OBSERVING THE PLANETS

Planetary observation can present interesting challenges, especially to users of smaller telescopes. Details with which we are all familiar in professional quality images are seen only briefly in the eyepiece - if they can be resolved at all by a particular aperture. Observing the planets with any sized telescope calls for time, patience, and a comfortable observing chair. Filters and high power eyepieces (there are some designed specifically for planetary observation) can also help, but whatever gear you use it will be the patience to spend time at the eyepiece that makes the most difference in the quality of a planetary observing session. You need to be comfortable in order to spend that kind of time at the eyepiece, and so the need for an observing chair. (Of course, this is true of any category of object you decide to observe, so a comfortable chair of some sort is an all-around essential telescope accessory.)

For many beginning amateur astronomers, starting out with modest equipment and looking at a planet (especially Mars and Jupiter) for the first time, the view can be a big disappointment. A magnification of 100x may sound impressive, and can certainly turn up some great views of the Moon, but in that same eyepiece Jupiter will be revealed as no more than a slightly flattened ball with a few bands and four bright satellites. Details within the clouds, even the so-called Great Red Spot, may be difficult (or impossible) to see. Saturn will usually please the eye even at 100x (in most telescopes), but Mars, unless we are experiencing one of its close approaches, will be a tiny yellow-orange disk. Similar results are likely to be obtained for the other bright planets. This is not to say that planetary observations with smaller telescopes are not worth the trouble, far from it. But you need to have your expectations tempered in order to enjoy what you *will* see, and you will need to spend a few sessions observing planets before you learn to see them well enough to recognize the details that *are* visible through the equipment available to you. Higher magnifications can of course be used – within the limits of your aperture (explained below) – and eyepieces suited to high power views of planets might prove worth the investment, but it is a rare night indeed during which seeing conditions are good enough to allow you to push your telescope to its limits in this way. More often than not the highest power you can use will be determined not by your telescope's potential, but by the observing conditions. So when it comes time to point your optics at Jupiter or Saturn keep an open mind, and concentrate on what you *do* see, not on what you thought you might.

Planetary observing also presents a special challenge to a program of this sort. The size of the aperture and the type of telescope used influences the sort of view you have of any celestial object, but it can fairly be said that this is nowhere more true than the study of the planets. Since the participants of this program could be using anything from a 60mm refractor to a 12" or larger Dobsonian mounted reflector, how do we set meaningful goals for all to share? Fortunately, there are observations, dealing with the locations of planets in the sky, that are independent of aperture size. Telescopic observations will involve a few guiding questions, such as those used in the lunar section, and but these questions are designed to reveal as much about your telescope's capacity as they do about the planets you observe. For this reason, when observing a planet for the

BSIG program, “no” is a perfectly acceptable answer to the questions below. We realize that you might not be happy with such an answer, but you need to understand the capacity of the equipment at your disposal in order to set realistic goals.

One big advantage here: a dark sky site is not necessary for observing the five planets visible to the naked eye, so much of the work for this section can be done from your own back yard, should you wish to do so.

Which Planet Is That?

There are many ways to keep track of which planets are up in the night sky at any given season. The most readily available are in the magazines *Sky & Telescope*, *Astronomy*, and *Night Sky*. Each issue provides information for the location of planets and - for Saturn and Jupiter - their moons, set out in a simple and straightforward fashion. Any good planetarium software will do the same thing, and there are plenty of reliable online sources of planetary information. (Type the phrase SkyView Café into your browser to find an especially good one that includes an option to show where the moons of Jupiter and Saturn are to be found at any specified hour.) Use whichever resources best suit you to determine the location of a planet (or planets) to observe.

A Few Tips

If you are using a Newtonian reflector or an SCT you need to make sure the telescope is very well collimated before making observations. A poorly collimated reflector will provide a poor view of any planet, no matter how fine the seeing conditions happen to be. You also need to make allowances for cool down (or warm up) time. This is true of any telescope, but can take longer for reflectors and SCTs. Allow a minimum of 30 minutes before making an observation with any telescope involving a mirror. If seeing conditions *seem* to be poor after that time, give it 30 minutes more. If the view is improved after this additional wait then there is a very good chance you were experiencing turbulence *within* the telescope caused by currents of air stirred up by differences in temperature between the mirror and the air in the tube.

Color filters are often recommended for planetary viewing, and their use is an option you can pursue. Most amateur astronomy references include a run-down of which filters are used for various planets. The *Backyard Astronomer’s Guide* by Dickinson and Dyer, and *Astronomy Hacks* by Thompson & Thompson contain this information, but it can also be found quite easily online. If you use a filter of any kind to make an observation for this program, remember to record this fact.

If you own a variable polarizing filter, give it a try when observing Venus and Jupiter. Properly adjusted, such a filter can greatly reduce the glare of the planet, allowing your eyes to pick out details that might otherwise be washed out.

Seeing conditions can play havoc with planetary observations. One way to get around this is to wait to do the observations when the planet in question is as high in the sky as it is likely to get, at which time you will be viewing it through the least amount of atmospheric turbulence. This is, of course, a moot point as far as Venus and Mercury are concerned, since neither of these planets rises very high in the sky. However, transparency is of relatively little influence on planetary observing and in fact a bit of haze or high clouds can actually improve the view of the planet.

Earlier the phrase 'within the limits of your aperture' was used when high power eyepieces were mentioned. As a general rule the maximum magnification you will be able to get from your telescope, under ideal viewing conditions, can be determined by multiplying your aperture in millimeters by two. So if your refractor has a 60mm objective lens, 120x is as high as you should go. Purchasing an eyepiece that provides a 200x view will prove a disappointing waste of money.

The best advice we can give you for observing any object is to take your time. This is especially true of planetary observations. It is recommended that you view a planet more than once before recording your 'official' BSIG observation. Give yourself a chance to see how your telescope performs, *then* think about the required observation for this program. A practiced eye will give you a far better – and truer – understanding of what that telescope can do. Record these observations as part of your general record keeping if you are keeping a separate log for BSIG.)

Making Planetary Observations

Do the following for three of the five planets visible to the naked eye:

Using a suitable log format (the lunar observing record template included with this workbook would be very good for this project) plot the stars you see with your eyes alone immediately surrounding the planet being studied, then mark the planet in its proper location. Plot the stars as dots, but mark in the planet using some other symbol (such as an open circle or triangle), and then label the planet by name. Label a few nearby brighter stars as well, assuming of course that the star charts you use show names or designations for those stars. In your notes record the constellation that contains the planet. If your target is Venus or Mercury you probably will not see many (or any) stars to chart. In this case draw a line on your log sheet and label it "east horizon" or "west horizon," depending on whether it is a morning or evening observation. Estimate the planet's distance above the horizon in degrees using your fist held at arm's length. Your fist will measure very close to 10 degrees across; turn it sideways (thumb on top) to estimate the distance. For all observations be sure to include the usual time, date, location, and observing conditions information.

Now turn your telescope toward the target planet. Use a low power eyepiece to find the planet to be observed, then increase magnification until you have determined the best view possible for that night's conditions. This maximum magnification might be

very different from one night to the next, depending on seeing conditions. In general, the poorer the seeing conditions, the lower the magnification you will be able to use. The first observation you should make, after viewing the planet for a while, is the effect of seeing conditions. Use the Antoniadi Scale provided in the Lunar section of this workbook. Be sure, if you are using a reflector, that you have given the telescope enough time to cool down or warm up to the ambient temperature before trying to determine the seeing conditions. Take a good, long look at the planet, and only then try to draw a small sketch off to one side of the position chart you have drawn (or in the detail circle on the template if you use it). This sketch need be no more than a rough indication of the phase you see for Venus, major dark bands and the positions of the four bright satellites for Jupiter, and a simple line to indicate the position of the Cassini Division in Saturn's rings - if you see it. It can be as detailed as your hand is as capable of producing, but it need only be recognizable. (**TIP:** The Association of Lunar and Planetary Observers has on its website templates for making sketches of Jupiter and Saturn. Using these template will make it much easier to get the overall shapes of the planets right, allowing you to concentrate on the details visible through your telescope.)

In your notes, consider the following thoughts and questions relevant to the planets you observe:

Venus

1. Can you make out a moon-like phase? If so, which phase would it be?
2. Is Venus easier to observe through a telescope before or after the sky is completely dark?

Mercury

This planet, like Venus, shows a moon-like phase. Can you see a phase, and what phase would it be?

Mars

1. Do you see any trace of a polar cap?
2. Can you see any dark markings?
3. What overall color does Mars have?

Jupiter

1. How many belts or bands can you see?
2. Can you make out the Great Red Spot?
3. How many of the Galilean moons can you see? (List them and plot their positions relative to the planet.)

Saturn

1. Is the planet itself (not the rings) marked or banded in any way?
2. Can you see the Cassini Division in the rings?
3. Is the moon Titan visible? If so, mark it in on the sketch in the correct position relative to the planet and its rings.

The above questions need to be answered to the best of your ability, even if the answer happens to be "no." This is especially likely to be the case when observing Jupiter (the Great Red Spot is not always easily seen even when facing the Earth), Mars, and Saturn (the Cassini Division can be a challenge in smaller telescopes). Because conditions can vary greatly, and we have no way of knowing what sort of telescope it is you will be using, the point is to find the planet, and then see what your telescope can reveal of that distant world. This is why a 'no' answer to questions regarding the visibility of Martian surface features, Jupiter's Great Red Spot, and the Cassini Division in Saturn's rings is perfectly acceptable. If writing the word "no" leaves you feeling unrewarded, supplement such an answer with a description of what you *can* see, apart from the specific question. Note things such as overall shapes, colors, and the presence of deep sky objects in the same field of view. *Absolutely anything that occurs to you when making an observation is worth placing in your notes.*

Of course, if you want to try again at a later time or with a different telescope and *do* manage to see a detail such as the Great Red Spot on Jupiter, add that record to your logbook. (Be sure to record the proper telescope information if you make an observation through someone else's telescope.) Always remember that while there are certain minimum requirements that must be achieved for this program, you are under no obligation to stop observing an object just because your BSIG requirements have been met. Everything in the sky is worth more than a single look.

Multiple observations are always encouraged.

Planetary Observing References

The Planet Observer's Handbook by Fred Price and John Westfall (Cambridge Univ. Press)

The Backyard Astronomer's Guide by Dickinson and Dyer

Association of Lunar and Planetary Observers (ALPO) Can be found online by doing a web search.