivers (illustrated by a large relief map made in clay), and so on. Popular science lectures were also organised in mofussil towns and villages on the occasion of festivals and fairs in open pandals. To make them attractive to the rural folk, an element of theatricality was introduced and a nominal fee was collected on the spot after the show. These lectures created so much enthusiasm and interest in the study of science that by the end of the nineteenth century, the number of schools teaching elementary physics and chemistry in the Punjab was more than any other province of India.

RRS realised quite early that no science teaching in the province was possible without the provision of ordinary facilities for the repairs of simple school apparatus. Despite financial constraints, Professor Sahni went ahead in his mission and established the PSI workshop in 1888 in a corner of his house. He engaged a railway workshop mistri (technician), Allah Bakhsh, on part-time basis and the simple items were sold to schools at cost price, or even less to promote experimental skill among the students and teachers. The 'baby workshop' grew into a full-fledged workshop and a manufacturing unit for locks and safes and scientific equipment of high precision when RRS recruited Allah Bakhsh on full-time basis as workshop assistant and put a lathe machine at his disposal.

The reputation of PSI workshop grew so much that RRS received invitations from all over India to participate and display his scientific equipment at industrial exhibitions. At the 1906 Calcutta Industrial Exhibition, PSI workshop was awarded a Gold Medal by the committee which included Professor J C Bose as one of the Judges for the section of scientific exhibits. The equipment produced at the workshop cost less than half the price of imported equipment. When the financial position improved, RRS was able to afford sending gifts of simple apparatus to schools and colleges in the Punjab. The scientific temper and culture which was introduced in the Punjab, did not stop with his death. His son Prof Birbal Sahni founded the Birbal Sahni Institute of Paleobotany (BSIP) in Lucknow. RRS died on 3rd June, 1948, at Bombay. Thus began the study and development of science in the Punjab since the mid-nineteenth century.