Watching the Planets

Observation of the planets has long been a field of special interest to amateur observers, and although professional patrols and spacecraft missions have provided a vast amount of new information, the latter in particular are naturally limited in their coverage. Amateurs are able to maintain a watch upon the various planets and ensure continuity by following the changes which occur over a period of time. It is just this sort of continuity which has made earlier observations so valuable to workers investigating planetary atmospheres, in particular, in the light of modern knowledge.

As planetary disks are so small, detailed observation requires large apertures and long focal lengths capable of giving high magnifications. Refractors or catadioptric systems (pages 230–1) have certain advantages over reflectors for this sort of work, but few persons can now afford the large-size refractors favoured by wealthy amateurs in the late nineteenth and early twentieth centuries. Reflectors are frequently used, therefore, although a growing number of Maksutov and Schmidt-Cassegrain systems are also employed. Visual techniques for drawing the various features are generally the same as those for the Moon (pages 108–109), while Mars, Jupiter and Saturn offer the opportunity to try working in colour.

Of the inferior planets, **Mercury** is the more difficult to observe as it is always close to the Sun and is at best visible only low in the sky before sunrise or after sunset. For most amateurs, especially those at high latitudes where it remains low in the sky, there is always a sense of achievement in spotting the planet low in the evening or morning twilight. Very little detail can be seen on the surface, even with the largest telescopes, and this is limited to faint albedo markings. Its study therefore is likely to be undertaken by only the most dedicated observers.

Venus can be quite well placed on occasions and its phases discerned even through a fairly small telescope, but the intense brilliance of the planet and the low contrast of the atmospheric features mean that these can only be seen with difficulty, although they can be accentuated by the use of suitable filters. At some time in the future it may be possible to correlate the observed distribution of bright and dark patches (usually very indistinct) with atmospheric activity or features, but this has yet to take place with any degree of certainty. However, it may be noted that amateur observations indicated the 4-day rotation period for the upper atmosphere even before the first spacecraft observations.

Telescopes with setting circles may be used to find the planet in the daytime sky, when observation is sometimes easier because of the reduced contrast between the brilliant planet and the background of the sky. Despite the difficulties in observing the planet, more work needs to be done on certain unresolved problems such as the 'Schroter Effect', a discrepancy between the observed and calculated times of dichotomy (half-phase), and the existence of the 'Ashen Light', when the unilluminated portion of the disk appears, near inferior conjunction, to be faintly luminous.

Mars is not easy to observe as the high eccentricity of its orbit causes its maximum apparent diameter to vary from 25 to only 14 arc sec. as its minimum distance from the Earth varies from 5.6×10^7 km at a perihelic opposition to 10^8 km at an aphelic opposition. In addition, the relative motion of the two planets is such that the period most favourable for telescopic work lasts only a few months and occurs at intervals of more than two years. Detailed observation of the planet requires a telescope of at least 200mm aperture, but the more prominent surface features can be distinguished through a smaller instrument. Careful drawings may be used for the study of several effects, such as the seasonal changes which occur – particularly the advance and retreat of the polar caps and the changes which take place from year to year. Similarly the variations in the extent and intensity of the dark markings are a measure of the transport of material over the surface of the planet, while atmospheric conditions are monitored by observing the hazes and clouds which occasionally obscure the surface, as well as the sometimes planet-wide dust-storms.

Jupiter undoubtedly offers the best prospect for the planetary observer. Its apparent diameter is rather more than 46 arc sec. at its mean opposition distance and is never less than 30 arc sec., so the planet may be profitably observed for several months around the time of opposition, which occurs at intervals of about 13 months. Even through a small telescope the disk of the planet is seen to be crossed by dark belts separated by light zones, interspersed with streaks and oval features of which the most prominent (at present) is the Great Red Spot. Drawings of the relative positions and prominence of the numerous features can help to determine the various circulations which are taking place in the atmosphere, and which with modern spacecraft measurements are leading to an understanding of the processes at work. Due to the short rotation period of less than 10 hours, many

The identification of the various belts, zones and regions on Jupiter. (A similar system is used for Saturn, although details are more rarely seen on that planet.) The abbreviations are: E equatorial; GRS Great Red Spot; N north; P polar; R region; S south; T temperate; Tr tropical; Z zone.