N. V. G. Sarma (1931–2008)

N. V. G. Sarma, one of the few scientists who have made pioneering contributions to the growth of radio astronomy in India, passed away on 5 December 2008. He also made important scientific contributions, but his main interest was concerning technical developments at the forefronts of radio astronomy.

Nidumolu Venkata Gurunadha Sarma, an outstanding scientist–technologist of the country, was born on 2 October 1931 in Andhra Pradesh. His early school and college days were in Andhra. He passed his B Sc and M Sc (research) from Andhra University at Waltair in 1953 and 1954 respectively. Sarma joined the National Physical Laboratory in 1955 and worked there till 1964. In 1953, K. S. Krishnan, the Director of NPL, approved the formation of an ionospheric and radio science programme under the leadership of A. P. Mitra. Mitra has recorded that Sarma's contribution to the ionosonde measurements and cosmic radio noise measurements were significant and first rate. Later Sarma, Mohan Joshi, R. Parthasarathy and M. R. Kundu initiated work at NPL in the area of radio astronomy, as the CSIRO of Australia had agreed to donate 32 parabolic dishes of 6 ft diameter to NPL. Sarma developed a keen interest in building electronic receivers, an interest which was to stay with him throughout his life. In 1960, he took a sabbatical leave for two years from the NPL to work at the Strerrewacht, Leiden, on the design of receivers of the Benelux Cross Antenna project, which was modified later substantially, to become the famous Westerbork Synthesis Radio Telescope.

In 1963, the first author (G.S.) of this report proposed the construction of the innovative Ooty Radio Telescope (ORT) that was approved by TIFR, Bombay. He then wrote to both Sarma and (late) Joshi requesting them to join the Radio Astronomy group of the TIFR to form its core team. Joshi had joined NPL in 1956 and went later to work at the Meudon Observatory, where he got the Ph D degree in radio astronomy in 1962. Sarma and Joshi joined TIFR in 1964. The ORT consists of a 530 m long and 30 m wide parabolic cylinder that is placed on an inclined hill of ~11° slope so that its long axis of rotation becomes parallel to the axis of rotation of the earth, thus allowing tracking of radio sources for ~9.5 h. It was the Ooty project requiring a complex receiver system which inspired Sarma. Along with Joshi and a set of raw youngsters, right out of their colleges with good academic careers, Sarma developed the whole receiver system of the ORT operating at 325 MHz, with few electronic components from abroad. The entire design was indigenous. It was first developed at TIFR and later at its Ooty centre.

The ORT was commissioned in early 1970 and became one of the largest radio telescopes in the world. It has performed at a high level for almost 40 years. This was in no small measure to the meticulous care with which Sarma, Joshi and their team built the receiver system. They tested its stability in terms of the amplitudes and phases of various parts that are working satisfactorily even today, albeit, with further upgrades.

Using the ORT, Sarma made valuable scientific contributions in collaboration with colleagues concerning occultation observations of extragalactic radio sources, Crab nebula, Keplar's supernova remnant and particularly the Galactic Centre clarifying the nature of its thermal and non-thermal components for the first time. Later, Sarma developed a multichannel receiver for searching for the deuterium line. Sarma and D. K. Mohanty put an upper limit to its value towards the Galactic Centre, in contrast to a positive detection claimed by the Caltech group.

During 1974–76, Sarma started toying with the idea of making a large radio interferometer at 4.4 mm wavelength at the Radio Astronomy Centre, Ooty. The authors remember his making several different sketches with novel ideas. An opportunity came his way when V. Radhakrishnan of the Raman Research Institute (RRI), Bangalore invited Sarma to join him in designing and building a radio telescope of 10.7 m diameter of high accuracy for operation at millimetre waves. This telescope was patterned after the 10.7 m diameter millimetre dish invented by Bob Leighton at Caltech. The RRI project required several receivers operating at millimetre wavelengths (frequencies >30 GHz). At that time there was no one in the country with the expertise at millimetre waves. Sarma joined RRI in 1976 as Head, Millimetre Wave Lab, and became a professor in 1987. He was responsible for coordinating all aspects of the 10.7 m radio telescope project and particularly to provide the receiver system. He again started from scratch, building up a competent group of youngsters and motivating them to build a world-class millimetre wave receiver, covering several frequency bands. Many from this group at RRI have gone on to build important millimetre and sub-millimetre wave array telescopes in USA in later years.

During early 1990s, Sarma, Raghunathan and their team at RRI took up the important challenge of building sensitive broadband corrugated horns and Low Noise Amplifiers (LNAs) for the Giant Meterwave Radio Telescope (GMRT) being set up by the authors and their colleagues. It covered the operating frequencies of 1000–1430 MHz. These L-band feeds have given excellent performance in the 30 antennas of GMRT. His group also built a few feeds for covering the frequency range of 1100–1700 MHz, so that they could be used for observing OH maser sources for VLBI observations with GMRT and some of the European radio telescopes.

Sarma had made contributions to many radio telescopes in the world, including those described above. During 1971–73 he took a sabbatical leave from TIFR to work at the National Radio Astronomy

Observatory. He joined the group which was building the complex three-element Green Bank Interferometer and made valuable contributions. During 1987–89, Sarma participated in the development of certain important parts of the state-of-the-art Australia Telescope (AT) that was being built by the Division of Radiophysics, CSIRO, for operation at millimetre and centimetre wavelengths. He designed the robust high-frequency transmission system for reception of RF signals received by the 25 m diameter antennas of the AT from celestial radio sources, using phase coherent transmission on optical fibres for short spacing and via satellite links for longer ones, amongst the first such systems in the world. In 1989, Sarma was elected as a Fellow of the Indian Academy of Sciences, Bangalore.

Sarma remained a simple person through his life and was highly committed to his work. Fondly called Sarmaji by everyone who knew him, he was an epitome of good things that are part of India's culture. He and his wife led a simple life, but were extremely generous in inviting all the youngsters around them to their house on all possible occasions. It was a pleasure to be with Sarmaji and listen to his many philosophical discourses on life and its different hues.

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