MICHIANA ASTRONOMICAL SOCIETY

The Sirius Observer

February 2010 **South Bend, Mishawaka, Elkhart, Niles**

February Meeting:

Moon Observation 101

Information and Pointers

for Observing

Our Nearest Neighbor in Space

Presented by Mike Sherck

Monday, February 15th

7:00 PM

Mishawaka Library, Lions Room

Event Calendar

February 2010

Sun	Mon	Tue	Wed	Thu	Fri	Sat
	1	2	3	4	5 ◗	6
7	8	9	10	11	12	13 ●
14	15	16	17	18	19	20
21 ◖	22	23	24	25	26	27
28 ○						

Feb 5:	Last Quarter Moon
Feb 6:	Science Alive! SB Public Library
Feb 13:	New Moon
Feb 13:	New Moon Observing, Potawatomi
Feb 15:	MAS Meeting, 7:00 PM
Feb 21:	First Quarter Moon
Feb 28:	Full Moon

March 2010

Sun	Mon	Tue	Wed	Thu	Fri	Sat
	1	2	3	4	5	6
7 ◗	8	9	10	11	12	13
14	15 ●	16	17	18	19	20
21	22	23 ◖	24	25	26	27
28	29 ○	30	31			

Mar 3-16:	Globe at Night project
Mar 7:	Last Quarter Moon
Mar 13:	New Moon Observing, Potawatomi
Mar 14:	Daylight Savings Time begins
Mar 15:	New Moon
Mar 15:	MAS Meeting, 7:00 PM
Mar 23:	First Quarter Moon
Mar 29:	Full Moon

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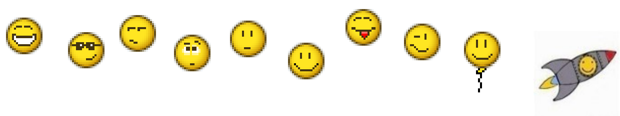
REMINDER! DUES are Due!!!

That's right,it's that time of year again. 2010 dues are now due. Please see the form attached to this newsletter. Or even better, come to February's meeting and get a club officer's autograph on your receipt! Collect all four to make a complete set!



GLOBE at Night 2010

3 - 16 March, 2010

GLOBE at Night is an annual 2-week campaign in March. People all over the world record the brightness of their night sky by matching its appearance toward the constellation Orion with star maps of progressively fainter stars. They submit their measurements on-line and a few weeks later, organizers release a map of light-pollution levels worldwide. Over the last four GLOBE at Night campaigns, volunteers from over 100 nations have contributed 35,000 measurements. The 2009 effort, taking place a little later in March, included three reports from Elkhart, one from Granger, and four from South Bend/Mishawaka. Additional reports from further south of South Bend and from lower Michigan, are also plotted on their map. Consider adding your report this year; it's easy and fun!

So, Just How Dark is it, Anyway?

You go outside and wow! It's dark out there! Maybe even dark enough to lug the ol' telescope out and have a look!

Or is it? Wouldn't it be nice to have a convenient way to measure how dark it is, without using any equipment at all, just the trusty old Mark 1 eyeball we all have as original installed equipment?

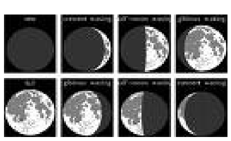
The usual thing astronomers do is to find the dimmest star they can see using their normal night time vision. We go outside and find a constellation we're familiar with and find the dimmest member star we can see, look up the star's magnitude on a star chart, and call that the “limiting magnitude” of the sky at that place and time. However, as practiced astronomers we also know that our eyes adapt to low light and after being away from bright lights for 15 minutes or so, we can see more stars than we could before. If you look at a constellation after you've been out in the dark for a while, you'll be able to see stars significantly dimmer than you could see when you first came out. Now our “limiting magnitude” has changed, because our eyes have gotten used to the dark. This new limiting magnitude, measured once you've been away from lights for at least 15 minutes, is really how “dark” your skies are! So, when you go outside during the two weeks of the Globe at Night project, March 3-16 this year, allow yourself to just look up and enjoy the night sky for a while, before you start checking the sky for the project. You might surprise yourself!

The Moon! Lunar Observing Basics

Ask any group of amateur astronomers the object in the sky they resent most and almost every one will identify the same object – the Moon. It's big, it's bright, and it illuminates the darkness for at least some portion of three out of four nights, drowning out the faint delights of galaxies and nebulae. What's to like about *that*?

Quite a bit, actually. One of its attractions is that it's conveniently visible about half the time; evenings when it's waxing small to large, all night long when near full, and mornings and even into the daytime when waning smaller from Last Quarter. If your night sky (and sometimes daytime sky!) is clear, most of the time you'll have something interesting to look at.

Another attraction is that our Moon is both large (as moons go,) and nearby. In other words, even a small telescope can show tremendous detail. As the line separating night from day on the Moon (the "terminator",) moves across, features such as craters and mountains change greatly in appearance, giving something new to see every night of the month. You could literally spend your life watching the moon through a telescope, and never repeat a night's viewing.



Lunar Observing ("Luna" being the word for Moon in Latin,) requires only basic equipment, but there is enough scope to find a place for the most complicated technology, if desired. While it's fun and educational to watch the procession of phases with the naked eye, some magnification brings additional targets into view. Binoculars generally don't have enough magnification to bring out much detail but a telescope, even a small one, is perfect.

This chart indicates the smallest crater you ought to be able to see, in average conditions, with different size scopes:

60mm (2.4")	4 or 5 miles
4" - 5"	3 miles
6"	2 miles
8"	1 mile
10"	Less than 1 mile

Note that this information is generalized. Someone with better than average eyesight, using a better than average telescope under perfect skies, can probably do better than indicated.

So we should all run out and grab the biggest telescope we can, right? I mean, if there's all that detail to be seen on the Moon (and there is,) why wouldn't we want to see it all?

The primary function of a telescope is to gather light. Most things astronomers look at are small, dim and far away so the more light you can collect the better. The Moon, however, is as we have said, large, close, and bright. The only thing aperture gives us is greater resolution, so we can resolve smaller details. Details on the Moon begin to become visible at magnifications of less than 50x and a list of features larger than five miles wide would contain thousands of entries, so a large telescope isn't really needed. What is helpful is a scope which can be carried outside in one or two trips, set up quickly and easily, so you can be observing whenever the bug hits. Generally that means a smaller scope and for looking at the Moon, that's fine.

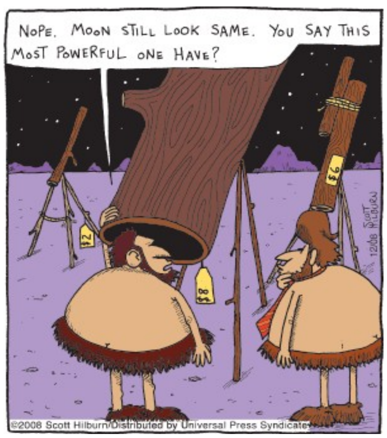
For the most part, the smallest telescopes, 60mm to 70mm refractors, are small and easily set up but unless of very high quality, can't provide clear enough views to be very satisfying. The problem is that most small telescopes of this size are too cheaply made, with molded plastic lenses held in rough alignment with glue or plastic fittings pressed together and held by friction. You're going to get tired of these pretty quickly.

The next size up includes 80mm and 90mm refractors. These are typically larger than you'll find in your average department store and are generally of better quality. These scopes, if reasonably well made, are a good starting point for a quick to set up scope for casual, as the mood strikes, observing. In the same league are the 4.5" Dobsonian mounted telescopes often recommended as good first telescopes for newcomers to astronomy.

The next step upward in both ability and price are 4"-5" refractors and 5" - 6" reflectors, schmidt-cassegrains, and Maksutov design telescopes. By this time the scope will have the ability to provide highly magnified views, so a motorized tracking mount will be very convenient, to keep things in view as the Earth turns deeper into night. While a magnification of 50x or 60x per inch of aperture is often considered to be the limit of a telescope of normal quality, telescopes in this size are more often limited by sky conditions than by the aperture of the telescope.

One exception to this are short focal length telescopes, popular because of the low power, wide-field views of star clusters and the Milky Way they can provide. They work well for their intended purpose but unless very well made, they can't provide the levels of magnification usually employed in lunar observing.

Beyond a 4" refractor or a 6" reflector, larger scopes start to bring a different category of problem. For instance, a full Moon is quite bright even to your naked eyes. Through an 8" telescope or larger it can be almost painfully bright. Astronomers often use filters, such as polarizing or neutral density filters, to cut down on the light. They are also more time consuming and difficult to bring out from storage and set up, which means that over time, they'll be used less often. If you find yourself thinking, "Is it really worth it to get the telescope out tonight" then you may have too large of a telescope.



Since the magnification of a view through a telescope is calculated by dividing the focal length of the *telescope* by the focal length of the *eyepiece*, you're going to want a selection of eyepieces to provide different magnifications. Given the way magnification is calculated, short focal length eyepieces will provide greater magnification. Unfortunately, the way eyepieces are made, short focal lengths in inexpensive eyepieces often mean that the eyepiece's *eye relief* is short as well, often just a few millimeters. To see the image, you have to get your eye very close to the eyepiece. That's both uncomfortable as well as making it impossible to view with glasses. If you are young and have good eyesight, you can probably live with inexpensive Plossl or Kellner eyepieces; if not then you should take a look at investing in a somewhat better and more expensive set. Here's a summary of major points of different eyepiece designs:

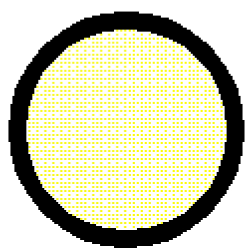
Cheap eyepieces (Kellner, Plossl, inexpensive orthoscopics): poor eye relief and narrow fields of view. They'll work but you may have to get your eye into a "just right" position to see anything. It can be tiring to look through these sorts of eyepieces for very long periods, but on the other hand, they're the sorts of eyepieces amateurs have been happily using for decades and are far better than the designs the old-timers had to put up with. Plus, they're good for star parties: if someone has mascara on their eyelashes and it gets into the glass, just clean it off, no harm done!

A step up the ladder are better made orthoscopics and premium plossls. For the increased price you get a wider field of view, better color correction, improved eye relief and better correction of optical defects near the edge of the field of view. Nevertheless, plossls with focal lengths less than about 10mm are going to have very short eye relief regardless of who makes them. One solution is to use a 10mm or 12mm plossl along with a Barlow lens.

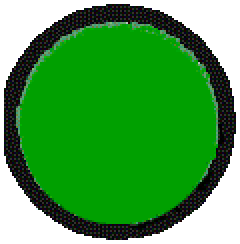
More expensive eyepieces are generally designed to provide highly corrected, wide fields of view, and new designs appear regularly from many different manufacturers. Most of these designs are either overkill for observing at high magnification with long focal length telescopes, or are subject to optical problems which aren't a problem when used for low magnification views of dim objects but which become objectionable when pointed at something as bright as the Moon. If you have them for other purposes then by all means, go ahead and try them on the Moon, but without careful research I wouldn't recommend purchasing them specifically for this use.

A Barlow lens increases the magnification of an eyepiece: it's sort of like a magnifying glass for eyepieces. You can get them to double (2x) your eyepiece's magnification, triple it, or other values in between. To use them, insert the Barlow lens into the telescope like you would an eyepiece, then insert the eyepiece into the end of the Barlow lens. Sometimes a telescope's focuser can't move far enough in or out to focus an eyepiece with a Barlow, but that's not often encountered. As always, buy the best quality you can afford; it will be worth it in the long run.

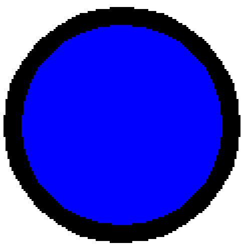
One filter you will need only for the Moon and probably Venus is a polarizing filter. This sort of filter screws into the end of your eyepiece and part of it can rotate. You turn the rotating part until the filter has blocked enough light to make observing comfortable. Since you can adjust how much light is transmitted through the filter by turning the ring, this filter can be used under many different conditions. The alternative are “neutral density” filters, which are a grayish color and each filter blocks a certain quantity of light. You'll need several of these if you don't use a polarizing filter, since you will probably want to block less light during a quarter phase than during a full Moon. I'd recommend a polarizing filter, personally. Polarizing filters can be stacked (used with) colored filters, to get the benefit of both.



A light yellow filter (Wratten #8) can increase contrast in smaller telescopes (less than 6”.) It dims the light slightly. For a larger telescope, use a Medium Yellow, #12 filter or a Deep Yellow, #15 filter.



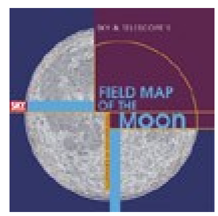
A light green #56 filter increases contrast under strong lighting conditions but blocks about half the light. Best for telescopes larger than 6” or 8”.



Again for larger scopes, perhaps 8” or larger, the Blue or 80A filter works to enhance contrast around full Moon. The Light Blue or 82A filter can be used on smaller telescopes.

If your telescope of choice is, like mine, an inexpensive refractor, it doesn't bring all the colors of the rainbow to exactly the same focus. You don't notice it on dim objects but around bright objects such as the Moon, Venus, Jupiter, and bright stars you may see a violet or rainbow colored halo. That's an “achromatic” refractor, as opposed to a more expensive “apochromatic” refractor. If, like me, you have an achromat, you need a filter to “clean up” those colors which don't quite focus all together. Sold by a variety of suppliers under various names, just get a Baader Fringe Killer. 'nuff said.

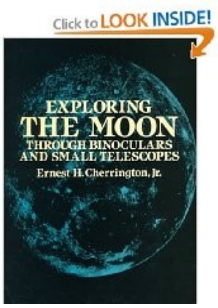
If your interest in the Moon is more casual, you can find small books of colored gel filters at stores which sell specialized lighting, such as for stage and theater use. Science outlets such as Edmund Scientific carry them as well, or at least used to. They're very inexpensive. Hold the filter over the eyepiece and look through it to see what it can do for you! They're prone to smudging and fingerprints but they cost next to nothing and are great fun to experiment with.



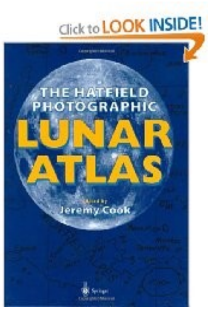
Any time you go on a long trip, you probably take a map with you. Wandering over the face of the Moon is likely one of the longer trips you're going to be taking, so you're going to want a decent map, or possibly a whole set of maps. Without a doubt, Anton Rukl's maps are the best available for the amateur. Also without a doubt, his book is out of print and sells for ridiculous prices used. Some day some one will reprint it at a reasonable price; when they do, order one as soon as you hear about it. Until then, here are some others to consider:

Sky and Telescope publishes several versions of the Field Map of the Moon. You can get it right-reading or reversed, laminated or not laminated. The map itself is by Rukl but the level of detail does not approach that of his book. Still, very useful at the telescope. Get the laminated version: we are familiar with dew around here! S&T also has a “Lunar 100” chart, showing the locations of 100 of their self-selected most interesting lunar features. It's best feature is that it's inexpensive.

Atlas of the Moon by Serge Brunier and Thierry Legault is a large atlas, designed more for your desk than outdoors at the telescope. It's a photographic atlas with transparent overlays containing the names of features, and is organized by phase of the moon. Good for planning a night's observing, not so good for trying to read in the dark. They also have a smaller, paperbound version which is helpful at the telescope.



An oldie, first published in the early 1960's, but still a goodie. Contains a section for each day in the lunar cycle. Every beginning lunar observer needs this one.



Sadly, although considered the best available photographic lunar atlas, this is one of those things that apparently you have to get used to. Some like it, some love it, some hate it. I'm in the "wouldn't go out of my way to get it" category. Comes in right-reading and inverted versions (for people using a star diagonal.)

There are also a few lunar atlases available for free online. You download them to your computer to use. Some of them are intended to be used interactively, at the computer, others provide ways to print maps and charts on your printer. The granddaddy is the Virtual Moon Atlas (http://www.ap-i.net/avl/en/start). Does almost everything but make you coffee but it's a big, big download. It's also worth it.

Now that we've spent the entire article this time talking about equipment, we'll let that sink in with some casual observing advice. When ever you get the chance, take out whatever telescope or binoculars you have available and just look at the Moon along the terminator, the line dividing dark from light on the Moon's surface. Along this line the rays of light from the Sun are almost parallel to the Moon's surface, so every little hill and crater stands out. Don't worry about names yet; just get a feel for the amazing variety of things up there to look at.

Next time we'll start talking about features on the Moon's surface, what you can see and how you can see them. In later articles we'll get into specialized topics such as looking for meteor impacts and gas venting, and finding the locations where spacecraft and humans touched the Moon. We'll also get into lunar history and geology and examine some of the tremendous impacts which shaped the face of the Moon. Over time I hope that you'll come to enjoy our unique ability to closely examine our nearest neighbor in space.

Mike Sherck