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RANGO KRISHNA ASUNDI

(1895-1982)

Elected Fellow 1951

INDIA has a great tradition in spectroscopy and was in the forefront with discoveries of Raman Effect for the elucidation of molecular structure and Saha's ionisation formula for understanding the stellar spectra. To this generation belonged Professor RANGO KRISHNA ASUNDI, who was one of the pioneers in molecular spectroscopy and endeavoured to develop spectroscopy as an important field of basic research.

EARLY CHILDHOOD AND EDUCATION

Born on August 14, 1895, Rango Krishna Asundi hails from a village which bears their family name, Asundi near Gadag in Dharwar district of Karnataka. Early in his childhood the family of Asundi moved to Gadag (1902) and then to Dharwar (1909) where the young Asundi had his primary and secondary education respectively. He passed his matriculation examination of the Bombay University in 1912, standing first in Dharwar district. This provided him a Dharwar scholarship to pursue his collegiate studies in Pune. He took his first degree of BA (Hons) with Physics and Chemistry in 1917 from Deccan College. Subsequently, he joined the staff of the Fergusson College from where he took his second degree of BSc (Physics) in 1919.

DEDICATION TO SERVE KARNATAKA EDUCATION SOCIETY

Asundi realised the need for establishing higher educational institution in old Bombay Karnataka, the absence of which made him go to Pune from his own native district of Dharwar. When the Karnataka Education Society, Dharwar started, he joined it as a Life Member in 1919 and resolved to dedicate his services to a teaching career in Dharwar. He first joined as a teacher at Victoria High School and one year later, when Karnataka Education Society started a college, joined as a Professor of Physics along with Principal P S Katti, a senior wrangler in mathematics from Cambridge (who was formerly at the Dacca University along with Professor S N Bose). When they started collecting funds, they found enthusiastic support from Dharwar and within a year they had an enviable record of students rushing to their college in preference to the government college in Dharwar. Thus, their dream of building a premier college of university education in Karnataka seemed to be coming true. However, when the college had hardly come into



existence in 1920, the non-cooperation national movement started against the British rule with the first plank of operation to boycott the schools and colleges. In the wake of this agitation, they had to close down the college and thus the young Asundi had to leave Dharwar for Bombay in 1921.

While at the KES college, R K Asundi took active interest in the history of Karnataka and wrote articles highlighting the grandeur of Karnataka, its culture and literature, the poetry of Purandara and the great women of Karnataka. He served as the honorary secretary of the Karnataka Historical Research Association (1919-1921).

PURSUIT OF RESEARCH CAREER IN PHYSICS

As R K Asundi decided to leave Dharwar for further studies in Bombay his eldest brother, A K Asundi who was serving as a District Judge of Bombay Province advised him to study law and later try for a position of a sub-judge in the judiciary of the Bombay State. But he was more interested in an academic career and so contrary to the wishes of his brother, he went to Bombay for post graduate studies in physics.

Asundi joined the Wilson College, Bombay first as a Lecturer (1921) and later as an Assistant Professor of Physics (1924). He did his research work with Professor A R Normand and submitted a thesis entitled *Boiling Points of Solutions in Methyl Alcohol under Reduced Pressure*. This work was recognized as a commendable piece of research which not only won him the MSc degree of the Bombay University with distinction but also the Sardar B R Akbarnavis Foreign Research Scholarship of the University for higher studies.

Asundi proceeded to London in October 1927 to work in O W Richardson's Laboratory at King's College. He soon started working with the R C Johnson on molecular spectroscopy and in two years he could finish his work for the PhD degree of the London University. He acquired great skills in experimental techniques for the excitation of molecular spectra. His main contributions were in the identification and characterization of electronic states of CO molecule. One of his first discoveries in the CO molecule was the $C^1\Sigma^+ - A^1\Pi$ system. Asundi did fine structure analysis of the bands and identified the transition to be $^1\Sigma - ^1\pi$ type. This band system was also discovered at the same time independently by G Herzberg. These bands were then known as Johnson-Asundi-Herzberg bands. His guide Dr R C Johnson was so much excited with the discovery of the new CO bands that he rushed post-haste for its publication in the *Proceedings of the Royal Society*. During the same year, Asundi discovered a second band system of $a^3\Sigma' - a^3\Pi_r$ which is known after him as 'Asundi bands'. Soon afterwards, he studied the so called high pressure carbon bands which were attributed to CO, CO⁺, CHCH etc. and showed that they had the same final level as the Swan system of C₂, thus providing the correct identification of the emitter to be the homonuclear diatomic C₂ molecule. Thus, during the short period of his stay at King's College he had very important contributions which made him a pioneer in the field of molecular spectroscopy.



Drs K Rangadhama Rao, S Ramachandra Rao and I Ramakrishna Rao were also doing research in allied fields of spectroscopy in London and Asundi was a close associate of them. After completing the Ph D requirements of the London University, Dr Asundi spent a few more months studying spectra of diatomic molecules of interest at that time. Before returning to India, he visited some of the reputed spectroscopy laboratories in Utrecht, Eindhoven Amsterdam, Leyden, Bonn and Berlin.

At Aligarh Muslim University

On his return to India in May 1930, he was naturally looking forward to serve in a university where he could continue his research activity in molecular spectroscopy. He had to wait several months before he had an invitation from Professor R. Samuel who was then working at the Aligarh Muslim University. He accepted an appointment from the university which provided him with an opportunity to set up an excellent spectroscopic laboratory at Aligarh which was soon recognized as an active research centre and often visited by Professors M N Saha and K S Krishnan. They had trained several students for research in spectroscopy for doctoral work during 1931-1938. The most significant publications from Aligarh were related to dissociative energies and the structures of molecules, SO_2 and SiF . However, when Professor Samuel returned to Israel in 1938, Dr Asundi's contract was also terminated. He, therefore, had to look for a job and wait for several months.

At Banaras Hindu University

Pandit Madan Mohan Malaviya, the founder Vice-Chancellor of the Banaras Hindu University (BHU) had learnt about Dr Asundi earlier and was, therefore, very glad to offer him a Professorship in BHU. Professor Asundi narrates in one of his reminiscences how much he was impressed when he first met Panditji and from then on, he felt that he should contribute his best for the great institution that Malaviyaji created in Banaras. In the early years of his joining BHU, he had to contend with meagre facilities for spectroscopic research. However, being an excellent experimentalist he started designing and fabricating spectrographs and excitation sources to obtain emission spectra not only of several diatomic molecules, but also of polyatomic molecules such as benzene, toluene, benzaldehyde, benzoquinone, benzonitrite etc. In the latter studies of benzene, several Fermi resonances were discovered and correctly explained. Very soon, the laboratory was full of activity with discoveries and interpretations of new electronic band system in CO , CO^+ , I_2 , Br_2 , Cl_2 and the continuous emission bands of fluctuation type in I_2 , I , C_1 . Professor Asundi's contributions were soon recognized by successive Vice-Chancellors, particularly Acharya Narendra Deva and the university created an independent Department of spectroscopy which has, over the years, grown into a good 'school of spectroscopy in the country.



At Bhabha Atomic Research Centre

On learning that Professor Asundi was to retire from Banaras Hindu University at the end of the academic year 1955-56, Dr H J Bhabha invited him to join the Department of Atomic Energy as an Honorary Adviser. He readily agreed and moved over to Bombay in February 1957. The very first task that he undertook was to build a spectroscopy laboratory so that it could provide sensitive and reliable analytical service of nuclear materials. He has simultaneously organized research activities in atomic, molecular and crystal spectra. Optics was an essential component of spectroscopic instrumentation and so a section of optics was added into the design and fabricate high quality optical components like Fabry-Perot plates and sophisticated lens systems. Professor Asundi devoted time to do research himself in addition to supervising the work done by the spectroscopy group. Resulting from his work were many research publications such as (i) The identification of the fluorescence spectrum of neutron irradiated monocesium uranyl nitrate as that of di-cesium uranyl nitrate (involving the synthesis of di-salt for the first time) and (ii) The evaluation of ionisation potential of oxygen molecule.

Thus, 'subsequent to his retirement from BHU, he worked vigorously for another twentyfive years and helped establish one of the finest laboratories at the Bhabha Atomic Research Centre in Bombay.' (Quoted from a tribute paid at the Annual Conference on Molecular Spectroscopy and Molecular Structure at Columbus, USA in June 1982)

The Department of Atomic Energy (DAE) established a Board of Research in Nuclear Sciences (BRNS) with an Advisory Committee in Physics to support research through grants and Professor Asundi was appointed as its Chairman in 1957. It was during his tenure (1957-62) that the annual symposium on Low Energy Nuclear Physics (under the sponsorship of DAE) was started. This has now considerably extended and continues to meet in large numbers in two major groups of Nuclear Physics and Solid State Physics at several universities and research institutes actively engaged in these areas.

Dr Bhabha entrusted to him the work of Disarmament Study Group in 1962 which used to meet regularly at the Tata Institute of Fundamental Research. He was associated with this activity upto 1966.

Professor Asundi believed in international association in research and persuaded Dr Bhabha to invite such eminent scientists as Professors R S Mulliken, G Herzberg, A Kastler, J Lecomte, H Spomer-Franck, J Rud Nielsen, P Swings, G H Dieke and P Jacquinet who spent a few weeks to several months in Bombay as distinguished Visiting Professors, gave illuminating lectures and participated in the research work of the Division.

Professor Asundi organized the first International Symposium on Spectroscopy in January 1967 which was attended by most of the active spectroscopists of the



world. In honour of Professor Asundi, a one day symposium was held during this conference when all the participants lauded the excellent work done by him and admired the success with which he was building a new spectroscopy laboratory in Bombay.

Professor Asundi was all along actively associated with the academic bodies of several universities and Institutes of Technology, particularly, Powai and Kanpur, and the Research Councils of CSIR laboratories. Though he was critical in evaluating persons for appointment/promotion or research projects for support, he always offered constructive and helpful comments. While referring theses or papers for publication, he would have checked meticulously all calculations, references and experimental details and only then gave his recommendations with full justification. He lamented the deteriorating standards and quality of research. He felt that support and encouragement for fundamental research were inadequate. He stressed the importance of spectroscopy as one of the basic sciences with very wide applications in physical and life sciences. This conviction strengthened with his every participation in many international symposia *e.g.* at Montreal at the International Astronomical Union (IAU) meetings or at the Royal Society meeting on 'Molecules in Interstellar Space'. He appealed for large support for spectroscopy and greater interaction among spectroscopists.

Professor Asundi was one of the pioneers in molecular spectroscopy and made many significant contributions. He was a Fellow of several Scientific Academies and honoured with Academy awards. He was elected Vice-President of the Indian National Science Academy, Council Member of the Indian Academy of Sciences, President of the Indian Physical Society, Founder-President of the Convention of Spectroscopists of India and President of the Physics Section of the Indian Science Congress. He was also a Member of the American Physical Society and the Optical Society of America.

He visited several laboratories in USA and Canada and participated in the international conferences in India and abroad. He was a distinguished Visiting Scientist at the National Research Council, Ottawa and MIT, Cambridge, and visited both very often. He was a special invitee for the International Symposium on Atomic and Molecular Quantum Theory held in January 1965 in Sanibla island in honour of Professor R S Mulliken and for felicitation to Dr (Mrs) Charlotte E Moore of the National Bureau of Standards, USA. He was also invited to an International Symposium, on van der Waal's molecules held in honour of Dr G Herzberg in Montreal at the time of meetings of IAU. Eight months before he died, he attended a Royal Society meeting in London of a select group of spectroscopists as a special invitee.

Professor Asundi delivered the M N Saha Memorial Lecture (1964) of the Indian Physical Society, the first K S Krishnan Memorial Lecture of INSA in 1970 and the first INSA K Rangadhama Rao Memorial Lecture in 1980. The Kannada Sahitya Sammelan of Karnataka Sahitya Parishat in Dharwar elected him with President of its science section. In 1973, that Kannada Sahitya Sammelan honoured him with a citation and an inscription VIGNAN-SUGNANA SANGAMA on a copper shield



ASUNDI AS A TEACHER

Professor Asundi was a great teacher. His affection and love towards his students were such that each one would think that he alone was his favourite. Indeed, all his students in India and abroad always eagerly looked forward to his visits, since all their families would enjoy his company. The children remember him as the grandfather to whom they could listen with absorbing interest about the great Indian heritage and learn the constellations of stars in the skies. He was a man of great humanism and an affectionate companion. He helped many students all through his life. Many stayed with him like members of his family.

ASUNDI AS A MAN

Professor Asundi was very active and spent his time reading or writing articles on science, literature and philosophy. He had gone through many hardships in life but always worked and hoped for better things. He never bore ill-will or animosity towards those who denied him his due. He was a true friend and loved one and all.

Professor Asundi was as deeply interested in religion, philosophy and sanskrit literature as in science. He gave discourses on Bhagavat Gita and Madhva philosophy. His article on (the unforgettable) Mahamana Pandit Madan Mohan Malaviya and the convocation address at IIT Kanpur, bring out the greatness in him and his appreciation of human values, spiritual and moral.

Though Professor Asundi hailed from Dharwar, he developed an intense love for Banaras and the river Ganges. He acquired a plot of land close to the river at the University Ghat to settle there after his retirement from the Banaras Hindu University. He, however, left for Bombay when Dr Bhabha invited him. As long as he was in the university, he used to go every day early in the morning even in rainy weather or cold winter, to Ganges to take his bath and in fair weather to swim almost half-way across the river.

Professor Asundi was the youngest of three brothers. He had great respect and affection for his eldest brother A K Asundi who worked as District Judge in the old Bombay State and took parental care and guided his career throughout. During his Vice-Presidentship of INSA, Professor Asundi got an Endowment of Rs 16,000 (a donation from his brother) to INSA to institute Shree Dhanwantari Prize. Professor Asundi lost his wife very early before he left for England for his doctoral studies. He had only one son, Krishna R Asundi, who is an aeronautical engineer working in Air India and one granddaughter and two grandsons.

On 2 February 1982, on the sacred Maha Navami day, Professor Asundi died at his home in Santa Cruz. He was to have participated in the discourses at the Ahobila Mutt on that day. The scientific community has lost a spectroscopist of world repute, a man of wisdom and of great human qualities.

N A NARASIMHAM

PS : The Editor, Dr G S Venkataraman fondly remembers this great man during his BHU days as a friend, philosopher and guide and pays respectful homage to this great soul.



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