

## Narasimhiah Seshagiri (1940–2013)

In the passing of Narasimhiah Seshagiri, India has lost one of the most versatile and eminent scientists. Born on 10 May 1940 at Satyamangalam in Coimbatore district of Tamil Nadu, he received his early education in Bangalore, graduating in engineering from the University College of Engineering in Bangalore in 1961. After receiving the Ph D degree from the Indian Institute of Science, Bangalore in 1964, he joined the Computer Group of the Tata Institute of Fundamental Research (TIFR) in Mumbai in 1966.

The plan at TIFR was to start activities in the field of systems science. He soon made a positive impression with his exceptional competence in applying mathematical techniques for quantitative analysis in problems involving physics and economics. It gave him opportunities of working in many diverse fields. Use of mathematical techniques for national planning was keenly pursued in several countries including India. His mathematical skills brought him in contact with top scientists and gave him an opportunity of making a significant contribution at the national level. With the establishment of the Department of Electronics, M. G. K. Menon appointed him the director of the newly created 'Information, Planning and Analysis Group' (IPAG) in 1971. The IPAG publications were very useful for the Indian industry as it provided important and timely information on government policies and plans and the state of electronics development and the industries.

His five productive years at TIFR gave him visibility at the national level. He had a great innate capacity in applying mathematics to a physical phenomenon. Among his important contributions in various fields are optimization of the satellite links for ISRO, optimizing bus schedules for Bombay city's bus transport, optimizing techniques for power planning and generation, modelling developing economies, analysing protein structure, etc. Not so well known is his work on the derivation of Maxwell's equations. He showed that Maxwell's equations and Lorentz transformations are equivalent. This was taken note of by K. Demys in 'The Mathematical Heritage' by C. F. Gauss, pp. 163–164. Apart from these studies, he guided a number of students successfully for their Ph D

degrees. He had several high quality publications in peer reviewed journals.

The work of his IPAG group also received international recognition. I was in Florence, Italy for a conference on informatics organized by the International Computer Centre. One of Seshagiri's colleagues P. Chandrashekhar was also a participant. Having heard about IPAG's activities, two Italian experts came to meet him. When Chandrashekhar explained to them about their current work, one of them remarked to her colleague, 'piu avanti che noi' – (they are more advanced than us!



A unique feature of the Department of Electronics was the Technology Development Council (TDC) which gave significant funds for projects undertaken by the academic and R&D institutes. Seshagiri was keenly interested in computer education. Under his leadership TDC supported many projects that helped universities in strengthening their research capabilities and student training programmes. It also helped in upgrading, expanding and spreading computer education. For example the popular MCA programme was launched with his initiative which became an important source for generating skilled manpower on a large scale. This must have been a major contributor to the success of the software industry in India. He was a great supporter of indigenous technology development and industry with focus on self-reliance. In fact, the concept of IIIT was originally conceived by Seshagiri in the late 80s and early 90s, though it never took off.

His real impact making contribution to national development came with the establishment of the National Informatics Centre (NIC) in 1975. The timing happened to be just right. Computer and communication technologies were undergoing a major transformation with rapid advances in integrated circuits, availability of powerful minicomputers, the digital conversion of telecommunications and the arrival of small satellite earth stations. Data communication was competing with telephony and separate rules were made for dealing with data communication, taking it out of the stranglehold of telephone administrations (all over the world). He foresaw this and made a plan for a nationwide data communication network for interconnecting government and public service offices. Special efforts and innovations were required for the fullest utilization of the limited capabilities of the most advanced equipment available in mid-seventies. With his great personal appeal, he succeeded in putting together a team of bright young engineers, the best that were available in India at that time and who later became leaders in the field. He helped the creation of an infrastructure and environment where young members were able to make their best contributions. Experience at TIFR was perhaps very useful for this purpose. This large nationwide organization has played a key role in the computerization of administration and operations of the government and utilities of the country. This also helped the process of national integration.

Interconnecting far-flung offices covering the whole country was the biggest challenge. Data communication and networking facilities that were then available were very limited (and expensive), providing at best 2400 bps in the most favourable conditions. Fortunately at that time a company (Equitorial) set up by Edwin Parker, a professor at Stanford University, provided a neat solution to match exactly NIC's requirements, viz. small compact low-cost earth stations with less than a metre wide dish and capable of two-way communication at 9.6 kbps. Seshagiri saw a great opportunity here and set up a nationwide network of Very Small Aperture Terminals (VSATS). A local company was set up

## N. Seshagiri

I have known N. Seshagiri for almost 50 years, first slightly and subsequently fairly intimately. We were Ph D degree students together at the Indian Institute of Science. After obtaining his Ph D degree, he moved to the Tata Institute of Fundamental Research and then to New Delhi. His contributions to the IT revolution in India, including the founding and nurturing of the National Informatics Centre (NIC) are very well known. Less well known are his contributions to other areas of science, including biophysics and structural biology.

In addition to his personal contributions, he has been, among other things, a great supporter of research efforts in biophysics and structural biology, particularly macromolecular crystallography. The efforts of my colleagues and myself to initiate and develop macromolecular crystallography in India received a decisive boost when DST handsomely funded us under their Thrust Area Programme in 1983. Seshagiri was the Chairman of the relevant PAC which strongly supported our proposal. I still vividly remember the enthusiasm and commitment with which he commended the effort. Since then, he has all along been very positive in his approach to the development of macromolecular crystallography in India.

By the late eighties and the early nineties, macromolecular crystallography at Bangalore had begun to assume a reasonable shape. The bottleneck then was computational facilities, particularly interactive graphics facilities. Nowadays we take these facilities for granted. In those days we used to interpret electron density maps and prepare diagrams manually. The graphics facility of choice then was the Evans and Sutherland system manufactured in the United States. On account of the several sanctions that then existed, the company would not even send us a quotation. Happily by that time Silicon Graphics got established. From my colleagues abroad I learnt that it was a good system. However we did not have the funds, especially foreign exchange, to procure it. It was then that Seshagiri came to our rescue again. He was then the Chairman of the Bioinformatics Task Force of the newly established Department of Biotechnology (DBT). On the recommendation of the task force, an Interactive Graphics Facility was granted to us. That facility has been involved in several landmarks in the development of macromolecular crystallography in the country. That also turned out to be the forerunner of several other such facilities in the country. He not only helped to grant the facility to us, but also ensured that we were provided the necessary foreign exchange to buy a state of the art Silicon Graphics machine.

What I have given above are just two examples of how Seshagiri impinged on our research efforts. Seshagiri and I have interacted fruitfully in many different ways. Through these interactions we became friends. I was moved very deeply by his passing away. I, like many many others, would sorely miss him.

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jointly with ITI for assembly and manufacture of these terminals for this purpose.

His other important and pioneering contribution was the setting up of satellite-based export processing zones in different states that helped local companies to have data communication facilities with large corporations overseas for providing software development services. This was crucial in making India a global leader in the business of outsourcing of software services.

Seshagiri was the recipient of various awards, including the prestigious Padma-bhushan Award, Asiad Jyothi Award, Om Prakash Bhasin Award and Karnataka Rajyostava Award. He was elected to the fellowship of the two national science Academies of the country (IASc, Bangalore in 1974; NASI, Allahabad in 1988) and the Indian Academy of Engineering (1998).

I had the fortune of working closely with him at TIFR and shared an office room for some time. We used to have interesting discussions and ideas on various issues like strategies in dealing with enemies, adversaries and competition. He used to speak about the *Mandukyopani-shad* and its contribution to logic. A keen practitioner of yoga, he even carried out a very impressive demo. We also worked on the problem (more like a puzzle) of designing pure RC networks (without any active element, not even a diode) that provided some significant voltage 'gain'. He frequently used to speak about his ideas and attempts at discovering possible relationships among relativity, gravity and quantum theory. Though not quite a builder of systems, he was one of the very few who understood and appreciated the importance of technology and manufacturing industry. A great thinker and analyst, he was one of the brightest

scientists that I came across and used to wonder about the possibility of great research contributions he would have made had he continued his work at TIFR. His national level contributions were no doubt outstanding and exceptional.

His death is a great loss for electronics technology development in India. In his passing, India has lost a pioneer who steered the IT act for Government of India and set up the NICNET – the nationwide data network – which has been the IT backbone of Government of India.

He passed away on 26 May 2013 and leaves behind his wife, a son, a daughter and two grand children.

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