

PROFESSOR BIRBAL SAHNI, M.A., D.Sc., Sc.D., F.R.S. (1891—1949)

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Editor

AMONG the leading savants who have held aloft the torch of science in India, and added to its lustre by their own out-



standing contributions, and enabled it to shed its light far beyond the confines of our country, the name of the late Professor Birbal Sahni will ever occupy an honoured position. He belongs to that galaxy of scientists who appear on the scene, in the history of science, from time to time, and who are remarkable not only for their own direct contributions in their special subjects, but more so for enlarging the scope of their studies and opening out new lines of enquiry, by their farsighted vision and versatile outlook, thus leading to co-ordinated research in different directions so as to make our knowledge of science more complete and comprehensive. They stand out for all time as the beacon lights which guide and illuminate these new pathways of science; and their greatness, far from being dimmed by the passage of time, actually grows as the years pass by, and we begin to recognise more and more fully the magnitude and importance of their fundamental contributions; and even long after they have disappeared from the scene, their memory will continue to serve as a perennial source of inspiration to the younger men. It is therefore not only a necessary but also a sacred duty for scientific workers to pause now and then in the course of their endeavours and look back on these great leaders of the past who stand out as landmarks in the progress of science and pay our tribute of grateful appreciation and reverence to their memory. It is in such a spirit that the

Palaeontological Society of India is dedicating this volume of its Journal to the memory of the late Prof. Birbal Sahni.

The thirty years of Prof. Sahni's active work as a man of science constitute one continuous record of brilliant contributions to the advancement of knowledge in his chosen field, sustained throughout as much by his unflinching devotion to duty as by his burning desire to see his country well and truly placed on the scientific map of the world. The late Prof. Sahni was primarily a botanist; and although there is no doubt that his work on the living plants was certainly of a very high order, it must be admitted that his most outstanding contributions were in the field of palaeobotany. Even in his earlier days when Prof. Sahni was concentrating his attention on the study of living plants, it is significant to note that he always kept an eye on their fossil representatives; and most of his 'botanical' papers even then had a distinct 'palaeobotanical' bias; and that was because he realised from the very outset that the study of plant life to be truly full and complete, must take into account not only the living floras but also their ancestral representatives as preserved in the stratigraphical record. Indeed, it is well known, at the present day, that in the discussion of the more fundamental problems connected with the origin, evolution, and inter-relationships of the existing groups of plants, such an integrated and co-ordinated study of living and fossil forms side by side is absolutely indispensable. There is a sort of an 'action' and 'reaction' of ideas emerging from such comparative studies which are of the greatest value to both these lines of research. This comprehensive outlook forms an important feature of Prof. Sahni's contributions which gives them a special and unique value, and was in accordance with the highest traditions of the famous Botany School at Cambridge which he had imbibed during his six years of stay

there working in close association with, and under the inspiring guidance of, that great doyen of palaeobotanists, Sir Albert Charles Seward.

It is hardly necessary in the course of this article to give a detailed account of the numerous investigations which Prof. Sahni pursued, or list the many important papers which he published from time to time; this has already been done in the magnificent 'Birbal Sahni Memorial Volume' of the *Palaeobotanist* published by the Institute of Palaeobotany soon after his death, wherein many of his distinguished colleagues and co-workers, both from India and abroad, have reviewed in a masterly manner his numerous scientific contributions, and revealed their intrinsic value and importance in the progress of palaeobotany. Spontaneous and eloquent tributes have also been paid in that volume by his many students, friends, and admirers from all over the world, to the many endearing human qualities which made Prof. Sahni's personality so amiable, charming, and magnetic. In the words of Sir C. V. Raman: "Every fresh contact only served to strengthen the impression produced on me of a most lovable personality, full of vigour and enthusiasm, and endowed with an unbounded passion as well as a very remarkable capacity for scientific achievement."

We would, however, like to focus our attention in this article on some valuable and distinctive features of Prof. Sahni's contributions in the field of palaeobotany which are of permanent value as a guide to all future workers.

The one subject which engaged Prof. Sahni's attention throughout his scientific career was the study of the Gondwana floras, for which India offers such valuable and unlimited opportunities. He realised that India occupied a 'key position' in the discussion of many problems connected with Gondwanaland, and in the course of his investigations, therefore, he dealt with his material not merely from a local or regional point of view; he took a wider outlook and examined the bearing of the results of his studies on such basic problems as the origin, nature, and distribution of the Glossopteris flora, and its relation to the other contemporary floras of the world, thus leading to

a clearer delineation of the 'palaeobotanical provinces' and the 'plant geography' of those days. Whenever and wherever problems connected with Gondwanaland will be discussed in future—and there are many such problems—the pioneer contributions made by Prof. Sahni will always command the highest regard and respect.

Very early in his career, Prof. Sahni realised that a mere description in the laboratory or museum of a stray collection of fragmentary remains of fossil plants was of no great value, and could by no means be an end in itself; after such preliminary studies, it was necessary, according to him, to go in search of and get together all the available fragments probably representing the different portions of the same plant and 'reconstruct' as far as it was possible the entire plant and study it as such. His brilliant work on *Williamsonia seawardiana* is a beautiful example of such a study; even more outstanding than this was his latest and classical work on the Pentoxyleae, a new group of Jurassic Gymnosperms from the Rajmahal series of India. By a carefully planned programme of research extending over a period of about fifteen years, Prof. Sahni and his team of co-workers made a series of detailed studies of the valuable material specially collected by them from the now famous localities Nipania and Amarapara in the Rajmahal hills. As this work progressed, it became clear that they were here dealing with closely related and interconnected plant remains which obviously represented a new main group of Gymnosperms combining in itself the characters of the Coniferales, the Bennettitales, and the Cycadales. Prof. Sahni soon worked out a complete picture of this new group by a remarkable series of syntheses and reconstructions, and published in 1948 an exhaustive account of the entire work leading to the recognition of this most interesting new group of Gymnosperms, to which he gave the name Pentoxyleae. This paper, which was also his last scientific contribution, immediately attracted worldwide attention and was acclaimed as a masterpiece of palaeobotanical studies; and as Prof. Halle puts it, "this final achievement seems most aptly to crown his career as a research worker."

Prof. Sahni was also never tired of emphasising the important fact that all palaeobotanical studies must be made in relation to the geological and geographical conditions under which the plants under investigation lived and died; and for this purpose, it was most desirable that the palaeobotanist should himself go to the field and collect his material. Without a proper understanding and appreciation of this geological background, the study of fossil plants will be more or less futile and lose practically all its vital interest. It is this rational line of approach that distinguished Prof. Sahni's contributions and made the results of his work of such special value both to the botanist and the geologist. As he himself put it, "in the consideration of many problems of earth history, the botanical and the geological points of view are sometimes so intricately mixed up that a separate treatment is neither easy nor profitable." It was inevitable, under these circumstances, that Prof. Sahni gradually got more and more interested in geological studies, and this led to the starting of a Geology Department in the Lucknow University side by side with his own Botany School there, so as to stimulate and facilitate such co-ordinated researches. It is most important that all palaeobotanists recognise and appreciate this intimate and mutually helpful relationship between fossil plants and their geological setting in the pursuit of their investigations.

A remarkable character of Prof. Sahni's scientific work is the very unbiassed and impartial manner in which he looked at all aspects of a problem. What he said of another eminent palaeobotanist is equally true of himself: "Like all cautious workers, he was difficult to convince... but was by no means of the type that clings to pet theories." He had no preconceived prejudices of any kind, and never imported any extraneous considerations, to influence his judgment. He had the highest regard for the views expressed by earlier workers in the field, but would not hesitate to differ from them when once he had convincing new evidence to do so; and if a 'controversy' thus arose between the two sets of views, he presented his case in the most dispassionate manner. For

clarity of presentation, lucidity of argument, and due consideration for the 'other point of view' in the course of such discussions, Prof. Sahni's contributions are a model for others to follow. One had only to read his papers on such controversial problems as the classification and age limits of the Gondwana System, the origin of the Glossopteris flora, and the age of the Deccan Traps, to appreciate his most judicial attitude in assessing the merits of the available evidences.

Special mention should be made here to Prof. Sahni's participation in the discussion of an intensely controversial and intriguing problem, *viz.*, the age of the Saline Series of the Salt Range. He was drawn into this controversy by the results of his own researches in the year 1944, leading to the discovery of numerous microscopic plant remains, such as shreds of angiospermous, gymnospermous, and coniferous woods, isolated wood elements with simple or bordered pits, pollen grains of angiosperms, cuticles of grasses, fungal hyphae, etc. (together with some insect remains), the combined evidence of which, according to him, is entirely in support of the Eocene age and altogether rules out the idea of their being Cambrian. This conclusion re-opened the whole controversy just at a time when we thought that this vexatious question had been once for all decided in favour of the Cambrian age on the authority of E. R. Gee's elaborate field studies. Thus the attention of all the leading workers, both in India and outside, interested in this problem was once again focused on this topic, and in the course of two Symposia which Prof. Sahni himself organised in 1944 and 1945, the whole matter was thoroughly discussed from all points of view, geological, stratigraphical, tectonic, and palaeontological, by the most competent authorities in the light of this new evidence. Prof. Sahni's own opening addresses at these meetings constituted, in the true spirit of a man of science, a critical review of all aspects and a clear exposition of the intricacies involved in dealing with this problem. The matter has been further pursued in recent years, and the whole question, according to some, should be considered as still *sub judice*; the important fact, however, remains that Prof. Sahni's

contributions in this field served to provoke and stimulate most fruitful discussions of many fundamental problems of great and permanent value, and as such gave a big impetus to the advancement of knowledge in the fields of both Botany and Geology.

A most striking feature of Prof. Sahni's outlook was the great importance he attached to studies of topics on the 'border line' between different portions of a science, or between the different sciences. He said that the ultimate object of all scientific endeavour must be to try and succeed in effacing the conventional lines which we often draw between subject and subject and thus 'compartmentalise' them; he firmly believed that Science was one and indivisible, and that its ultimate objective was to 'unite', and not 'divide', knowledge. He maintained that all our scientific endeavours should be constantly oriented so as to secure this objective, and it is such studies that are of the highest value in the progress of science as a whole.

An important aspect of Prof. Sahni's palaeobotanical work is concerned with his vindicating the position of fossil plants as reliable indices of the age of the containing beds. In the history of stratigraphical geology, especially in India, several instances were noticed in the age determination of strata where there appeared to be a conflict in the chronological testimony as between fossil plants and animals; and in all such cases, it was the practice on the part of geologists to ignore or brush aside the testimony of the fossil plants as undependable and come to conclusions based only and entirely on the faunal evidence. After reviewing and re-examining the entire position in many such cases, Prof. Sahni showed that this attitude on the part of the stratigraphical geologists was altogether unwarranted; such discrepancies between the two sets of evidence, he pointed out, were of our own making due to indiscriminate collection, imperfect observation, and incorrect identification of the concerned fossils, or a faulty interpretation of the stratigraphical disposition of the enclosing beds. In cases where the entire evidence, both stratigraphical and palaeontological was re-examined and reviewed in the light of modern ideas, it becomes evident "that there is really no conflict between the testimony of

the rocks and that of the plants or the animals."

To one who was thus devoting all his time and attention to scientific research and was making notable advances in our knowledge, it was only natural that the highest honours and distinctions in the scientific world came to be conferred on him in quick succession from time to time. Prof. Sahni was a Foundation Member of practically all the scientific bodies in India and always played a most effective part in promoting and upholding the highest traditions of scientific research in this country. Only a few days before his death, he was elected as the President of the International Botanical Congress to be held at Stockholm; but, alas, he did not live to occupy that Presidential chair which we are sure he would have done with outstanding ability and distinction.

The one ambition which Prof. Sahni cherished from the very beginning of his scientific career was the founding of an "Institute of Palaeobotany" in India which would be the first of its kind in the world and serve as an international centre of palaeobotanical study and research of the highest order. He dedicated himself with singular devotion and steadfastness to the pursuit of this objective, and was eagerly looking forward to the day when he would be able to realise his life's ambition. On the 3rd April, 1949, when the Prime Minister of India, Pandit Jawaharlal Nehru, laid the Foundation stone of the "Institute of Palaeobotany" at Lucknow, it was indeed a great event in Sahni's life as marking the fulfilment of his one great ideal. It is sad to think that almost within a week of this foundation, the cruel hand of Death, by a tragic irony of fate, snatched Prof. Sahni away from our midst, when he was still in the prime of his scientific career and was looking forward to achieve, through his Institute of Palaeobotany, higher ideals to raise and enhance the prestige and reputation of scientific work in India and secure for her an honoured place in the international scientific world.

Prof. Birbal Sahni is gone, but he has left behind him, as a precious legacy for the nation, his "Institute of Palaeobotany" which is now appropriately named after him;

and we are happy to note that during these ten years of its existence, the Institute has progressively developed and is playing an increasingly important part in the advancement of palaeobotanical studies, under the administrative guidance and devoted attention of Mrs. Savitri Sahni. Those that had the privilege of enjoying the generous hospitality of the Sahnis at Lucknow know how fondly they were attached to each other and had built up a home with an all-pervading atmosphere of peace, happiness, affection, and goodwill.

On the occasion of publishing this Memo-

rial Volume, the Palaeontological Society of India pays its tribute to the memory of the distinguished and illustrious founder of this Institute, and offers its fullest cooperation in the promotion of its aims and objects.

May the "Birbal Sahni Institute of Palaeobotany" live for ever as a fitting monument of his achievements and aspirations in the cause of Palaeobotany, and serve as a perpetual source of inspiration to workers from all parts of the world in this fruitful and fascinating field of study and research which he so richly adorned!