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## OBITUARY

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We announced in an earlier issue the passing away of Prof. S. Bhagavantam, one of our outstanding scientists and scientific administrators. He was President of the Current Science Association from 1970 to 1976. We publish below an obituary written by Dr G. Venkataraman.

S. R.



### S. BHAGAVANTAM—A TRIBUTE

During the Raman centenary celebrations, there was much euphoric recall of the golden days in Calcutta. Prof. Suri Bhagavantam, our last major link with that period, passed away recently, and with his death the curtain truly rings down on an era.

Bhagavantam was born on October 14, 1909, in an orthodox and respectable Hindu family. After attending school in the small town of Gudivada in Andhra Pradesh he obtained a Bachelor's degree from the Madras University and, attracted by Raman's fame and reputation, went to Calcutta in 1928. He could not have picked a better time to become a research student, for light scattering studies in Raman's laboratory were right then approaching a climax. Although Bhagavantam had no direct part in the great discovery that was made soon after his arrival, he had a ringside view of it. And shortly thereafter, when Raman wanted to detect the spin of the photon by studying rotational Raman scattering, he chose young Bhagavantam as his collaborator.

In 1933, when Raman moved to the Indian

Institute of Science, he tried to get Bhagavantam as his Scientific Assistant, but his efforts were in vain. Reluctantly Raman then recommended the young scholar to Andhra University, Waltair, which promptly accepted him. It is said that, on arrival, the young staff member was refused entry by the guard, who mistook the former to be a student seeking admission! Likewise, in the class he was not accepted at first, especially by some students older than him!! But with his forceful personality and superb lecturing abilities, he soon took command of the situation, as he was to all his life.

For over a decade and a half Bhagavantam was in Waltair (now Visakhapatnam), rising to become eventually the Principal of the University College. This increased his administrative load but it also enabled him to develop schools in disciplines not his own, such as chemistry, geophysics, etc. It was typical of Bhagavantam that he always made the best of the existing situation instead of complaining about it. If administration was inevitable, why not do a good job of it? If experiments were difficult because of meagre resources (as was the case at Waltair), why not try theory? Thus it was that he began to take interest in group theory, and this led him eventually to write the well-known book *The Theory of Groups and its Physical Applications* with Venkatarayudu. This book ran into three editions and was translated into Russian as well. Later, there was also an American edition. I recall receiving once a letter from a professor in America asking me where he could obtain a copy of this book. It is no exaggeration to say that a whole generation of scientists (particularly spectroscopists) have been brought up on this book. The other book he wrote during this period, namely *Scattering of Light and Raman Effect*, is also a minor classic.

Immediately after Independence, Bhagavantam went to London to serve as the Scientific Liaison Officer in the Indian High Commission. This sojourn brought him into contact with Krishna

Menon, a contact which was to prove fruitful later. It also enabled him to meet eminent physicists like Born, Bernal, Lonsdale, etc. all of whom had earlier examined various theses of his students. In fact, writing about it, Dame Kathleen Lonsdale observes, "I almost persuaded him to spend any spare time that he might have in my own laboratory at University College London, where I would have been proud to supply facilities for his continuation of research." But, responding to a call from Nawab Ali Yavar Jung, Bhagavantam returned to India to head the Physical Laboratories of Osmania University; later he became the Vice-Chancellor of the University. In Hyderabad, he initiated some work on cosmic rays and on high polymers, also finding time to write his third book, *Crystal Symmetry and Physical Properties*.

In 1958 Bhagavantam moved to Bangalore to become the Director of the very Institute he could not earlier enter as a Scientific Assistant. But he did not stay there very long, for in July 1961, Krishna Menon, who had now become the Defence Minister, beckoned Bhagavantam to Delhi to become his Scientific Advisor. Bhagavantam stayed in this post till retirement in October 1969, during which period he did much to promote self-reliance in defence systems through our own R & D effort. To him goes the credit for starting several new defence laboratories, including three major ones in Hyderabad dealing with materials, missiles and electronics. He was also connected with Bharat Electronics Ltd and Hindustan Aeronautics Ltd, serving these organizations in various capacities. The list of organizations that he served during the sixties and early seventies is breathtaking and has hardly been matched. He was once even on the Board of Directors of the State Bank of India! Impressive as all this was, his mentor and Guru was quite perturbed. To Raman, all these activities were no substitute to the pursuit of research, however beneficial or important the former might be. Bhagavantam has poignantly recalled how, during an Academy meeting, Raman criticized him on this score and how he (i.e. Bhagavantam) spiritedly defended himself, whereupon Raman, overcome with emotion, fondly embraced his former student.

Turning to the scientific papers of Bhagavantam, one does feel (as Raman appeared to have) that science was the loser. If Bhagavantam could manage to publish so much in the midst of all that distraction, how much more he could have accomplished with undiluted attention! Understandably,

his name is strongly associated with the Raman effect. Hence it might come as a surprise to many that he really made his debut with a single-author paper on the diamagnetic anisotropy of aromatic crystals. Following the discovery of the Raman effect came a veritable flood of publications on polarization effects, Raman effect in calcite, amorphous materials and gases, the effect of pressure on Raman spectra, and so on. To him also goes the credit for the first serious study of the Raman spectrum of diamond. He has, with his own brand of wry humour, narrated how he guarded the diamond during the experiments and how, when the results were reported by an abstracting service, the editor put four exclamation marks after the weight of the diamond to signify his amazement that an impoverished Indian physicist could have access to so rich a precious stone!

Few may know that he also pioneered a simple but effective method to measure the elastic constants of crystals. And on his paper on the elastic constants of diamond published with Bhimasenachar in the *Proceedings of the Royal Society*, there hangs a tale. As far back as 1914, Max Born had shown, by considering the stability of the diamond lattice, that there existed a particular relation between the elastic constants  $C_{11}$ ,  $C_{12}$  and  $C_{44}$ . For years there was no way of verifying this result since measurements of elastic constants were not available. Finally, in 1945, Born decided to write his friend Simon at Oxford to do something about it. Born says: "... before I had finished this letter, the postman brought me my mail, which included a paper by the Indian physicist Bhagavantam. It contained just these measurements." And so, finally, Born could verify his identity.

Even in the midst of his busy schedule, Bhagavantam maintained a respectable rate of publishing, and his last few papers on group theory applied to magnetic crystals are noteworthy, both for the reason that they were published *after retirement* and for the reason that they were *quite current*.

One must also mention that Bhagavantam wrote the memoir on Raman for the Royal Society, besides bringing out the first authentic biography (published by the Andhra Pradesh Akademi of Sciences). Readers of this journal would of course also remember him as the President of the Current Science Association from 1970 to 1976 and that he contributed a great deal to the progress of this journal.

I had the pleasure and the privilege of meeting

Prof. Bhagavantam during early 1987 while preparing a biography of Raman. He was recovering from a stroke, and though slightly slow in speech, his recall was excellent. He regaled me with delightful stories. It was also touching to see how he still venerated his Guru.

Bhagavantam was to have been honoured with the Raman Centenary Medal during the centenary celebrations in Calcutta last November but ill health prevented him from attending the function. He passed away in Madras on February 6, 1989. He

was a colourful personality, and his memory will live through his books, through the many students he has trained, through the several laboratories he founded, and above all through the various organizations he served so well during a long life.

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