

Ramachandran Srinivasan (1933–2004)

Ramachandran Srinivasan was born on 5 July 1933 at Nannilam in the erstwhile Tanjore District in Tamil Nadu. He obtained his B Sc (Hons) and M Sc in Physics in 1954 and 1955 respectively from the University of Madras. He did his doctoral work in X-ray crystallography under the guidance of G. N. Ramachandran (GNR) and obtained his Ph D degree with distinction in 1958. Recognizing his talents GNR appointed him as lecturer in the Department of Physics at the Madras University. Subsequently he became Reader in 1962 and was appointed as Professor in 1964 at the age of 31, one of the youngest ever Professors in the history of the University of Madras. He was a research Fellow at Cavendish Laboratory in Cambridge UK in 1962, and later a visiting Professor at Purdue University, USA in 1968.

Srinivasan became the Head of the Department of Physics in 1969, and continued in this position until his retirement in 1994. The Physics Department of the University of Madras was re-christened as the present Department of Crystallography and Biophysics while he was the Head, embodying the two major research areas of the Department. He was made Senior Professor in the University in 1972, a rare distinction. He was elected a Fellow of the Indian Academy of Sciences, Bangalore and a Fellow of the Indian National Science Academy, New Delhi. He was an executive member of IUCr and National Committee on Crystallography. He published over 200 scientific articles, wrote or edited nine books and monographs, guided more than 15 Ph D students who now occupy high positions all over the world.

The scientific contributions of Srinivasan may be divided into two broad areas—X-ray crystallography and structural biophysics. Perhaps his best-known work in crystallography is the explication of Fourier techniques to solve crystal structures. The book *Fourier Methods in Crystallography* (Pergamon Press) that he co-authored with GNR is regarded as a classic text on the subject. Similarly, his enormous contributions to the applications of statistics in crystallography have been collected together in an extensively quoted book *Statistical applications in crystallography* that he wrote together with his colleague S. Parthasarathy, another disciple of GNR. The contributions include the derivations of probability distributions of structure

factors from a pair of related crystals, which he used to predict the theoretical behaviour of different types of normalized R-indices and three different correlation coefficients of the structure factors of the related crystals. One of these (σ_A) finds use in protein crystallography. Another aspect of his statistical studies pertains to tests for centro-symmetry for crystals which obey Wilson distribution. He also made important contributions to the theory of anomalous scattering. Many years before the advent of synchrotron radiation sources, he was the first to recognize the possibility of using single-wavelength anomalous



differences to determine phases, a technique that is now widely used in macromolecular crystallography. His review article on 'Application of X-ray anomalous scattering in structural studies' in the book *Advances in Structural Research by Diffraction Methods* (1971) is still considered as a standard reference on the various early applications of X-ray anomalous scattering to crystallographic problems.

In the area of structural biophysics, Srinivasan's most important contributions include systematic characterization of secondary structural elements using the virtual bond concept and a single angular parameter. Several proteins were analysed and novel features were observed. The analyses led to a proposal of a new type of helix, viz. the ϵ -helix. The tools developed also enabled him to deduce the best experimental parameters for α -helices. This study led to the development of valuable methods for studying helical distortions using local helical axes. These results have been published in *Science* and in other reputed journals.

Apart from the above contributions, Srinivasan developed a powerful method of line shape analysis using truncated moments that can be used for motional stud-

ies in solid state NMR. He developed a solid state NMR laboratory in the department from scratch, including the construction of a wide-line NMR spectrometer. His other interests include Musicology and the Physics of Stringed Instruments.

Srinivasan was widely respected in the country and abroad. His services to the crystallographic and biophysics communities include organizing many of the early national seminars on crystallography, which are now an annual feature of the scientific calendar of the country. For a long time he was the Director of the National Information Centre for Crystallography (NICRYS), the then sole Indian custodian of the Cambridge Crystallographic Database. Though he faced great financial and administrative obstacles in this activity, he bravely soldiered on, supplying the Indian crystallographic community with the data it needed, until circumstances and technology made the service obsolete. He was a good administrator and a strict disciplinarian. He had an extraordinary memory, as was apparent during seminars, when he would point out any omissions made by the speakers that would add clarity to discussion. His stewardship of the department during hard times resulted in continuing support for its activities even after he was no longer formally associated with it.

Srinivasan retired from service in 1994. Srinivasan passed away on the morning of 19 September 2004. He had long been a diabetic, and the complications set in rather severely in the last few months. He battled bravely against them, engaging himself in scientific activity till the very end. His last 'public' activity was to pay a tribute to his mentor G. N. Ramachandran in the film 'The Immortal Coils' produced by CSIR and Vigyan Prasara. He leaves behind his wife and a daughter, besides several students, colleagues and friends, whose lives he guided and enriched over the last three decades. He will continue to inspire all his associates, within the country and abroad.

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