

## Suri Bhagavantam – a biographical note

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The Birth Centenary of Suri Bhagavantam was celebrated on 14 October at the Osmania University Campus with great enthusiasm jointly by many institutions with which he was connected during his lifetime. These institutions included Andhra and Osmania Universities, Defence Research and Development Organisation (DRDO), National Geophysical Research Institute, Alumni Association of Andhra University Colleges at Waltair, etc. Bhagavantam was a unique personality in many ways. He was a totally indigenous product and was mostly self made.

Born in an orthodox Brahmin family in October 1909, he had his initial training in the *Vedas*, Sanskrit and Telugu classics. He then joined the City College High School at Hyderabad. He stood first in matriculation in the Nizami's dominions and continued his education at the Nizam College, Hyderabad for intermediate and B Sc degree. He stood first in the B Sc exam of the Madras University. Readers may be aware that B Sc course in those days was a two-year programme after intermediate and although the main subject was physics, one had to study English, mathematics and chemistry also.

Having passed B Sc, Bhagavantam approached C. V. Raman to admit him as a research scholar. Those who are aware of Raman will remember the tough interview he would conduct before accepting a student. Raman had an uncanny knack of spotting the research potential of a person. One only has to recall the names of some of his students like R. S. Krishnan, G. N. Ramachandran, L. A. Ramadas, S. Ramaseshan, S. Pancharatnam, A. Jayaraman, N. S. Nagendranath besides Bhagavantam himself. One might even mention K. S. Krishnan, K. R. Ramathan and C. Mahadevan, who worked with Raman. The first task assigned to Bhagavantam was to scan the literature and collect material regarding the current status of studies of magnetic properties of materials and possible new studies that could be undertaken in this field. He was given 2 months for this task. But much before the deadline Bhagavantam was ready with his talk which he delivered to an audience consisting of Raman and all others working in the Indian Association for the Cultivation of Sci-

ence. The talk was clear, precise, comprehensive and very mature for a raw graduate. Raman was impressed and the others realized that they had an extraordinarily brilliant youngster amongst them. Those who were earlier indifferent to him suddenly changed their attitude and became very friendly.

His early work was based on this talk and in 1929 he published four papers in the *Indian Journal of Physics*, the *Proceedings of the Royal Society* and *Proceedings of the Institution of Chemists*. These papers were perhaps the core of his thesis for the M Sc degree at the Madras University. Neither in the preparation of the original study nor in carrying out the experiments whose results were published in the four papers did he receive much help or guidance from the seniors in the laboratory who were all fully immersed in the work leading to the discovery of Raman effect and its aftermath.

Very soon after he completed his M Sc degree, Bhagavantam also plunged into the investigations connected with Raman effect. As Raman in his foreword to Bhagavantam's book on Raman effect wrote: 'Bhagavantam was the most assiduous investigator in India in the field of Physics with which the book deals during the last ten years'. Raman also stated that Bhagavantam made many significant contributions to the subject (of Raman effect) the value of which has been widely recognized. It is noteworthy that Raman himself never referred to the effect as Raman effect even as late as 1940 when the above remarks were made.

One of the most important features of Bhagavantam's work between 1928 and 1940 and even thereafter was that he was very innovative and showed great ingenuity in using the facilities available at hand. He had the capacity to make the most of what was readily available. He designed many experimental arrangements for the study of Raman effect and these were widely copied by others internationally. This capacity he imbibed from Raman who discovered the effect named after him with the simplest of experimental arrangements. Bhagavantam passed on this philosophy to his students.

In 1932, Bhagavantam left Raman and joined the Andhra University as a lecturer in the newly started Department of Physics where courses leading to the award of B Sc Hons and M Sc degrees and research leading to D Sc degree were introduced. When Bhagavantam joined the department there were already two other lecturers who were equally brilliant and each of them had two doctorate degrees – one from India and the other from London. Bhagavantam was however not overawed by them and there was a healthy rivalry in the department in producing research results. The beneficiaries were the students and very soon Andhra University acquired a great reputation nationally and internationally not only for the work in the physics department but also the work carried out in the chemistry department. The credit for selecting the right people for the faculty in various departments initially must go



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S. Bhagavantam, H. J. Bhabha and J. R. D. Tata.

to S. Radhakrishnan who was the Vice-Chancellor of the University.

Bhagavantam, right from the outset, established himself as a good teacher and also plunged into research in various aspects of Raman effect. His first student for D Sc degree of Andhra University submitted his thesis in 1935 when Bhagavantam was 25 years old. In the years that followed, he guided three others for the doctorate degree at the Andhra University in problems connected with Raman effect. All in all, between 1930 and 1940 Bhagavantam published 78 papers most of which were studies in Raman effect. Many of the papers were single author publications and concerned Raman effect in all the three states of matter.

Around 1939, Bhagavantam initiated work in ultrasonics along with his work in Raman effect. Using the phenomenon of diffraction of light by ultrasonic waves in liquids, Bhagavantam and his co-workers determined ultrasonic velocities and on the basis of this data, calculated compressibilities of liquids, mixtures and solutions. Bhagavantam showed his experimental skill and invented the wedge method of exciting ultrasonic waves in solids and used this to determine resonant frequencies of solid plates and thence the elastic constants. He applied this method to both isotropic and crystalline solids. He also used very high-frequency ultrasonic waves in liquids to verify several aspects of Raman-Nagendranath theory of diffraction of light by ultrasonic waves in liquids. Much of this work was done during the Second World War and a little later when conditions became very difficult for obtaining necessary material, electronic components and measuring instruments. In addition, at the young age of 32, Bhagavantam had to accept the additional burden of Principalship of the University colleges in 1941. The independence struggle was reaching its peak and the student world was highly excited and volatile. Bhagavantam had to do a lot of tightrope walking as he had to satisfy the government that he was strictly enforcing discipline and at the same time not be too severe on the demonstrating students. It goes to his great credit as an administrator that he survived this test successfully unlike his predecessor who was removed because the government thought he was too lenient with the students. Of course, Bhagavantam was not very popular

either with the students or many of his colleagues. Added to this burden, the university was summarily ordered in May 1942 to vacate the beautiful campus at Waltair and move to Guntur during the war. The campus was converted into a hospital for the British forces.

It took more than one year (1942–43) to settle down at Guntur and resume research activities. Thus in 1943 Bhagavantam published only one paper on the normal oscillations of diamond structure. By 1944, however, research activity picked up in both Raman effect and ultrasonics. In 1946, once again the university had to move, this time back to its permanent home. Bhagavantam relied more on his students thereafter and his work shifted to ultrasonics, elastic constants and photo elasticity. Raman effect seemed to have taken a backseat during 1945–48.

During 1948–49, Bhagavantam went to London to work as Scientific Liaison Officer at the India High Commission. Two important consequences resulted from this trip so far as Bhagavantam's work and future were concerned. First, for a 39-year-old scientist, who had never been abroad before, Bhagavantam's reputation was quite widespread and remarkable. He had many invitations to visit and lecture at various universities and other institutions not only in Britain but also in many European countries. He could only accept a few of them and was warmly received and honoured by his hosts. Bhagavantam was pleasantly surprised to learn during his visit to the Soviet Academy of Sciences that his books on Raman effect and on group theory were both translated into Russian and were widely used. As the Soviet Union did not respect copyright, they never informed him or obtained his permission to translate. His visits to various laboratories broadened his horizons and he realized that much work could be done in many branches of physics even with available facilities. The second consequence was that V. K. Krishna Menon who was the High Commissioner of India in London developed a great liking and respect for Bhagavantam. This resulted a few years later in Bhagavantam becoming the Scientific Adviser (SA) to the Defence Minister, V. K. Krishna Menon.

On return to India, Bhagavantam moved over to the Osmania University as Professor and Head of the Department of

Physics in 1949. He immediately set up facilities for research in Raman effect, ultrasonics, photo elasticity, X-ray crystallography, cosmic rays, polymer physics and in due course added radio astronomy. He persuaded the members of the faculty in the younger and middle age groups to take to research in addition to their teaching duties. In addition, he guided several research scholars. In 1952, he became Vice-Chancellor of the university but continued to guide research as Director, Physical Laboratories which was set up specially for him and generously supported by the university as well as CSIR right from the time he became professor. As professor and Vice-Chancellor he guided 15 scholars for the doctorate degrees in all the branches mentioned here except radio astronomy. As Vice-Chancellor, Bhagavantam persuaded and encouraged research in all the departments of the university including humanities, commerce, science, engineering and technology. This tradition continued even after he left the university. He also abolished all undergraduate courses in the faculties of humanities and science so that the university campus could become a post-graduate teaching and research institution. In 1957, he moved to Bangalore to become the Director of the Indian Institute of Science. In the five years he was there, he made two important contributions to the future of the Institute. First, he successfully resisted the attempts of the Ministry of Education of Government of India to take over the Institute and manage it on the lines similar to the IITs and IIMs. His wisdom and foresight in doing so is amply demonstrated if one takes into account the present problems faced by the IITs and IIMs in relation to the government. In addition to preserving the autonomy of the IISc, Bhagavantam also got the UGC to recognize it as a deemed university which allowed it to confer various degrees on its alumni. The second important contribution was in persuading all departments to agree to multiple professorships in their departments. It needed all his powers of persuasion to make the existing professors to agree to this. Finally, by the time they agreed Bhagavantam could not implement it as he left the institute in 1962 to become SA to the Defence Minister at Delhi.

With his long years of administrative experience as Principal, Vice-Chancellor

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and Director and wide exposure to all branches of science and technology, Bhagavantam was able to quickly assess the needs of DRDO of which he became the Director General along with being the SA. It would interest readers to learn that Bhagavatam tried to be Director of IISc and SA to Defence Minister simultaneously for some months in 1961 and 1962 but it goes to his credit that he realized very soon that he was not doing justice to either post. Therefore in April 1962, he gave up the Directorship of IISc and moved over to Delhi. In the first 18 months of his tenure, he set up as many as 18 laboratories in very widely different disciplines all over the country. In this task, he had the unstinting support of Krishna Menon. Unfortunately in the aftermath of the Chinese invasion of India in 1962, Menon had to resign and Bhagavantam's position became quite uncomfortable. However, his devotion to duty was such that he carried on for the next seven years in this post and set up eight more laboratories and institutions. All the laboratories set up by him covered

very varied disciplines from aeronautics to agriculture and high altitude physiology to heavy combat vehicles. The only criterion applied was the relevance to our defence efforts and self reliance. He did his job with such foresight that DRDO did not need to set up any other institution for 15 years after he retired.

After retirement, Bhagavantam concentrated on taking science to developing countries as a principal aid to their development. This he did as Chairman of the newly set up Committee on Science and Technology for Development (COSTED) by the International Council of Scientific Unions (ICSU). He carried out this work with distinction for eight years. His health started to give him problems from 1980 onwards and he spent his last years till 1989 in peaceful retirement.

Bhagavantam was a great teacher, versatile physicist, able administrator and above all an excellent builder of many national institutions. He was an erudite scholar in both Sanskrit and Telugu. His sense of humour was well known. How

ever, his general demeanor and his appearance made people think he was rather aloof but once they came close to him, they realized he was a very warm hearted, generous and helpful person, very concerned about the welfare of his students and an entertaining conversationalist. He had the rare capacity to present very difficult concepts of science in an understandable and simple manner to the audience.

Although Bhagavantam's contributions to science and as a builder of modern institutions in the country put him in the same class as Bhatnagar, Bhabha, Sarabhai and others, his efforts in the service of the Nation have never been adequately recognized. Whatever recognition he got was from universities and professional scientific bodies. He deserved better. It has been my privilege to be his student and close colleague for nearly 25 years.

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## MEETINGS/SYMPOSIA/SEMINARS

### **The 4th International Earth Science Olympiad, 2010, Indonesia**

Date: 19–28 September 2010

Place: Gadjah Mada University, Yogyakarta, Indonesia

Theme: The Present is the Key to the Future

International Earth Science Olympiad (IESO) is an annual earth science competition for secondary school students. It is one of the major activities of the International Geoscience Education Organization (<http://www.geoscied.org>) that aims at raising student interest in and public awareness of earth sciences, as well as to enhance earth science learning of students. It also forges friendly relationships among young learners from different countries and fosters international cooperation in exchanging ideas and materials about earth science and earth science education. The earlier IESOs were held in South Korea (2007), the Philippines (2008) and Taiwan (2009).

Participants should not be older than 18 years on 1 July 2010 and should be students of secondary school. If they have already graduated before the competition, the organizer should be informed about the date of graduation. The competition is not open to students who have already participated in the IESO.

Questions in the competition would encompass all major areas of earth sciences, including geology, geophysics, meteorology, oceanography, astronomy and environmental sciences. The competition consists of two parts: theoretical and practical examinations. The theoretical examination is presented in a set

of earth science problems. The practical examination includes experimental task(s).

More details can be accessed at <http://ieso2010.ugm.ac.id>

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### **29th Annual Convention of IACR and Symposium on 'Biology of Cancer Stem Cells'**

Date: 20–23 February 2010

Place: Kochi, Kerala

Theme: Cancer Research

Contact: Prof. T. S. Ganesan  
Organizing Secretary, IACR 2010  
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and Cancer Institute  
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