Watching Minor Planets

It might at first be thought that the minor planets offer little scope for amateur study since most of them are quite faint and no detail can ever be seen even in the very largest telescopes. However, although they will never be as widely observed as the major planets, they do have their devoted band of followers. There is a certain challenge in locating and following a faint speck of light as it makes its way against the background stars, and this exercise provides valuable experience in finding one's way around the sky. The positions of some of the brighter objects are given in certain yearly publications, so that the paths may be plotted on suitable charts. ('Suitable' charts in this case implies that they show stars fainter than the expected brightness.

The next stage is to photograph the minor planets, and in its simplest form photography records the change in position from night to night, which can be easily seen on comparing the photographs. Some of the objects which make close approaches to the Earth may have so great a motion that an exposure driven at sidereal rate will show a trail even after a fairly short exposure. However, most such objects are fairly faint, so that moderate apertures are required.

The majority of the orbits of minor planets are reasonably well-known and they are less subject than comets to planetary perturbations. Nevertheless good photographs, especially of some of the fainter Earth-crossing objects are required for positional measurements. Unfortunately the equipment needed to carry out the measurement of 'plates' – usually film nowadays – is complex, and not readily constructed by most amateurs. However a few have built their own measuring engines and usually undertake work on suitable objects for other observers in the national groups, normally doing cometary work as well.

The measurement of magnitudes of these objects is not an easy task as they do not stay still. Locating suitable comparison stars becomes very difficult, especially as, apart from variable star fields, the magnitudes of stars in the general field are poorly determined, even around magnitudes 8–9. Some form of photometry is usually regarded as being most successful, and this can be undertaken with suitable photographs, using variable star techniques. However, more amateurs are turning to photo-electric photometry and achieving notable success, even managing to obtain rotational light-curves.

A completely different study, but of the greatest importance, is the observation of stellar occultations by minor planets. These are not easy to predict, given the uncertainties in the orbits and the inaccuracies in catalogued stellar positions. After a considerable period without success, professional astronomers, particularly Gordon Taylor at the Royal Greenwich Observatory at Herstmonceux, have successfully predicted a number of occultations in recent years. In nearly every case it has proved necessary to secure a photographic plate showing both the star and minor planet in order to make the final corrections, sometimes only hours before the event, to the predicted track of the occultation across the surface of the Earth. Even minor errors in the known positions may cause the tracks to shift by hundreds of kilometres, and, as some of the objects are so small, to miss particular observers completely. True enthusiasts may then pack up their telescopes and rush across the country.

The techniques of observing an event are the same as those used for lunar occultations, consisting of timing the disappearance and reappearance of the star as accurately as possible. If more than one observer has been successful these timings can indicate the size (and shape) of the body, which under favourable circumstances can be very accurate. Indeed this method is the best means of determining the sizes of these small bodies, and has also been used to detect the presence of satellite bodies, both certain and unconfirmed.

Opposite page, top: *The motion of the minor planet Iris* (bottom centre) *is shown on these two photographs taken by H. B. Ridley, West Chinnock, on 1980 September 5* (left) *and September 8.*

Below left: *The observation of an occultation by Pallas on 1983 May 29 accurately determined the minor planet's shape. The length of each line represents the time the star was hidden for one particular observer. (After D. W. Dunham and M. Marr, Maryland.)*

Below: *The photoelectric light-curve of the minor planet Thyra, obtained by R. Miles of Mouldsworth, Cheshire, from observations on 4 nights in 1983 February.*

Minor planets may prove difficult to identify unless their complicated paths are plotted on a suitable atlas.