

## IEEE awards Milestone status for the Giant Metrewave Radio Telescope

The Institute of Electrical and Electronics Engineers (IEEE) is one of the world's largest technical professional organizations, dedicated to advancing technology in all areas related to electrical and electronics engineering. The IEEE Milestones programme honours significant technical achievements and excellence in all areas associated with IEEE, worldwide. After a proposal, a positive recommendation by the IEEE History Committee and approval by the IEEE Board of Directors, a bronze plaque commemorating the achievement is placed at an appropriate site with an accompanying dedication ceremony.

On 30 March 2021, the IEEE presented such a plaque to the National Centre for Radio Astrophysics of the Tata Institute of Fundamental Research (NCRA–TIFR), the full citation reads

### *IEEE Milestone*

*Giant Metrewave Radio Telescope GMRT, 1994*

*GMRT, consisting of 30 antennas of 45 m diameter each, spanning 25 km near Pune, India, is one of the largest and most sensitive low frequency (110–1460 MHz) radio telescopes in the world. It pioneered new techniques in antenna design, receiver systems, and signal transport over optical fibre. GMRT has produced important discoveries in domains such as pulsars, supernovae, galaxies, quasars, and cosmology, greatly enhancing our understanding of the Universe.*

March 2021

IEEE

Two other 'IEEE milestones' have earlier come to India. One recognized the work of J. C. Bose in the 1890s on the generation, detection and properties of millimetre waves, and demonstration of wireless communication. The other was for the Raman effect (1928). Both dedications took place on 15 September 2012, at the Presidency University and at the Indian Association for the Cultivation of Science respectively.

In this instance, IEEE India represented by its Senior Director, and NCRA–TIFR, represented by its Centre Director, submitted the proposal, bringing out the technical challenges and innovations that went into the GMRT in the 1990s, and the impact of the project. This achieved the best performance in the world at metre wavelengths, at a fraction of the cost

of similar projects elsewhere, with all development and construction done in the country and much of it, in house. Starting in 2002, the observatory attracted a large international pool of observational astronomers, and produced outstanding results. A recent upgrade of all systems has ensured state of the art performance, keeping the observatory competitive for the coming decade, and has already generated exciting results.

The dedication ceremony was planned by NCRA and the IEEE Pune chapter. It had to be moved online, and attracted wide participation, from the IEEE, from TIFR, and a host of well wishers. The Chairman, DAE, unveiled the plaque remotely, conveyed his own congratulations, and read out a message from the Prime Minister. The Principal Scientific Adviser to the PM joined in person. The Secretary to the Department of Telecommunications conveyed his own appreciation and encouragement – significant since co-ordination and co-operation on the use of radio frequencies is vital to an observatory such as the GMRT. A short film highlighting the engineering aspects was shown. The event concluded with short, informal reminiscences by 'old-timers' (the author of this piece was one among them).

Amidst all this celebration, one figure was sorely missed – Govind Swarup, who passed away in September 2020 at the age of 91. The basic technical features and potential astronomical impact of the GMRT were laid out by him in an article in *Current Science* (Swarup, G. *et al.*, The Giant Meter-wave Radio Telescope. *Curr. Sci.*, 1991, **60**(2), 95–105). This was as early as 1991, a full decade before the observatory opened its doors to the world community of astronomers. The second birth has also been described in this journal (Gupta, Y. *et al.*, The upgraded GMRT: opening new windows on the radio Universe. *Curr. Sci.*, 2017, **113**(4), 707).

In the context of this major recognition by the IEEE, it is worth recollecting that Prof. Swarup, with a basic degree in Physics from Allahabad University was a faculty member of the department of electrical engineering at Stanford University before returning to India in 1963. Many members of the academic group, past and present, have first degrees in engineering. The engineering group at the observatory has always been very

strong, and its members were represented at the online event. Today, they take part in international meetings, spend significant time with other groups, co-author papers with their academic colleagues, and work for higher degrees in parallel with their major duties and challenges at the observatory. Many members have gone on to greater responsibilities in other institutions, in India, but also with major projects abroad. As many speakers emphasized, this milestone is equally a tribute to their dedication, skills, and adaptability and innovation in the face of many challenges.

The symbiosis between science and technology has been crucial to building and operating the GMRT. This theme was reiterated by speakers who had earlier led the Department of Space, and the CSIR. The audience was reminded of Govind Swarup's prescient proposal, with V. G. Bhide, to establish an institution which would attract youngsters to this frontier. One part of this dream was fulfilled with the establishment of the IISER's, but not all of it. Today, our nation aspires to be an equal partner in international mega projects. The Square Kilometre Array, SKA, in radio astronomy, is one of them. But there are others, such as ITER in plasma physics and technology, LIGO in gravitational wave astronomy, and the TMT in optical astronomy, to name just a few. Sixty five years ago, the BARC Training School played the role of attracting and nurturing talent and harnessing it towards a major national goal. Attending this meeting left me with the strong feeling that the time is ripe for a new major institutional initiative across departments and disciplines, serving and getting the best out of the young people now entering science and technology, not 'either' but 'both'.

I thank Prof. Yashwant Gupta for the invitation to take part in this event, and for sharing background material for this piece. Readers interested in more details can go to <http://www.ncra.tifr.res.in/ncra/outreach/press-releases/english-press-note-ieee-milestone.pdf> and view the dedication event at <https://www.youtube.com/NCRAOutreachCommittee/featured>

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