on only a narrow area of sky, it is essential to track the telescope continuously to compensate for the earth's movement. Mechanical drive motors have been used for many years, but recently the amateur has had access to computer-controlled systems. The telescope is mounted on an 'equatorial' axis pointing to true north, and the drive motor rotates the axle at precisely the same speed as the earth moves, which keeps the object in the field of view. Attached to the axle and telescope are shaft encoders and digitisers, which send a digital signal to the computer for the celestial co-ordinates and monitor the activity of the drive motor. In this way, a telescope can be left all night, under computer control, to track a faint star, while its image slowly builds up on a photographic plate. An adaptor is available in America called the Celestial Navigator Mk II, which connects a telescope to the home computer through the expansion interfaces.

Computers can also assist telescopes by allowing for those atmospheric changes, like variations in temperature and humidity, that refract and bend the light as it passes through the atmosphere. They can also compensate for and correct distortions of the image received through the telescope, by various techniques of image enhancement.

Astronomy has not only used computers for its own advancement, but has also contributed to the development of computer science. The language FORTH was devised by an astronomer, Charles H Moore, in 1971 at Kitt Peak observatory in Arizona for controlling the radio telescopes and processing data.

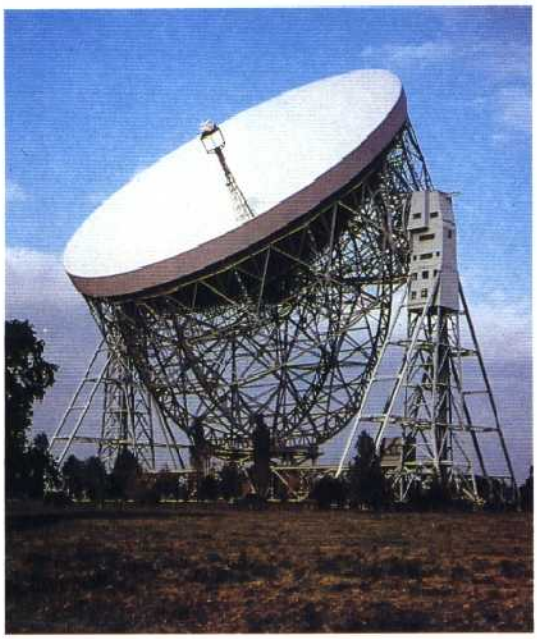
Books are now appearing devoted to home programming for astronomy enthusiasts, and there is even a magazine called *Apex*, in which home computer owners exchange and publish programs. Software has been written to calculate the times of Easter, the conversion of historical dates into the Julian calendar, the rising and setting of the moon and daily tables to pinpoint the exact position in the sky where astronomers expect to see the return of Halley's comet in 1986.

Grammar School All-Stars
The pupils and staff of Kettering Grammar School in Northamptonshire have long been held in high esteem for their work in astronomy, especially in the field of satellite tracking. On a number of occasions, KGS has been the first observer station to detect the presence of a new satellite in orbit

JOHN DRYSDALE/COLORIFIC

In America, some amateur astronomers have gone as far as to adapt the newer technologies of speech recognition and speech synthesis to help them. A computer is programmed to recognise certain command words so that when an observer walks into the building and calls out 'open', the dome slides open, and a further call 'rotate the dome' engages the motors to revolve the dome on its wheels. Speech synthesis is also very useful in the darkness of an observatory to output information from the computer. It could, for example, count time signals out loud to help the observer make accurate photographic exposures.

Professional astronomers make use of telescopes that register part of the electromagnetic spectrum other than light — such as radio waves or X-rays. With the increase in size of the telescope aperture and the accompanying increase in weight, engineering problems become critical. In 1964, the Jodrell Bank Mark II, a 38 by 25-metre (125 by 83-foot) elliptical disc near Manchester, was the first telescope to use a digital computer to convert the celestial co-ordinates into the instructions needed by the various drive motors, and the process was done continuously four times per second.



Radio Stars
Following the discovery of the presence of radio-emitting objects in remote galaxies, this massive radio telescope was built at Jodrell Bank, to the south-west of Manchester. Radio telescopes, which operate like huge aerials, can detect objects invisible through even the most powerful optical telescopes