ROYAL ASTRONOMICAL SOCIETY OF CANADA
Planetary Section

GENERAL INSTRUCTIONS

INTRODUCTION

Much of our present knowledge of the objects in the solar system is due to observations carried out over many years by dedicated amateurs around the globe. The person considering devoting his time to planetary work should bear in mind that although the human eye is prone to errors against which one must be constantly on guard, it also has a number of advantages over the photographic plate in this field. A systematic means of recording observations eliminates some sources of error and makes the analysis of the work of various observers easier.

It should be emphasized at the outset that planetary observations are by no means easy. Beginners may well become discouraged at the lack of detail on a planet; the eye requires considerable training in order to perceive slight differences in contrast near the limit of visibility. Even more frustrating is seeing detail which is beyond one's (present) ability to sketch. Many will give up in despair, a few will be sufficiently intrigued to try again, and I can guarantee that the latter will be amply rewarded for their patience.

INSTRUMENTS FOR PLANETARY RESEARCH

Telescopes. There is little to choose between a refractor and a reflector of the same aperture provided that the optics are good. Although a 3- or 4-inch can show detail worth recording, a 6-inch or greater will more than repay the extra cost. An equatorial mount with drive is a help but by no means an essential.

Eyepieces. Considerable thought should be given to obtaining a good set of eyepieces. For telescopes of small focal ratio (i.e. f/5 - f/9) the Huygens eyepiece should be avoided. An orthoscopic is the best, but the lowly Ramsden can be very useful with objects near the horizon if the object is so placed in the field that the eyepiece's chromatic aberration exactly cancels out the effects of atmospheric dispersion. Suitable magnifications depend on the seeing conditions and the object under observation. Powers in the range 150 - 250x will be found most useful on average nights; with excellent seeing higher powers may be used on Mercury, Mars, and Saturn.

Filters. A set of coloured filters may be found helpful under certain conditions. For instance, red filters (such as the Kodak Wratten 25) emphasize detail on Mercury and Mars, and a deep blue filter (Wratten 47) will make it easier to detect the shadings on Venus.

Timekeeping. An ordinary watch is sufficient for most purposes since high accuracy is not essential. The watch should be set by radio time signals and checked periodically. All times should be recorded to the nearest minute except in special cases.

REPORT FORMS

Form No 1 has been designed to make certain that all necessary information regarding an observation is recorded in a uniform manner. Virtually all the data must be entered at the time the observation is made; if left till later, any number of errors may creep in. The following is a description of the type of information required:

Local Date and Time. The double date is always used here (e.g. January 24/25). The times when the drawing was begun and completed should be given using the 24-hour system, 0^h at midnight, and the kind of time (e.g. E.S.T., P.D.T., etc.) indicated.

U.T. Date and Time. For comparison purposes Universal Time (i.e. Greenwich Mean Time) is always used. The correct number of hours should be added to the local time to give U.T. (see "Solar, Sidereal and Ephemeris Time" in the Observer's Handbook). In

areas where Daylight Time is in effect, one hour less than the number given in the Handbook should be added. The double date is not used here, the date changing at 0^h U.T.

Seeing. The steadiness of the telescopic image is usually recorded on a numerical scale with 0 representing seeing so bad that no detail can be made out to 10 when the image is absolutely steady for long periods of time (never achieved in practice!). On most nights the seeing is around 3 or 4, and values above 6 are recorded very infrequently.

Transparency. This gives the clarity of the sky and is usually taken as the magnitude of the faintest star visible with the naked eye at about the same altitude as the planet.

Central Meridian and "k". The central meridian of the planet at the time of observation may be calculated for Mars and Jupiter from tables in the Handbook or the American Ephemeris. Since Mars has many permanent surface features and a well-known rotation period, longitudes are given in terms of an internationally agreed upon system. The Ephemeris predicts the meridian that will pass through the centre of the disk at 0^h U.T. each night, and from this it is possible to calculate the central meridian (or "C.M.") for any other time. Because Jupiter's surface is not visible, two arbitrary longitude systems are used as a reference: System I for regions between the middle of the North Equatorial Belt and the middle of the South Equatorial Belt, and System II for the rest of the planet. "k" is the fraction of the planetary disk which is illuminated and is useful in comparing drawings of Mercury and Venus. It is tabulated in the Ephemeris.

Station. The location where the observation was made may not necessarily be the same as the observer's mailing address and so should be indicated here.

Drawing. A two-inch diameter circle should be drawn in this space with a pair of compasses except for drawings of Jupiter and Saturn. For Jupiter, Form No 1-J with the specially printed outline should be used. This outline has the correct shape for Jupiter's slightly elliptical disk, and the planet should be drawn so that its belts are parallel to the major axis of the ellipse. Since the aspect of Saturn's rings changes continuously, no outline can be given. For accurate drawing the dimensions of the disk and ring system must be taken from the Ephemeris and suitable ellipses drawn. After a drawing is completed, its appearance may be improved by carefully blacking in the background with a felt-nibbed marking pen (such as the Carter's "Marks-a-Lot").

Intensity Estimates. Another circle may be placed here for recording the intensities of the features observed (see p.3).

Observer's Remarks. Any information that may be useful in interpreting the drawing should be entered here. Most observers err on the side of making too few remarks; something that might not seem important at the time may take on a greater significance when compared with other observations. Remarks may be continued on the back of the form provided that nothing is written on the back of the drawing itself.

All observations should be sent to your Centre's planetary chairman not less frequently than once a month. If drawings are sent by mail, please do not fold the form across the drawing.

MAKING A DRAWING

The observer should equip himself with the following before going to the telescope:

(a) Some sort of drawing board to which the report form can be firmly attached.
(b) A suitable pencil (my own preference is for the 2B lead). One with an eraser attached is a great convenience; otherwise
(c) A fairly soft eraser, perhaps sharpened to a point.
(d) An "artist's stump". This is a small roll of blotting paper sharpened to a point (obtainable for a few cents from any art supply store) which is used to

smooth out pencil lines and give more even shading.

(e) A flashlight or other source of illumination which makes the drawing paper about the same brightness as the planetary image in the telescope. A red light is neither necessary nor desirable.

I would strongly recommend that no attempt be made to start drawing for at least 20 minutes after going to the telescope. During this time more and more detail will become apparent, and by the time the drawing is begun one will have a good idea of what is visible. The main details should be sketched in to form reference points. Great care must be taken at this stage since the drawing may later be measured for positional information. Then the finer detail is added, starting with the preceding part of the disk since this is the side that is rotating away from us. After smoothing out the pencil-work with the "stump", the drawing should be compared with the planet to make certain that it is an accurate copy. The actual time spent drawing should not be more than about ten minutes so that the positions of the features do not change appreciably during the period.

Since a beginner will often waste much time at the telescope in learning to manipulate pencil and stump, it might be a good idea to practise copying drawings and photographs published in magazines. Almost anyone can learn to make useful planetary drawings in time, and one accurate drawing is worth much more than a large number of pretty but careless sketches.

ESTIMATING INTENSITIES

The value of a drawing can be enhanced by the addition of quantitative estimates of the relative intensities of the features observed. For most planets a 0 - 10 scale is used where 0 is taken as the darkness of the sky background, and 10 as the brightest markings possible. Some rough guides to intermediate values are listed here:

Venus:	Average surface brightness	= 9	Mars:	Exceptionally dark markings	= 1
Jupiter:	Brighter zones	= 7-8		Normal tone of greenish areas	= 3
	Darker belts	= 2-3		Normal tone of reddish areas	= 6
	Polar regions	= 4		Tone of clouds at the limb	= 8
Saturn:	Outer part of ring B	= 9		Polar caps at brightest	= 10

Due to the special problems in observing Mercury, a 0 darkest - 5 brightest scale is often used with the average surface brightness taken as 3. With experience one can become quite consistent in assigning intensity numbers. Observations should be recorded on a rough sketch in the space provided. (Those familiar with standard Jovian nomenclature may prefer just to list the belts and zones with their observed intensities.)

OTHER DATA TO ACCOMPANY DRAWING

Under the "Remarks" section of the form various notes can be made on the colour and conspicuousness of the observed details. These may be recorded on another rough sketch or described verbally. The relative conspicuousness of Jupiter's belts and zones (considered separately) can be conveniently estimated by throwing the telescopic image out of focus and noting the orded in which the belts (or zones) reappear as the eyepiece is refocused. The most conspicuous should be marked "1", the next most conspicuous "2", etc.

Geoffrey Gaherty, Jr, National Co-ordinator,
Planetary Section, Standing Committee on
Observational Activities.

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