Radio telescopes

Radio telescopes work on the long wavelength end of the spectrum below the infrared, using a window which accepts wavelengths between a few millimetres and 30 m. In essence, radio telescopes are special directional radio aerials or **antennae** designed to receive radio waves over a specific range of wavelengths and pass these to a special radio receiver, whose output is fed either to a chart recorder or to a computer. The antenna may take a number of forms of which the **dipole** is probably familiar from television aerials, although the **Yagi** (invented by Hidetsugu Yagi) will also be familiar for the same reason. The **helix** antenna, invented by John Kraus, is another type, but in radioastronomy none are used alone; all require some additional reflecting system to enhance the signal-gathering ability of the telescope, just as a large mirror enhances the light-gathering power of an optical telescope. The varieties of reflector appear extremely numerous, but there are really only three basic designs. The best known is probably the **dish-type reflector**, of which the 76-m diameter parabolic dish at Jodrell Bank, England is a prime example; this is fully steerable, as also are the 64-m telescope at Parkes, Australia and the 100-m at Effelsburg, Western Germany, to mention only some of the larger instruments. Yet since radio telescopes can build up their plot of signal strength over a long period of time, many instruments rotate in altitude only, using the Earth's rotation to give a movement in azimuth. The most notable of the dishes to do this is the 300-m spherical reflector at Arecibo in Puerto Rico, the bowl of which is constructed out of a natural hollow in the ground; small changes in the position of the aerial at the prime focus can give a result equivalent to tilting the bowl in altitude by amounts of up to 20° from the zenith. On the other hand, the steerable dish is sometimes mounted equatorially – the 43-m dish at Greenbank, Virginia is a particularly