THE SHORELINE OBSERVER

Newsletter for the
Shoreline Amateur Astronomical Association

President- Peter Burkey **Vice President**- Steve Tuls **Secretary/Treasurer**- Rob Tuls

Robert Wade, Editor *January 1991*

January Meeting

The January meeting of the Shoreline Amateur Astronomical Association will be held on January 17th, beginning promptly at 7:00 PM in the West Ottawa Middle School Planetarium in Holland, Michigan. Refreshments will be provided. The agenda will be as follows:

7:00-7:10	The January Night Sky Tour.
7:10-7:30	General Business Meeting: Peter will chair a round table discussion about upcoming events for 1991.
7:30-8:30	*Project SPICA* - Pete will give an overview with some demonstrations about the NSF (National Science Foundation) program he participated in this past summer along with a few other teachers in the US.

December Meeting Highlights

The Royal Astronomical Society of Canada *Observer's Handbook 1991* are priced at $5.00 for members. Two are still available. Contact any of the new officers.

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As you can see, members voted to change the name of the newsletter to *The Shoreline Observer*. Mark Logsdon made a motion to vote on the constitutional changes as a package, and this was seconded by Rob Tuls. The vote was unanimous to accept the changes as published. If you would like a copy, contact an officer.

As of January 3, 1991, we have $324.43 in the club treasury. Our current (renewed) membership stands at 13 (welcome Michelle Tuls, our newest member!). Those of you who have not renewed your membership by the January meeting will be dropped from the club's roster. See last month's newsletter for current dues.

Board Meeting

The January Board meeting was held on January 3rd, 1991. Peter, Steve, Rob, and Mark were present. The Secretary/Treasurer material was transferred from Mark to Rob. Mark reported that the video is still on order from the Astronomical League. Some discussion centered on a possible monthly quiz to be included in the newsletter and on other articles submitted by members. Steve Tuls was appointed chairperson for 1991 Astronomy Day activities. He will try to get something arranged with Westshore Mall. Arlin Ten Kley will be the chairperson for a booth/display for 1991 Libertyfest -- we'll try to get some public observing session going then.

Star Parties in 1991 will center on weekends closest to a new moon, unless otherwise indicated. If it is clear on the Friday night, the session will be at Mark Logsdon's home. If it is clear on the following Saturday night, it will be held at Bob Wade's home. Next Star Party will be January 18/19 and February 15/16.

Dimestore Refractors

This article was obtained from the Astronomical League Computer Bulletin Board. Pass it on to a friend if he or she has an inexpensive refractor and wants to get some serious use out of it...Ed.

The second project for 1989 for the Saint Louis Astronomical Society telescope makers group has been the modification of several typical 60 mm department store refractors for improved usability.

This type of telescope, unfortunately, is sold with

- a marginal finder
- high magnification eyepieces
- a barely adequate alt-az mount

Each of these weak points will be addressed. To replace the finder with a Telrad(TM) is tempting but not cost effective. In 1989, a telescope and mount of this type retails for about $100 and a telrad is typically available through mail order dealers for less than $50, delivered. The simplest (and cheapest) solution is to fabricate a notch and pip gunsight. A small hole can be drilled near the top of the dew cap lip and a small bolt can be screwed from the inside upward. That will be the pip. The notch can be cut from the black bottom of a two liter plastic soda jug. Depending on where the original finder was attached to the telescope, the notch may be fitted to the finder footprint of the telescope tube. Since the plastic is from a throw away item, the first attempt need not be the final version. If the observing site is a dark site, consider cutting the notch from a white plastic gallon milk jug and painting the pip white.

A wide field, low magnification, long focal length eyepiece is recommended. As the saying goes, "Try it, you'll like it". Orion Telescope Center is now selling a .965 diameter 40 mm f.l. "Achromatic Hygens" for $32.95 plus $1.89 shipping. With a 60 mm objective of 700 mm f.l., it gives 700/40 = 17.5 X, a field of about 1 3/4 degrees, and an exit pupil of 60/17.5 = 3.5 mm. Note that the 'exit pupil' is the image of the objective created by the system, where light from the objective leaves the eyepiece and enters the pupil of the observer's eye. With this eyepiece, the moon's diameter appears as one third of the field and at this magnification the moon shows very good detail. Also, this exit pupil is approaching the 6.5 mm exit pupil of a deep sky, rich field telescope so objects like the double cluster in Perseus and M-13 in Hercules look good.

Note that high magnification eyepieces cannot bring out detail that is not there. A star, being at a fair approximation to an infinite distance, should have an infinitesimal image. Because of the wave nature of light and subsequent wavelength interference effects, the stellar image formed by a circular lens is a circular blur. In fact, this 'Airy Disk', named after the scientist who explained the effect, is larger for smaller objectives. Larger objectives give better images until the objective is about ten inches in diameter, then the 'seeing' becomes obvious. Atmospheric cells of different density are typically that size and as they randomly interact, degrade the image. Recall how the sky looks from underwater or anything looks on the other side of a fire.

There are several problems with the alt-az mount:

* The telescope may be balanced for terrestrial use with the focuser racked out and several accessories installed. Then when the telescope is used for celestial viewing, in order

to hold a certain direction, the altitude pivots may need to be tightened to such an extent that moving to another object is a major effort.

The telescope motion in azimuth is typically controlled by a jam bolt that must be tightened to hold a certain direction and loosened to move to another object.

* Proper "push" in the two axes may not only be difficult to obtain, it may be difficult to maintain.
* The altitude pivots may loosen as the telescope is moved.
* The azimuth pivot may become damaged by overtightening of the jam bolt or by galling as the steel jam bolt slides against the aluminum pivot.

Let us address the last problem first because we want to rework the azimuth fork separately. Remove the altitude pivots bolts and set them aside with the telescope tube. Next, remove the azimuth pivot from the tripod head; a small allen head set screw is probably what locks it in. Then wipe off the grease and check the jam bolt track; if it is severely dimpled and galled, machining may be required to true it and polish it. Do consider working it by hand. A lot can be accomplished with sandpaper and emery cloth. Obtain a cheap pair of scissors and dedicate it to cutting the sandpaper and emery cloth. Medium sandpaper should give fast enough action and fine sandpaper may be used instead of emery cloth. Cut your strips from the full width of the sheet and make them wide enough to just fit in the track.

The azimuth pivot should be well supported during the sanding of the track. If a vise or C-clamp is used to hold it out over the edge of a workbench, be sure to use wood or thick cardboard to protect the metal faces. Alternatively, if the center of the pivot has been drilled out, insert a wooden dowel or a screwdriver and then rest that on your belt and rest the pivot fork arms on the edge of your workbench. Sand 180 degrees of the track, invert the pivot, and sand the other 180 degrees. You might break a strip or two until you learn the coordinated motion necessary for applying a consistent, moderate tension and for keeping the strip moving perpendicular to the axis of the pivot.

After a few cleanup passes, check for concentricity. Reinstall the pivot and place a narrow strip of tape on the shoulder of the fork, just above the tripod head. Slowly tighten the jam bolt while spinning the pivot. Stop when it just begins to drag - with no grease, it will gall easily. Mark this high spot on the tape, turn the pivot 180 degrees, and tighten the jam bolt until it just touches the track. Note how much the jam bolt can be tightened between these high and low points. Back the bolt out half this amount, slowly turn the pivot until it drags, mark the tape, then go around to the other side of the bump and mark that. Remove the pivot and sand down the bump. Repeat this procedure but turn the pivot rather then spin it. Eventually the track will be reasonably concentric and it may be polished.

A plastic brake shoe in the track will keep the jam bolt from dimpling and galling it. Cut one from the black bottom of a plastic two liter soda jug so that it just fits in the width of the track and just touches when wrapped around the track. Of course, it should be thinner than the depth of the track. When installing the azimuth pivot for the last time, put some grease on the lower part, slide it into the tripod head, and then get the plastic brake shoe started. Line up the joint of the strip with the allen head set screw, put some grease on the upper part of the pivot, slide the pivot in the rest of the way, and adjust the set screw to the depth which holds the pivot in the tripod head. A drop of Loctite(TM) on the screw before adjusting it will help keep it in place.

Some department store refractors have the pivot extend into an open space at the bottom of the tripod head. The shoulder for each leg has room between the channel and the bolt securing its leg, room for a coil spring to press against the end of the pivot. A bolt or large wood screw inside the spring will keep the spring from settling down on the leg bolt and possibly working loose.

Another strip of black plastic from a soda jug will keep the ends of the springs from damaging the end of the pivot. Cut the strip so that it lays in one channel, with a notch to clear the leg bolt, wraps all the way around the end of the pivot, and lays beside itself in the same channel, with a notch to clear the leg bolt. The spring in the channel where the strip doubles back should also hold the strip against the side of the channel.

Washers or spacers can used to increase each spring's compression. Three springs with the right compression will provide enough drag to make the 'push' in azimuth feel right. Now to get the 'push' in elevation to feel right.

We noted earlier that the typical telescope tube is out of balance. Adding a counterweight will probably be easier than relocating the altitude axis. A simple counterweight can be fabricated with hand tools, double sided carpet tape, large diameter solder, and black electrical tape. The necessary length of solder may be determined with a little experimenting with some other objects as a temporary counterweight. Be sure to balance the telescope with the most commonly used eyepiece installed and focused to infinity. Next form the solder around the tube, verify the balance, determine the width of double sided tape required, and preshape the ends of the solder. Then remove the solder, apply the double sided tape, rewrap the solder, and apply a finish wrapping of black electrical tape to protect the solder and provide a neat appearance.

With the tube balanced, the altitude pivots need not be very tight to obtain a reasonable amount of friction. We have encountered two different styles of pivots, one where the friction results from the ends of the steel pivot bolts resting in steel seats on the telescope tube and one where the friction comes from the plastic heads of the bolts squeezing the altitude fork tines against flat seats on the telescope tube. The steel on steel pivots are not as likely to back off as the other type when the telescope is moved. Locktite or jam nuts might be necessary. The other type requires a little work.

The altitude pivots that squeeze the fork tines against the tube will benefit from the installation of polyethylene washers. These can be cut from a plastic one gallon milk jug, using scissors and an Xacto(TM) knife. Four washers are required, one for each sliding surface. Locktite in the threads of the flat seats prior to assembly should keep the pivot bolts at the preferred tightness and so maintain the desired 'push' necessary to move the telescope in altitude.

With these modifications, a typical department store refractor will be easier to use and should provide many hours of enjoyment.