

# Preface

While radio astronomy began at metre wavelengths, the need for higher angular resolution and the problems of interference and calibration imposed by the ionosphere, led to construction of large radio telescopes at progressively higher frequencies. The last decade or so has seen a revival of interest in radio astronomy at lower frequencies, which is more suited for the study of objects like pulsars, steep spectrum relic radio sources and neutral hydrogen at large red shifts which can be a powerful probe of cosmological evolution. A few imaging instruments like the Very Large Array (VLA), the Westerbork Synthesis Radio Telescope (WSRT) and the Molongolo Synthesis Telescope (MOST) have been making significant contributions at metre wavelengths. Recent technical advances like the development of large multi-channel digital correlators, development of software techniques for self-calibration and wide field imaging, together with the proliferation of powerful computers, have enabled astronomers to overcome the initial difficulties of low frequency radio astronomy and rejuvenated interest in building large low-frequency radio telescopes. The Giant Metrewave Radio Telescope (GMRT) has already been commissioned, while even more powerful telescopes like the Low Frequency Array (LOFAR) and the Square Kilometre Array (SKA) are being planned under international collaborations. These developments led to the proposal for an IAU symposium on science at low radio frequencies. The present volume contains the proceedings of the IAU Symposium 199 on “The Universe at Low Radio Frequencies”, held in Pune, India from November 30 to December 4, 1999. The venue of the conference — the National Centre for Radio Astrophysics (NCRA) of the Tata Institute of Fundamental Research, was befitting since the GMRT, built near Pune by the NCRA, had just become operational.

The symposium was nearly derailed by the unexpected and shocking demise of Vijay Kumar Kapahi, who was one of the prime movers behind the symposium. Vijay, who was the Centre Director of the National Centre for Radio Astrophysics (NCRA) of the Tata Institute of Fundamental Research (TIFR), was personally responsible for proposing the symposium and getting the approval for its being held in Pune, India. He was the Co-Chairman of the Scientific Organizing Committee when he passed away. His absence was deeply felt by all of us organizing the symposium.

The symposium was attended by 157 participants, including 63 from India. The nine areas covered are: radio source surveys and cosmology, extragalactic neutral hydrogen and cosmology, clusters of galaxies, extragalactic radio sources, galactic surveys and extended emission, spectral studies of our galaxy, pulsars

and other compact galactic objects, the sun and planetary systems and instrumentation and techniques. The scientific programme for each area included invited talks, oral presentations and poster papers. Also, a half day visit to the GMRT observatory was organised, which included a session on the first results from the GMRT.

The symposium was sponsored by the International Astronomical Union (IAU) and co-sponsored by the International Union for Radio Science (URSI). It was supported by the IAU commission 40 and co-supported by the IAU commissions 27, 28 and 48. Financial support for the symposium was provided by the IAU, URSI, Tata Institute of Fundamental Research, Indian Institute of Astrophysics, Raman Research Institute, Department of Space, Government of India and the Council of Scientific and Industrial Research, India. Considerable logistical support was provided by the Inter University Center for Astronomy and Astrophysics (IUCAA), Pune We thank the organisations that provided support and the members of the SOC and LOC and others who contributed to the success of the symposium. We also thank the staff of NCRA and GMRT observatory without whose efforts the symposium could not been held. In particular, we would like to thank Nancy Verghese, the secretary for the symposium, H.C. Khataavkar for secretarial help to the SOC, B. Premkumar, the photographer for the symposium and Annabhat Joshi who looked after organisational matters during the conference and later assisted in bringing out these proceedings.

A. Pramesh Rao  
Govind Swarup  
Gopal-Krishna

Pune  
30 July 2002

## The Scientific Organizing Committee (SOC)

R.D. Ekers (Australia), Co-Chair  
G. Swarup (India), Co-Chair  
S. Ananthkrishnan (India)  
A Ger de Bruyn (Netherlands)  
P.E.F. Dewdney (Canada)  
W.C. Erickson (Australia)  
Gopal Krishna (India)  
W.M. Goss (USA)  
N.S. Kardashev (Russia)  
A.G. Lyne (UK)  
Randong Nan (China)  
L. Padrielli (Italy)

## The Local Organizing Committee (LOC)

A.P. Rao, (NCRA) Chair  
S. Bhatnagar, (NCRA)  
J.N. Chengalur, (NCRA)  
Gopal Krishna, (NCRA)  
P. Gothoskar, (NCRA)  
Y. Gupta, (NCRA)  
N. Krishnamurthy, (NCRA)  
V.K. Kulkarni, (NCRA)  
D.J. Saikia, (NCRA)  
L. Shankar, (IUCAA)  
K. Subramanian, (NCRA)