

Professor Birbal Sahni's contributions to Indian botany and its impact on the scientific scenario

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WHEN I received an invitation from Dr. B. S. Venkatachala to write a lead article for the special issue of *Geophytology* on Professor Sahni's contributions to Indian botany, and palaeobotany in particular, I did not realise the immensity of the undertaking. Strictly adhering to the title of this article seems to be the best way out, for, very detailed articles have been written, in an authoritative fashion, by Professor A. R. Rao on 'Professor Sahni's twenty-eight years at the University of Lucknow', by Professor P. Maheshwari on 'Professor Sahni's contributions on living plants', by Professor T.G. Halle on 'Professor Sahni's palaeobotanical work' and by Dr. S.R. Narayana Rao on 'Professor Birbal Sahni's contributions to Indian Geology' (*The Palaeobotanist*, vol. 1, pp.9-16, 17-21, 22-24, 46-48; 1952). It occurs to me, therefore, that a general coverage of Professor Sahni's contributions to Indian scientific thought, his establishment of a school of research and its all round excellence in the pursuit of classical botany and his setting an example to other universities for emulation of what one can achieve in a life-time of dedication and motivation, are worthy of recapitulation. Furthermore, Professor Sahni's eminence, not only as a researcher, but also as a teacher *par excellence*, his creativity, his role as an explorer of new fossiliferous localities, his brilliant Presidential Addresses and the many legacies he has left behind mark him out as a trend-setter and an architect of Modern Botanical Studies in India.

In 1921, a young botanist who had imbibed the best in the Cambridge University tradition, studying in the famous Botany School under the tutelage of the eminent botanist of the time, Professor Sir A. C. Seward, was invited to the Chair in Botany at the University of Lucknow. It must have been a wise and momentous decision

of the University authorities as, indeed, it proved to be, in the years to come. At once a much sought after 'Botany School' was established at Lucknow under the able guidance of Professor Birbal Sahni. The young, Birbal, apart from his sound academic background had a family backdrop of rich culture and scholarship. His father Professor Ruchi Ram Sahni held the Chair in Chemistry at the Government College, Lahore. Birbal's younger brother, Dr. M. R. Sahni, was a noted geologist in the Geological Survey of India. In 1920, Birbal married Savitri Suri, a vivacious person who had to play a big role, not only in the scientific career of her husband, but also, an even bigger role in the establishment of the Institute of Palaeobotany as we shall see later. In fact, Shrimati Sahni used to attend Professor's class lectures although she did not acquire a degree in botany. Together the Sahnis, Birbal and Savitri, set about their destined tasks, attending conferences in India and abroad and forging lasting friendships with national and international scientific communities. Behind Birbal's success story was the intelligent, unstinted and total support he received from Savitri Sahni.

Professor Sahni, the teacher and educator—With just three teachers in the newly started Botany Department at the Lucknow University, Professor Sahni threw himself, with a missionary zeal, revising the syllabi of the B.Sc., B.Sc. (Honours) and M.Sc. courses in botany. His first batch of M.Sc. students took their examination in 1923. He himself handled pteridophytes, gymnosperms, morphology of angiosperms and genetics—a tall order to any present generation of teachers. Perhaps, the most significant years in advanced teaching were 1924-27, when newer curricular materials were added and notably his two colleagues Dr. S. K. Mukherji and Professor H.P.

Chowdhury, who had been exposed to institutes in the United Kingdom to recent advances in plant ecology and plant physiology, lent a helping hand in up-grading the teaching process. In the thirties the teaching and research team was further strengthened by the induction of Professor S.N. Das Gupta, a mycologist and plant pathologist, Professor S. K. Pande, a bryologist and Professor A. R. Rao, an algologist and palaeobotanist. At that point of time, Professor Sahni's Department had a reputation of excellence all round in the teaching of botany.

Professor Sahni's lectures were simple and direct and in the Master's classes he would introduce the students to the latest views from original published papers. Thoroughness in dealing with a subject was the hallmark of this great teacher. He would not spare himself and found the time and energy to sit through the practical classes both at the B.Sc. and M.Sc. levels, for, he knew that, the foundation to a sound scientific career lay in these formative years for a discerning student. Apart from his academic brilliance, Professor Sahni combined in himself lovable human qualities. He was kind and considerate to the industrious and understanding student but would not tolerate slipshodness and indifference in the learning process in a student. To the needy his help would be spontaneous.

India's greatest thinker and philosopher-saint of the 8th Century A.D., Sri Adi Sankara Bhagavadpada defines the attributes to a perfect teacher: "The teacher must be deep-versed in the scriptures. He must be free from the least taint. He should be beyond desires. His sole concern should be the knowledge of *Brahman* (The Absolute). He should be absorbed in *Brahman*. He should be tranquillity incarnate. He should glow like a smokeless fire. His compassion must be unconditional and unbounded. And he should be readily accessible to every one who approaches him for help". Looking back to the year 1934 when I first came under the spell of this remarkable teacher, Professor Sahni, I feel that he had the qualities demanded of him by Sri Sankara.

To those of us who were his students, Professor Sahni was an ideal teacher, a real *Guru* in the traditional Indian style. In the words of the Great Hindu monk and thinker, Swami Vivekananda: "A library containing an enormous number of books cannot be a substitute for a single teacher in flesh and blood. We can acquire knowledge and information from books, but wisdom can be gained only through a living teacher". *Acharyavan purusho veda* (having lost the sense of direction the seeker requires a preceptor who knows the path to guide him) declares the *Upanishad*. In fact, Sri Adi Sankara extols the *Guru* as superior even to *Chintamani* or the Philosopher's stone. The *Chintamani* can convert base metal into gold, but it cannot convert the base metal into a *Chintamani* itself. The *Guru*, on the other hand, raises the *Sishya* (disciple)

to a nature non-different from his own.

With the rapid growth of his department, Professor Sahni's reputation spread all over the country as a teacher and as a scholar. His contemporaries in some of the older universities began emulating the dynamic teaching and research programmes initiated by Professor Sahni at Lucknow. At the annual gatherings of the Indian Science Congress, senior botanists, of the country, would look forward to a dialogue with the Professor on the methodology in teaching and research followed by him at Lucknow. Such was his meteoric rise in stature within a short span of less than a decade. A charming personality with a powerful expression in chaste English, full of vigour, with the subject of the lecture at his finger tips, all these attributes made a tremendous impression on his students and even the mediocre among them would be enthused and encouraged in his learning process. In fact, we, his students, can vouch for the fact that his summing up, of any topic on hand, could well be regarded as a stimulant for further thinking. Indeed, we used to look forward to his expositions with utmost keenness. Looking in retrospect, one regrets at the lost opportunity of not having tape-recorded his lectures as the modern electronic gadgets were just not there at that point of time. Posterity has, in a sense, been deprived of the intellectual stimulation that a master-mind could give them while covering basic concepts in Botany.

At a time when many Botany departments in Indian universities were concentrating on teaching systematic botany and taxonomy of angiosperms, at depth, much to the detriment of other aspects, Professor Sahni had a curriculum giving equal weightage to the teaching of cryptogamic botany, bryophyta, pteridophyta and gymnosperms and, what is more, of teaching plant geography, ecology, palaeobotany and plant physiology. The message was very clear that, for a proper understanding of the origin of a land flora and problems of floristics, in general, a broad-based teaching programme at the Master's level was absolutely essential. The idea spread and many universities did adopt this holistic approach in the teaching of botany.

Professor Sahni firmly believed that research students in palaeobotany should have a geological background. This sound view made him induce the authorities of the Lucknow University to start a Department of Geology in 1943 which he himself headed for some time. It is these initiatives taken by Professor, in the interests of building integrated science departments and in helping borderline disciplines of science, that made him a pioneer in the dispensation of good science in our universities. Many of his friends and admirers, who later became Vice-Chancellors of universities, took the cue and developed interdisciplinary departments in their own universities.

Researcher and pace-maker—In the twenties

and the thirties. Professor Sahni and his group paid much attention to the little explored field of Indian Gondwana flora. It is also to the credit of the Professor that the attention of young aspiring Indian palaeobotanists was directed to the rich and classical Jurassic flora of the Rajmahal hills in Bihar. A steady stream of first rate scientific papers emanated from his school working endlessly on the new materials. The main point was that he was no arm-chair theoretician. His field trips were well planned. In fact, he was an indefatigable field explorer and his collections could be the pride of any department of botany. His keen and alert mind also told him, intuitively, that the exquisitely preserved Deccan Intertrappean flora could well be his next hunting ground. Very interestingly, plant fragments of fungal hyphae, algal spores, fern sporangia, silicified fruits, petrified palm fruits and stems were described. To my mind these series of investigations were so important that Professor Sahni summarized the results of the researches in his thought-provoking Presidential Address to the Indian Science Congress in 1940 entitled: "The Deccan Traps". It was a scholarly address which covered, in a big sweep, the Tertiary scene in India, the great Continental Drift, the Deccan Trap country and the Age of the Deccan Lavas. Professor Sahni's many other lectures in relation to the theories of Continental Drift were well received, especially when he dealt with Wegener's theory involving movements *drifting apart* continental blocks and Professor Sahni's counterpart of Wegener's theory of a *drifting together* of continents once separated by ocean. Professor Sahni also opened up a new storehouse of palaeobotanical materials in the Karewa deposits of Kashmir and with careful studies on the microfossils he gave an Eocene age to the Saline series of the Punjab Salt Range as against the then current view of regarding it as Cambrian. Professor Sahni and his group may well be regarded as a pioneer in initiating studies in microfossils and its application to stratigraphy.

Sahni's non-doctrinaire approach to science and society—Right from his entry into the scheme of higher education in India in 1921, his impact on other leading scientists of the time was one of a cordial welcome in their midst. His popularity and his scientific stature became evident as he was elected, even as a young man, in his early thirties, to preside over the Botany Section of the 8th Indian Science Congress at Calcutta in 1921. His Sectional Presidential Address was: "The present position of Indian Palaeobotany". This was soon followed by his Presidential Address to the Indian Botanical Society in 1924, the topic being: "The Ontogeny of Vascular Plants and the theory of recapitulation". It was again a rare honour to be asked to preside over the Geology Section of the Indian Science Congress in 1925. He spoke on: "The Southern Fossil Floras - a study in

plant geography of the past". As already mentioned Professor Sahni's election as General President of the Indian Science Congress in 1940 and his brilliant address on: "The Deccan Traps", showed beyond doubt the high esteem in which he was held by the scientific community in the country. Being a nationalist to the core, there was nothing that he said, or did, which did not have a bearing on the healthy growth of Indian Science as a whole, not just Botany, Geology or Palaeobotany. This was his greatness.

Professor Sahni served the cause of science in India in many other ways too. He was President, Indian Botanical Society and also Editor of its journal. He was twice President of the National Academy of Sciences, Allahabad, Vice-President of the National Institute of Sciences of India (now Indian National Science Academy) and the Indian Academy of Sciences. He was Member of the Council of the then Imperial Council of Agricultural Research (now, Indian Council of Agricultural Research).

Among Professor Sahni's contemporaries, were many scientists of great stature, each building his own school of research in different disciplines. With all of them, Professor Sahni was not only on the same wavelength, intellectually, but also developed a sense of mutual respect and regard. Of special mention are the names of two physicists, Nobel Laureate Professor Sir C.V. Raman and the eminent Dr. Sir K.S. Krishnan. Among the noted botanists were Professors M.O.P. Iyengar, P. Parija and Shri Ranjan. Professor Sahni had close ties with some of the geologists of the Geological Survey of India and, in particular, he had developed close professional ties with Dr. D.N. Wadia and Dr. M.S. Krishnan. Professor Sahni had much respect for the fishery specialist, Dr. S.L. Hora of the Zoological Survey of India. There were many occasions when these eminent scientists shared the same platform during seminars or symposia jointly sponsored as multi-disciplinary meetings in one Science Academy or another during their annual gatherings. Those occasions provided an intellectual treat, particularly to the up and coming young scientists.

The unfinished symphony — This brief sketch of the life of India's illustrious botanist, unfortunately, has to be in a sad, as well as, optimistic note. To many of Professor Sahni's students, the laying of the foundation stone for the Institute of Palaeobotany by independent India's first Prime Minister Pandit Jawaharlal Nehru, in 1949, was an occasion for rejoicing as it meant the realization of a dream of their *Guru* coming to fruition. This joyous occasion on April 3, 1949 was soon overcome by the tragedy of the passing away of the Professor a week later. Soon after, the Institute was very appropriately re-named: 'Birbal Sahni Institute of Palaeobotany' as a mark of respect and tribute to the great botanist. Nevertheless, in the task of carrying forward the

message and implementing the many ideas and ideals of the savant, the mantle fell on Shrimati Savitri Sahni who rose to the exacting demands of the sad occasion. She got on with the job with fortitude and obtained the necessary funds by way of grants for the Institute's buildings and equipments. In this uphill task a number of the devoted band of research colleagues of Professor Sahni gave their best in continuing the highest research traditions of the Professor. As one closely connected with the birth and growth of this unique institution for palaeobotanical research, I would like to pay my tribute to Shrimati Savitri Sahni for her courage and total dedication in the cause of building this national research facility and bequeathing it, on behalf of her illustrious husband,

to posterity. I would also like to record here my personal appreciation to all the students of Professor Sahni for carrying forward his mission. In particular, I would like to mention Dr. K.R. Surange who ceaselessly toiled for giving the scientific stature to the Institute, first as its Assistant Director and later as its Director over a period of three decades.

In the Birth Centenary year of Professor Birbal Sahni, the Palaeobotanical Society and its official organ *Geophytology* have to re-dedicate themselves in upholding the highest scientific traditions and, I have little doubt, they will, as it involves the growth and interests of Indian Science in which, we scientists, are performing partners.