

Tutorial: New Telescopes, Techniques, and Observations

Geoffrey C. Bower

University of California, Berkeley, CA USA

The past decade has seen an explosion of creativity and progress in radio astronomy telescopes and techniques. In the coming decade, we will harvest the fruit of these innovations with a powerful new generation of radio telescopes that are coming on line. These will open avenues for new science, in areas such as the epoch of reionization, synoptic surveys for radio transients, and exquisitely sensitive observations of the most distant objects in the Universe.

Dramatic improvements in digital instrumentation have been and will continue to be central to the advancement of the field. But there has also been a resurgence of interest in many other areas including receiver technologies, antennas, optimized array configurations, remote site management, software, commensal observing modes, and algorithms. Considerable attention has been paid to manufacturability and array costs in order to address the prospects of optimizing array performance at costs exceeding \$1B. Telescope projects have also bifurcated into general facility instruments and targeted experiments, with significance consequences for their design and operation.

I will review the current state of the art for meter and centimeter wavelength telescopes. Among the projects of note, I will discuss the SKA Technology Development Project, the Allen Telescope Array, MeerKAT, the Australian SKA Pathfinder (ASKAP), the Precision Array for Probing the Epoch of Reionization (PAPER), the Mileura Widefield Array (MWA), the Long Wavelength Array (LWA), the Low Frequency Array (LOFAR), and SKA Phase 1. I will also explore what telescope parameter space remains unexplored and where new technical developments are required to make scientific progress.