In this issue

Bhabha and radio astronomy in India

It is exactly twenty-five years ago that Homi Bhabha died in an air crash in the Alps and India and Indian science suffered an irremediable loss. Bhabha promoted many scientific ventures and perhaps one of the most successful ones was that of radio astronomy which has flowered out in this country in a big way. In this commemorative issue we have chosen the subject radio astronomy as the theme. Govind Swarup gives us some of his personal reminiscences (**page 75**) and relates how he first offered to form a radio astronomy group in India and how Bhabha responded immediately and within six months he 'decided to establish a radio astronomy group'. Swarup then goes on to tell us the story of the building of the Ooty Radio Telescope. Ramesh Sinha tells us (**page 76**) the exciting story of the search for the site for the Ooty telescope.

'Twenty-five years of radio astronomy at TIFR' (**page 79**) by Swarup along with eight of his colleagues and collaborators details the number of results that poured out by the use of the remarkable machine—the Ooty Radio Telescope. There is an article (**page 95**) about the Giant Metre-wave Radio Telescope (GMRT) which is being set up 80 kilometres north of Pune. It is again the crystallization of a concept developed by Swarup and his group. GMRT consists of thirty fully steerable 45-metre-diameter dishes fabricated using very novel principles, and which are being built indigenously at a very modest cost. Fifteen of these dishes are spread out in the three arms of a 'Y' over an area of 50 square kilometres, while the other 15 are clustered in a relatively small central area. The primary scientific objective of this aperture-synthesis array with a total effective collection of 30,000 m^2 (which incidentally is three times that of the Very Large Array in the USA) is to detect the highly redshifted 21 cm line of neutral hydrogen from protoclusters and protogalaxies in the early epochs of the Universe, and also to detect and to study a large number of millisecond pulsars. One implication of this would be to investigate the hypothetical primordial background gravitational radiation.

Having successfully designed GMRT, Govind Swarup becomes more ambitious and suggests (**page 106**) the setting up of an International Telescope for Radio Astronomy (with 160 dishes 75 metres in diameter) with a sensitivity 30 to 50 times higher than that of GMRT in India, or of the Arecibo dish in Chile, or of VLA in the USA. It is suggested that this enormous array could be set up in South America, Africa or Australia where man-made interferences would be minimum.

There are two original articles. T. Velusamy and Anish Roshi of the TIFR Radio Astronomy Centre at Ooty return to a subject which has always fascinated astronomers (for 937 years to be precise—the Crab nebula (**page 120**). This object has become a classic of the connection between the explosion of the outer layers of a star, collapse of the centre to a spinning magnetic neutron star, spectacular but brief fireworks in the optical region of the spectrum, and a longer-lasting aftermath of radio emission from the neutron star and its surroundings. But the Crab nebula also has many unique and peculiar features of its own. The radio data on the Crab presented in this paper are remarkable for the ranges of spatial scales and intensities spanned, and will no doubt form the subject of detailed studies later.

Twinkling—or scintillation to give it the proper technical name—has become a powerful tool at radio wavelengths, not only for revealing the nature of the medium through which the waves pass but also the nature of the objects that emit the radiation. Gopal-Krishna of the TIFR group at Pune attempts to give the subject a new twist (**page 117**) by interpreting some slow time variations of extragalactic radio sources in terms of propagation in the intergalactic medium—by far the most tenuous component of the Universe which one would normally tend to discount for such applications. The new ingredient is that the time-scales could be made shorter by the line of sight to the source apparently moving faster than light in the transverse direction—a well-known effect which incidentally does not violate relativity.

In a review article (**page 109**) D. J. Saikia discusses observational results and theoretical ideas that have helped mould our current understanding of active galaxies.

In two historical notes pertaining to astronomy in India, Kochhar relates the development of astronomy during the early British times (**page 124**) and S. N. Ghosh recalls Saha's observations on upper-atmospheric studies and solar astronomy (**page 129**).