The Prairie Astronomer

The Official Newsletter Of The Prairie Astronomy Club, Inc.

August 1998 **Volume 39 Issue #8**

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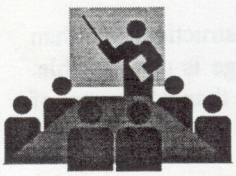


MEETINGS & EVENTS

PAC MEETING
TUESDAY AUGUST 25, 1998, 7:30 PM
at Hyde Memorial Observatory

UNL STUDENT OBSERVATORY
Open to the public
FRIDAY AUGUST 28 (sundown–11PM)

MAHONEY STAR PARTY
FRIDAY SEPTEMBER 25, 1998, Sunset 'till ?
Mahoney State Park – Driving Range

PAC MEETING
TUESDAY SEPTEMBER 29, 1998, 7:30 PM
at Hyde Memorial Observatory

PAC-LIST: Mark Dahmke maintains an e-mail list server for PAC. If you have an e-mail address and are not on the PAC List, you may subscribe by submitting an e-mail to list@4w.com. Write "Subscribe PAC-List" in the body of the e-mail.

August's Program:

The program at the August PAC Meeting will be:

"Elliptical Arguments in Favor of the Existance of Gravity"
by John W. Reinert

Follow the elliptical paths taken by the planets as Mr. Reinert shares the geometric proofs developed by Newton, Feynman, and others to defend the role gravity plays in ordering our heavens. Young astonomers, middle school age and older, should be able to grasp if not fully appreciate the presentation as a number of diagrams and visual aids will accompany the talk. Kepler's analysis of Brahe's observational data notwithstanding, it took more than a few great scientists to explain how orbital mechanics might be used to launch satellites into space and that atomic particles in collision with one another might borrow from these early thoughts on gravity. You are invited to connect with this weighty subject as it tugs at our universe from moment to moment each day. Join us won't you. Feynman's Lost Lecture by Goodstein and Goodstein, W. W. Norton, New York and London, 1996 provides the basis for the presentation.

*If you would like to present a program at the monthly PAC Meeting, call **Erik Hubl** at 488-1698 or email at ehubl@ci.lincoln.ne.us*

ANNOUNCEMENT

The club is selling club shirts and hats with the PAC logo. Orders will be taken at the August meeting and the order will be placed in September. If you can't make the meeting please contact Dave Knisely or Larry Hancock and we will take care of you. If you would like to design a new PAC logo then please bring your design to the August meeting for the club to vote on. If your design is accepted then your shirt will be free. If no new designs are submitted then we will go with the style already on file. The shirts are sky blue with PAC lettering on the left upper front side. T-shirts are $7, Polo shirts are $14 & Hats are $5. Please specify size. All members are encouraged to buy a shirt. This will help advertise the club and help sharpen our image.

CONTENTS:

LOOKING FOR SOMETHING TO DO?

- **How about being a volunteer at Hyde Observatory?**
- **How about helping the site committee locate a new observing site?**
- **How about writing an article for this newsletter?**

Contact Dave Knisely or Dave Scherping for info

The Prairie Astronomer is published monthly by the Prairie Astronomy Club, Inc. Membership expiration date is listed on the mailing label. Membership dues are: Regular $20/yr, Family $22/yr. Address all new memberships, renewals, or questions to: The Prairie Astronomy Club, Inc., PO Box 80553, Lincoln, NE 68501. For other club information, contact one of the following: Dave Knisely –President (402) 223-3968, Doug Bell V.P. (402) 489-8197, Liz Bergstrom - Treasurer (402) 464-2038. All newsletter comments and articles should be sent to: Dave Scherping, 640 S. 30th St., Lincoln, NE 68510 (402) 477-2596 or e-mail dscherp1@aol.com ten days prior to the club meeting. Club meetings are held the last Tuesday of each month at Hyde Memorial Observatory in Lincoln, NE.

CENTRAL OBSTRUCTIONS AND THEIR EFFECTS

By: Dave Knisely

In most reflecting/ catadioptric telescope designs, a secondary mirror is required in the optical path to send the light from the main mirror to the correct position for viewing. This mirror obstructs some of the light entering the telescope, and for larger secondaries, this has the potential to cause some problems.

A central obstruction affects the image in two ways:

1. Causes a light loss due to the blocking of light entering the telescope.
2. Induces diffraction effects, which can cause a loss of both light and contrast for high power images if the secondary is too large.

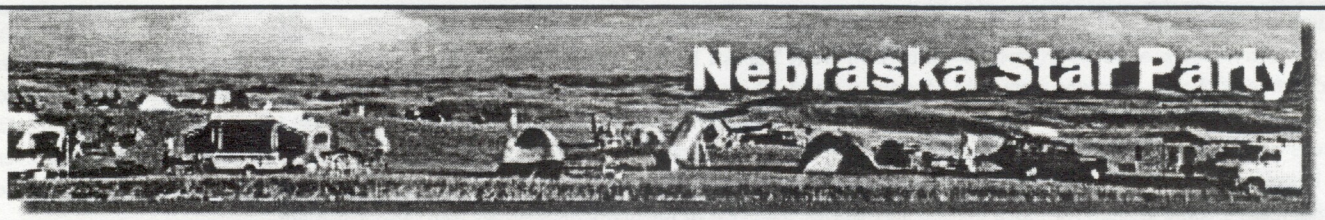
As far as light loss is concerned, the best human eye can just detect a difference of 0.1 magnitudes, so with obstructions less than 30 percent of the aperture diameter (9 percent of the area), the actual light loss caused by just the blockage is undetectable. Indeed, most people have trouble seeing a magnitude difference of 0.2 magnitudes, so for obstructions of less than 41 percent of the aperture (16.8 percent of the area), the light loss due to the obstruction is not all that noticeable.

Of these two effects, the second (diffraction) is more significant. The obstruction from the secondary and its cell causes a change in the diffraction pattern of stars, taking some light out of the central Airy disk and putting it into the rings. If the secondary is large enough, this can result in a slight drop in the contrast for high power images of the moon and planets. How much a problem it is depends on how big the obstruction caused by the secondary is. In practice, if the secondary obstruction is less than 20 percent of the main mirror's diameter (1/5th of the mirror is obstructed), the effect on the image is negligible. For example, a six-inch with a 1-inch secondary mirror (16.7% obstruction) would perform about as well as if the obstruction wasn't there at all. Indeed, the secondary's obstruction can be slightly larger without hurting high power images all that much.

As you use larger and larger secondary size, however, high power images will tend to gradually acquire a slight "softness" to them, which may make fine low- contrast detail a bit harder to see. A certain limit comes when the secondary obstruction does become somewhat more noticeable, and that point is when the obstruction reaches 25 percent of the main mirror's diameter. This amounts to a six- percent light loss, and becomes significant, especially for daytime use, when the shadow of the secondary mirror may become visible in the eyepiece. Only Rich-field instruments or those requiring large fully illuminated fields should have such large secondaries. As long as you keep the secondary's minor axis size below 1/4 of your primary mirror diameter, the telescope should yield good images. However, even at a 25 percent level, the image degradation is far from fatal, and the telescope will still function.

As for resorting to ultra-small secondaries to improve the telescope's high-power performance, this can backfire. You don't really get significant image quality improvement by using a secondary size much under 20 percent of the main mirror's diameter, and you may actually lose light with a secondary mirror which is too small to catch all the light from the primary. In addition, low profile focusers used with such small secondaries may allow external scattered light to get to the eyepiece without being blocked by the diagonal. You need to balance the need for high power contrast with the need for proper overall design, and for this, the 20% to 25% obstruction guideline is often a good rule to follow.

The "modified" Schmidt-Cassegrain telescope needs a much larger secondary, often obstructing 33 to 35 percent of the primary mirror's diameter. This does cause a loss in contrast for high power images and a slight reduction in limiting magnitudes for stars, but overall, the telescope still performs adequately. The tradeoff is in contrast verses telescope compactness. The SCT does offer a very convenient package for people who want portability or ease of use for photography, so the secondary obstruction isn't the only factor to consider. Overall, optical quality is the most important thing to have when it comes to an astronomical telescope.

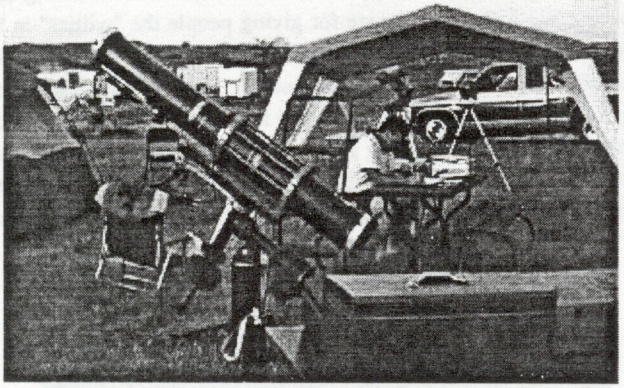


A Report on the Fifth Annual Nebraska Star Party

Text by David Knisely, Photos from the NSP web site

This year's Nebraska Star Party was a mixed bag of good fun, good friends, and variable observing conditions. Held at Merritt Reservoir, high in the Nebraska Sandhills near Valentine, the event is a combination of a family vacation and a week-long dark sky observing session. The weather this year seemed to be the biggest problem, as it started out very hot (like much of the rest of the midwest), and ended up rainy. Friday July 17th, before the official start of the star party, nearly 100 early birds were already gathering on the observing fields near the Snake Campground to star their week of viewing. As it turned out, they got the best viewing that night, with many people seeing stars as faint as 7.5, and a few hitting the 8.0 level. Unfortunately, the unusually hot wet weather the sandhills had been experiencing over the past month had spawned a bumper crop of mosquitoes, making observing a bit more of a challenge than usual. Still, several large truss-tube Dobsonians made their appearance on "Dob Row", and the views were spectacular. The brilliant Milky Way once again held center stage, with most people hitting the old favorites along its star-studded length. M8 and M20 looked almost photographic in these giants, and the brighter globulars were stunning. In Tom Miller's 30 inch Obsession, M13's many stars even showed some color in them. The tiny galaxy IC-4617 near M13 made its appearance in Tom's 30", and nearby NGC 6207 showed some interesting detail. The real winner of the night was the bright planetary nebula NGC 6543 in Draco, known as "The Cat's Eye Nebula". All scopes on the field showed its beautiful bluish-green color, and the 30 inch revealed the weak inner arcs, the fan-like cusps on the ends, and the faint irregular outer shell. The central star was easily visible even in a ten inch. NGC 7662 also showed interesting interior detail, with its odd off-center inner shell.

Saturday afternoon brought the start of registration, along with hot temperatures, which made many people seek the cooler waters of the lake. The heat spawned early evening thunderstorms and gusty winds, but the sky cleared after midnight, letting night owls get several hours of observing in.

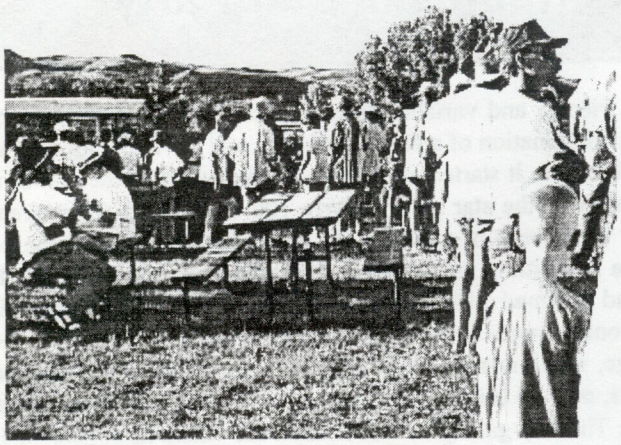


Optimistically awaiting sundown

Photo taken at NSP5 using a cloud filter?

Sunday was also quite warm, which convinced more attendees that the water was the place to be. A clear sunset heralded the star of the public star party for the people in the Valentine area, which was held just north of the Merritt Resort. Lori May gave her usual fine constellation talk, while scopes from four to 18 inches in aperture let visitors get a look at the wonders of the dark sandhills skies. Later, those helping with the public party went back to the main observing fields to continue taking advantage of the dark skies. A group set up with just binoculars and lounge chairs seemed to have the most fun. Barnard's galaxy was logged with a pair of 10x70 binoculars, and several people managed to see M27 with the unaided eye. Although not quite as transparent as Friday evening, Sunday's skies did let attendees see much of the interesting dark nebulae in Sagittarius and Ophiuchus.

Monday was again hot, but this didn't stop the NSP Beginner's Field School from giving some new people a chance to get into amateur astronomy from the ground floor. Brenda Culbertson from Topeka Kansas taught nearly 100 attendees with her own comprehensive manual, provided free of charge. Sessions were held Monday through Thursday, and gave many people the help the needed. The evening ice cream social went off without a hitch. The star party was covered on Nebraska Public Radio, as several attendees were interviewed on the fields. Darin Stephens of Bushnell Sports Optics gave a talk on future manned missions to Mars to attendees on the observing field. However, the evening skies began to cloud over, putting an early end to observing, but not the socializing. Vendors also began setting up on the observing fields, allowing many people to shop for much needed accessories. The first of the many door prizes were also given out.



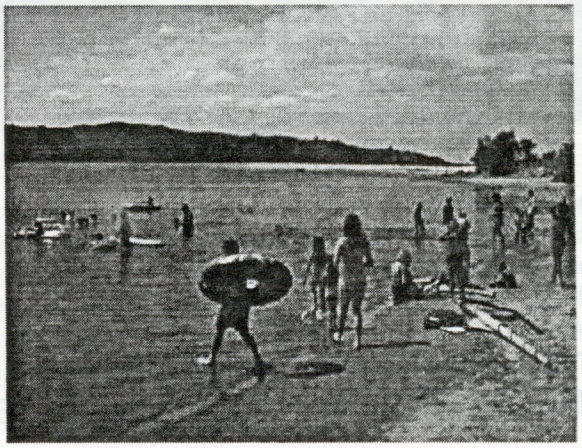
Monday's Ice Cream Social

Another couple of optimistic star partiers

Tuesday brought a break in the heat with mostly cloudy skies and much cooler temperatures. The field school continued, and a number of people spent time fishing or doing some extensive kite flying over the dunes on the observing fields. The evening brought the hamburger BBQ, more door prizes, and more socializing, but little observing could be done due to cloud cover. Once again, the NSP "Mystery" Kite made its ghostly ascension over the observing fields. Two green glow bars and a red flasher made it quite a sight, and a real mystery for a church group who weren't in on the secret.

Wednesday was warmer with partly cloudy skies. The Great NSP Beach Party began in earnest in the afternoon, with many attendees taking time swimming or boating, while others just basked in the warm sun. Tom Miller once again had a new device for giving people the "willies" in the water. It was a huge inflatable cylinder, which was towed behind his boat, giving the few who dared to try it a wild spinning ride around the lake. A mean session of sand volleyball got started, with others trying their luck at horseshoes or the sand wedge contest. Finally, this year's water balloon slingshot event managed to hit clear skies coordinator Dave Scherping from long range with more than a few water-filled bombs. More kites filled the air, and groups of kids and adults participated in the 3-legged races on the beach. The big gas grill was fired up at 4:30 p.m., and the cooking began, with people fixing everything from simple hamburgers to steaks, fish, and other dishes. After the BBQ, most attendees congregated on the observing fields for more talk, and the skies opened up with a huge clear observing "window" which lasted about 2 hours before clouding over.

Bob Leavitt keeps a close eye on his steak as BillO'Donnell & Clark Cheney tend the grill.



Wednesday's Beach Party

Thursday dawned stormy, with heavy thunderstorms and rain, forcing many to cancel their trips down the Niobrara river, although about 60 brave souls did tough it out. Thursday evening brought the catered steak dinner, along with the judging of the telescope-making contest, but the skies were variably cloudy with an occasional misty rain.

One of the catered meals at the Snake Campground

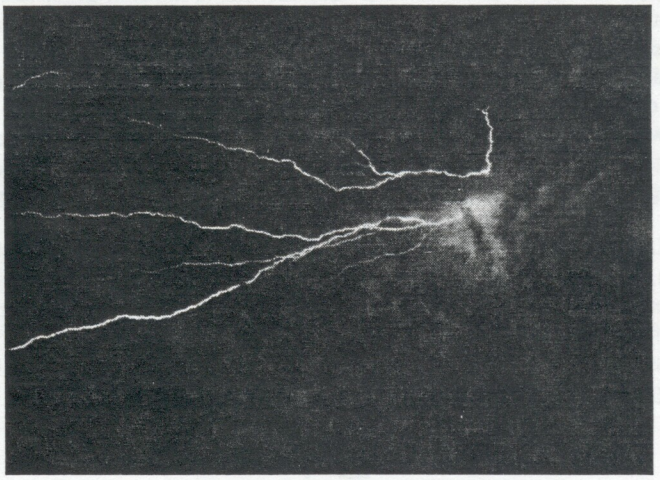


Photo Contest Winner (NSP5 Category) by Dave Johnson

Friday's activities centered around the Valentine High School Auditorium and the scheduled talks. Dave Knisely of the Prairie Astronomy Club, Lincoln Nebr. started things off with a presentation on observing Planetary Nebulae, followed by Louis Dorland of the Omaha Astronomical Society with his talk on time. The vendors once again set up in the high school lobby, along with the winners of the telescope-making contest.

The Valentine High School auditorium

Vendors' area at the Valentine High School

A unique 16-inch truss-tube alt-azimuth Newtonian won both the Technical Innovation and the Best Design awards. This design featured a unique method of attaching the truss tubes in coupled pairs, along with a versatile mirror cell, which allowed easy mirror alignment as well as mirror cleaning without removal from the instrument. The Best Workmanship award went to a ten inch equatorial Newtonian with a PVC tube and aluminum reinforcing to prevent tube flexure. The Astronomical Accessories Award went to a beautiful observing trailer which contained sleeping quarters, storage space for a large dobsonian, and a computer.

After lunch, Steve Edmondson, a biochemist at Southern Illinois University School of Medicine did an interesting talk on Astro-biology and "extremophiles". Gary Fugman followed with a presentation on observing variable stars. Carolyn Peterson of Sky Publishing gave an inspirational presentation on the Future of Amateur Astronomy, while Tippy D'Auria, founder of the Winter Star Party, gave talks on the Milky Way, and Collimating the Newtonian Telescope. A large number of door prizes were given out, including several eyepieces, a 4.5" Bushnell Newtonian, and a Meade ETX Maksutov. The evening sky remained mostly cloudy. Saturday found most attendees preparing to head home with hopes of attending the next Nebraska Star Party, NSP-6 August 7-14, 1999.

TELESCOPE BUYER'S GUIDE

Written by David Knisely, Taken from the Prairie Astronomy Club Web Site

Amateur Astronomy is one of the most fascinating hobbies in the world, but to get really into it, you probably will want to get a telescope either for yourself or perhaps for a son or daughter who is showing an interest in the wonders of the universe. Somehow, you will have to find your way through the maze of ads, catalogs, claims and counterclaims about which telescope is best or the least expensive. You may be asking yourself questions like "What type should it be?", or "Just what should I believe when I read the ads?". Finally, you will have to lay out the cold hard cash needed to purchase what you hope will be the best instrument your money can buy. If you are a bit confused or frustrated at this point, don't worry. We of the Prairie Astronomy Club know exactly how you feel, because we have all gone through this many times before. This article should help answer many of the questions you may have about purchasing a telescope as well as clearing up some of the mysteries about astronomical telescopes in general. It was assembled by our club members using the many years of experience they have in selecting, buying, building, and using telescopes. They all had to buy that "first telescope", and hopefully, you can benefit from their hindsight.

TELESCOPES IN GENERAL: A telescope has two main functions: (1) to gather and focus a large amount of light from an object (much more than the eye alone can) to form an image of the object, and (2) to magnify that image so that distant objects can be better seen. There are many different designs of telescope that will accomplish these functions but only two designs are practical for small inexpensive telescopes: the refractor and the Newtonian Reflector. A refractor (figure A) focuses light by "refracting" or bending it through a special two element glass lens. A reflector (figure B) focuses light by reflecting it off a curved mirror. A set of lenses known as the Eyepiece then magnifies the focused image in each design.

Figure A: REFRACTOR

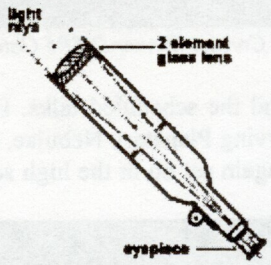
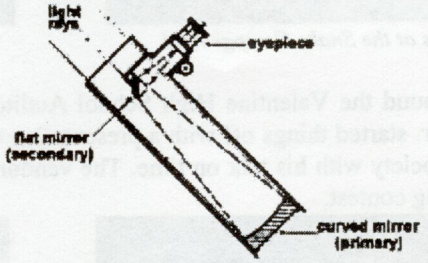


Figure B: NEWTONIAN REFLECTOR



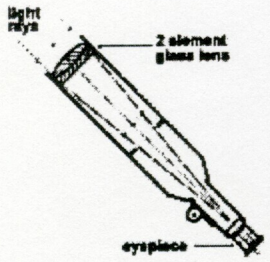
TELESCOPE TERMS:

Telescope performance depends primarily on the diameter of the main lens or curved mirror, whichever is used. This diameter is commonly known as the APERTURE. The larger the aperture is, the more light is gathered and the better the image will be. Aperture is usually measured in inches, with commonly available sizes being 2.4 and 3 inch refractors and 4.25, 6 and 8 inch reflectors. Another term used in describing telescopes is the FOCAL LENGTH. It is simply the distance from the lens or the main mirror's surface to the point where the light comes to a focus. The two terms (aperture and focal length) are sometimes combined into the F-RATIO, which is just the focal length divided by the aperture. Thus if a telescope has a 6-inch mirror and a focal length of 48 inches, its f-ratio (or f/) is f/8. The f-ratio is often quoted instead of the focal length since it is a useful way of quickly stating what the focal length is regardless of the units of measurement for the aperture. The focal length of a telescope also helps determine another useful item, the MAGNIFICATION, or "power" of a telescope. The magnification of a telescope increases the apparent size of an object to a point where the human eye or camera can easily view it. Magnification is changed by changing the eyepiece being used. The "power" of a telescope is determined by dividing the focal length of the telescope by the focal length of the eyepiece, which is usually marked on the eyepiece barrel in millimeters. Thus if you had a telescope with a focal length of 48 inches (1219 mm) and were using an eyepiece with a 9 mm focal length, you would be using about 135x, and the object being viewed would look 135 times larger than it does to the unaided eye. THERE IS A CATCH TO USING HIGH POWER! Higher magnification, while making the object appear larger, spreads out the light gathered by the telescope over a larger area resulting in a fainter image. Also, because of the restrictions imposed on eyepiece design, you may only see part of that big image due to the smaller "field of view" high powers give you. Very long f-ratio telescopes can give you higher power with a given eyepiece, but you may not be getting much out of those powers if the light is too spread out. You have to compromise to get the best results.

At this time we must cover a very important point:-- DO NOT BE FOOLED BY AN ADVERTISER'S CLAIMS OF A "HIGH-POWER" TELESCOPE !!! There is no theoretical limit on power, but there is a practical limit beyond which the images obtained are worthless. Because of the way light behaves, the MAXIMUM USABLE POWER is about 50 times the diameter of the main mirror or lens in inches or 50 POWER PER INCH of aperture. Using magnifications much beyond this will make the picture dim and very very fuzzy, like using a microscope on a newspaper picture or blowing up a photograph too much. For example, a common 2.4 inch refractor has a maximum usable power of about 120x, but we frequently see ads in major catalogs or retail chain stores advertising this same telescope as having "over 400 power !!!". You would have trouble seeing anything at 400x in such a small instrument, although it might perform well at low magnification. Most astronomical objects except the moon and planets require very low powers to be seen at all, so the so-called "high power" would do you little good. In short: DON'T BUY A TELESCOPE JUST BECAUSE IT IS ADVERTISED AS HAVING "HIGH POWER". Aperture and quality in a telescope are worth much more than power any day.

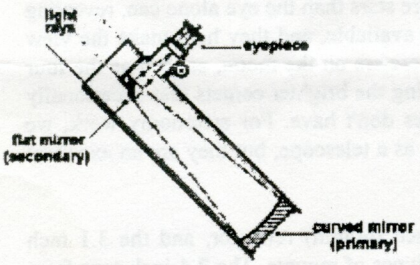
TELESCOPE TYPES:

WHICH IS BEST? The least expensive types of telescopes (small refractors and Newtonian reflectors) both have many advantages and disadvantages. The Refractor is probably the first type of astronomical telescope most people encounter so we will deal with it first. Because different colors of light are bent differently, a refracting telescope must use a special compound main lens, which consists of at least two lenses of different shape and glass type to correct for this unequal bending (known as Chromatic Aberration). In addition, all of the glass surfaces must be coated with a thin layer of material, which enhances contrast and reduces unwanted reflections. The main lens is mounted firmly at the front of the telescope tube, and when the eyepiece is in place, the tube is closed, keeping dust or air currents out. Refractors require little maintenance, although they must be handled with care to prevent scratching or damaging the delicate coatings on all the glass surfaces. They provide good high-contrast images, and are fairly popular with those who observe the moon and the planets exclusively. Their major good and bad points are summarized in the following chart.



Advantages	Disadvantages
Closed tube means no air currents which could degrade the images. Gives very good images and long focal lengths allow the use of less expensive eyepieces.	Much more expensive than reflectors. Must use a 2-element main lens. Tend to be fairly long physically, (fairly long focal lengths). Awkward to look through for objects high in the sky unless star diagonal is used. Difficult to build by amateurs at home.

None of these disadvantages are terribly critical. The Newtonian Reflector also has some disadvantages, but it has many good points as well. It uses a specially curved aluminum-coated glass mirror to gather and focus the light, and a flat second mirror to direct the light out the side of the telescope tube and into the eyepiece. The Newtonian is an inexpensive fairly simple design, which can be easily constructed at home, and is quite rugged. Its open-ended tube does allow air currents to sometimes degrade the images, and dust can settle on the mirrors, requiring careful cleaning periodically. Its strong and weak points are summarized as follows:



Advantages	Disadvantages
Much less expensive than the refractor. Easy for the amateur to build at home. Very popular. More compact than most refractors (short focal length). Works well on a simple mounting. Easy to use when looking at objects high in the sky.	Open tube means dust can get on the thin metal coatings of the mirrors. Mirrors sometimes need to be re-aligned after the telescope is transported or handled roughly. Secondary mirror blocks some light, and its supports cause small spikes on star images (not really much of problem). Cannot use cheap eye- pieces.

A refractor may give slightly better high power views than a reflector, but the refractor can cost well over three times as much as a reflector of the same size! It is for this reason that most amateurs prefer the Newtonian reflector over the refractor for apertures larger than four inches.

OTHER TELESCOPE DESIGNS: A newer design which has a price somewhere between that of a refractor and a reflector is the so-called CATADIOPTRIC, or "mirror-lens" telescope. It uses a curved main mirror, an oppositely curved secondary mirror, and a special large correcting lens out front to obtain sharp images over a wide field of view. Catadioptric telescopes offer large aperture performance in a package that in some cases is small enough to sit on a table top! Their portability makes them popular with those advanced amateurs who don't have room for a large Newtonian or refractor, but their price usually makes them out of reach of most beginners' pocketbooks. You may see them listed under the names "Schmidt-Cassegrain", or "Maksutov", each of which uses a somewhat different optical design to do the same thing.

TELESCOPE MOUNTINGS: Most astronomical telescopes cannot be hand-held like binoculars, so some sort of mount or stand must be used to hold the instrument and allow it to be pointed at any object in the sky. There is nothing more frustrating than having a good telescope on a mount that makes the images jiggle and dance every time the wind blows, so a good solid steady mount is a must. Many cheap telescopes found in stores have small metal tripods with thin legs and small screw-tightened pivot points for bearings. We call these "pillar and claw" mounts and they are the worst possible way to mount a telescope. The single tiny support bearings are so small that the telescope vibrates like a tuning fork when touched. Most camera tripods are almost as bad. The mount must be designed to support the telescope well and to damp out vibration while at the same time make the instrument easy to point. There are two basic types of mountings: the Altazimuth (figure C), and the Equatorial (figure D). The altazimuth is a good simple design that allows the telescope to tip up and down and to rotate around in a circle somewhat like a gun turret on a ship. It can point at any area in the sky and is easy to use especially for the beginner. The equatorial mount is the design favored by serious amateurs because it allows the instrument to follow the motion of the stars using movement around one axis instead of two. If equipped with a device called a clock drive, it will follow the stars automatically without the user's help. This is a real convenience at high powers where the earth's rotation causes many objects to drift out of the field of view in only a few seconds. The equatorial is heavier, a bit more expensive, and somewhat harder for the beginner to get used to than the altazimuth. Both mounts will work well if the bearings are large enough and the tripod or pedestal used with the mount is sturdy.

Figure C: ALTAZIMUTH

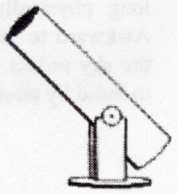
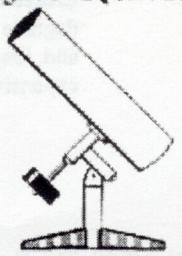


Figure D: EQUATORIAL



TELESCOPES AVAILABLE AND PRICES

BINOCULARS: Binoculars are really two small refractors mounted side by side that use special prisms to "fold" the optical path of the light and make the instrument very short. They are described by two numbers (ie: 7 x 35), the first giving the magnification and the second giving the diameter of the main objective lenses in millimeters. In astronomy, binoculars can be used to see many more stars than the eye alone can, revealing many faint star clusters, nebulae, and even a few galaxies. Camera tripod mounts for binoculars are also available, and they help make the view steadier and more comfortable during longer viewing sessions. Binoculars will show many of the larger craters on the moon, as well as the four brightest moons of Jupiter. Their wide field and low power make binoculars an excellent choice for studying the brighter comets that occasionally appear. They also have the advantage of a right-side up image, something most astronomical telescopes don't have. For astronomy work, we suggest the 7 x 50 wide-angle binoculars available for a s low as $60. Binoculars can't show you as much as a telescope, but they are an excellent way to get your feet wet in the hobby of amateur astronomy.

REFRACTORS: There are basically two sizes of refractors that are suitable for beginners: the 2.4-inch (60mm) refractor, and the 3.1 inch (80mm) refractor. The 2.4-inch is the most common and is available in various focal lengths and on both types of mounts. The 2.4-inch runs from about $170 for an altazimuthly mounted 700mm focal length, to about $350 for a 900mm focal length equatorially mounted instrument. The 3.1 inch is considered an instrument for serious amateurs and is usually mounted equatorially for about $450 to $600. Many refractors smaller than 2.4 inches are often poorly made and generally not worth the money, except as small spotting or finder telescopes. Refractors larger than 3.1 inches are also available, but they are rather expensive. Most of the small refractors are made in Japan and come with a small telescope or "finder" mounted on the side of the refractor, as well as with one or two eyepieces. FINDERS ARE A MUST since the main telescope frequently has a fairly small field of view making pointing it at anything without using the finder very difficult. A 60mm refractor with a 20x to 60x zoom feature is also a good buy since it uses fewer eyepieces.

REFLECTORS: The two most popular sizes for the beginner are the 4.25 inch and 6 inch reflectors. The 4.25 inch size comes in a variety of focal lengths from 17 inches (f/4 "rich field" telescope) to 45 inches (planetary scope), and most are in the $250 to $500 price range. The good ones come with a finder and several eyepieces along with a Barlow or "booster" lens for higher powers. Newtonian reflecting telescopes are generally impractical in sizes under 3 inches and we know of few quality reflectors on the market under 4 inches in aperture (most are just junk mounted on the infamous "pillar and claw" mount, so beware of them). If you are at all handy with tools, you can buy the optics for the 4.25 inch scope in a kit and build the telescope using wood, plumbing fixtures, and a few spare weekends of time. Your total cost can be as low as $90 (the complete plans for an excellent and easily built telescope are found in the October 1978 issue of ASTRONOMY magazine).

One of the most popular telescopes among amateurs is the 6 inch f/8 Newtonian. It offers good light grasp and allows a wide range of powers at a fairly reasonable cost ($400 bare bones to $850 for one fully equipped, equatorially mounted and clock driven). These telescopes can be home built for under $300 and hold their resale value well. Large altazimuthly mounted short focus Newtonians commonly known as "Dobsonians" are also inexpensive with many 8 inch models selling for as low as $300. Their short f-ratio means they must use somewhat more expensive eyepieces. Also, many do not come with finders.

BUYING TELESCOPES: Some camera or hobby stores have in stock or can order some of the more popular telescopes and accessories. However, there are no "telescope stores" in this area where you can go to see the full range of products from a variety of manufacturers. Some department stores sell a few 2.4 inch refractors, but be very careful when buying one of these. You should beware of any retailer making exaggerated performance claims (ie: over 120x for a 2.4 inch refractor). Check to see whether it has a good sturdy mount and clear crisp images at high power. Excessive color fringes around bright objects can mean poor optics, so look through the telescope before you buy it (the main lens should be called an "achromat" by the manufacturer). Also, make sure the finder gives good images and is mounted securely with metal, rather than plastic.

Most amateur astronomers in this area buy from mail order companies that advertise in magazines such as Sky and Telescope or Astronomy (available at local libraries and bookstores). Most of these firms are reputable and sell quality instruments, parts, or accessories. These magazines also have classified ad sections where used equipment is advertised, often with much lower prices than new instruments. The local Astronomy club is also a good source of information on new as well as used equipment. Occasionally, newspaper ads or garage sales can prove fruitful in the search for used telescopes.

SOME RECOMMENDATIONS: For a young student or a beginner who is not sure of his/her interest in astronomy or who doesn't want to spend much money, we recommend a short focal length (700mm or less) 2.4 inch (60mm) refractor on a good sturdy altazimuth mount. Also, binoculars are a good choice for stargazing as well as for other more down-to-earth uses.

For the older child or for someone interested in astronomy as a part-time hobby, the 4.25 inch reflecting telescope is a good choice (either f/4 for wide angle views or f/10 for higher power lunar and planetary viewing). For the person with a serious interest in astronomy who wants to start seeing the sights immediately, we recommend a 6 inch f/8 Newtonian reflector on an equatorial mount. The person who likes building things may want to build their own telescope from scratch or from parts and optics that are commercially made. A great deal of money can be saved by building, and the builder can take real pride in a customized instrument of his own making. A monthly column on telescope making appears in Sky and Telescope and there is even a magazine that deals with telescope making only. About a third of all telescope owners make their own instruments. The local Astronomy club can show you the many different approaches people have to instrument design and construction.

REFERENCES: Small telescope users who become more interested in the sky often want to move up to a larger telescope quickly. People should be cautious here because getting taken in a deal for a larger instrument can cost a bundle! Members of your local Astronomy club own many different types and sizes of telescopes and are usually happy to show them to anyone interested. And above all, remember, when you do get your telescope, USE IT! If you have trouble setting it up or using it, the members of the Prairie Astronomy Club will be glad to help you.

* * * * *

BOOKS ON TELESCOPES: These books are recommended for additional reading.
Telescope Handbook and Star Atlas, by Neal E. Howard. Published by Thomas Y. Crowell, New York, N.Y.
The Complete Manual of Amateur Astronomy, by Clay P. Sherrod. Published by Prentice-Hall, Englewood Cliffs, N.J.
All About Telescopes, by Sam Brown. Published by Sky Publishing Co. Cambridge, Mass.
Build Your Own Telescope, by Richard Berry. Published by Charles Scribner's Sons, New York.
Making Your Own Telescope, by Allyn J. Thompson. Published by Sky Publishing Co. Cambridge, Mass.
Standard Handbook For Telescope Making, by Neal E. Howard. Harper and Row, New York.
Norton's 2000.0 Star Atlas and Reference Handbook, by Ian Ridpath. Sky Publishing Co. Cambridge Mass.
A Field Guide to the Stars and Planets, 2nd ed. by Donald H. Menzel and Jay M. Pasachoff. (1983, Houghton-Mifflin Co.)

MAGAZINES: (Monthly publications about Astronomy and related subjects)
Sky & Telescope, published by Sky Publications, 49 Bay State Road. Cambridge, Mass. 02138.
Astronomy, published by Kalmbach Publishing. 21027 Crossroads Circle, P.O. Box 1612, Waukesha, Wisconsin 53187.

CLUB LIBRARY

Did you know that the Prairie Astronomy Club has a library with scores of astronomy related books, which are available for loan at no cost to it's members?

These books are now located in a cabinet at Hyde Observatory, and may be checked out by PAC members at any monthly meeting of the Prairie Astronomy Club. Larry Hancock is our librarian.

The PRAIRIE ASTRONOMY CLUB CALENDAR

for SEPTEMBER 1998

SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
UNL Student Observatory Open to the public Friday August 28 (sundown–11PM) & Friday Sept 25 (sundown-11PM)		1	2	3	4 **OAS Meeting** **7:30PM** **UNO campus** **Durham-Rm169**	5
6 **FULL MOON**	7 **Mercury, Venus & Regulus In a 1° Triangle**	8	9	10	11 **Mercury ½° Northeast Of Venus**	12
13 **3RD QUARTER**	14	15 **Jupiter Is At Opposition**	16	17	18	19
20	21 **NEW MOON**	22	23 **Autumnal Equinox**	24	25 **MAHONEY STAR PARTY**	26
27	28 **1ST QUARTER**	29 **PAC Meeting** **7:30 PM** **Hyde Observatory**	30			

LONG-TERM CALENDAR

MAHONEY STAR PARTY - Friday Oct 23

Cosmosphere trip sometime in October ?

WHAT'S UP . . .

Planets:

Mercury is visible in the eastern morning twilight the last week of August. On the 11th, it's only ½° NE of Venus. It Joins Venus and Regulus on September 7th to form a tight triangle only 1° across.

Venus is visible in the morning sky throughout September, but by month's end, it rises only 45 minutes before the Sun.

Mars rises in the early morning hours. Look for Mars just south of M44 on September 1st.

Jupiter shines brightly in the evening near the Pisces/Aquarius border and reaches opposition September 15th. Jupiter reaches opposition every 13 months, however, this time it happens when Jupiter is nearest the Sun and it will be the brightest it has been in nearly 12 years.

Saturn rises due east in early evening and is visible the rest of the night.

Uranus, at magnitude 5.7 is visible in binoculars near the 5.9 magnitude star 19 Capricorni.

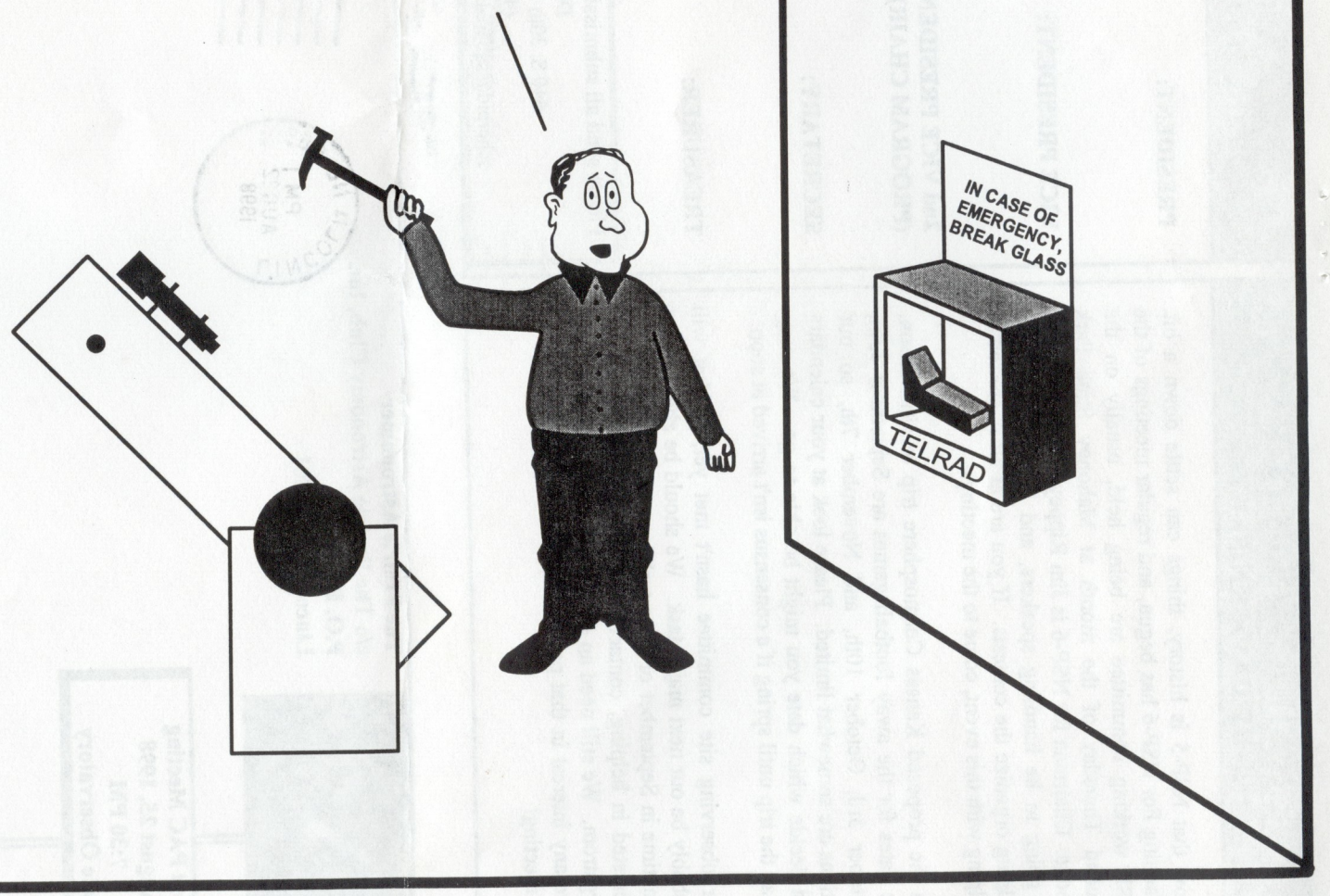
Neptune is near the Saggittarius – Capricornus border, and shines at magnitude 7.8.

Pluto is near the Scorpius – Ophiuchus border.

Astro Man

By Dave Scherping

Inspired By Dave Knisely



PRESIDENT'S REPORT
BY DAVE KNISELY

Now that NSP-5 is history, things can settle down a bit. Planning For NSP-6 has begun, and regular meetings of the NSP working committee are being held, usually on the second Thursday of the month at Mahoney State Park Lodge. Chairman for NSP-6 is Jim Rippey. Dave Hamilton is going to be handling speakers, and I am going to be helping organize the contests. If you are at all interested in helping with this event, come to the meetings.

On the proposed Kansas Cosmosphere trip to Hutchinson, the dates for the away football games are September 12th, October 3rd, October 10th, and November 7th, so our options are somewhat limited. Please look at your calendars and decide which date you might be able to go. We may delay the trip until spring if a consensus isn't arrived at soon.

Our observing site committee hasn't met yet, so that will probably be our next major task. We should be able to meet sometime in September or after a club meeting, so if you are interested in helping, contact me or see club Treasurer Liz Bergstrom. We still need an observing chairperson, so if you have any interest in that position, it's still open. See you at the meeting!

OFFICERS
OF THE PRAIRIE ASTRONOMY CLUB

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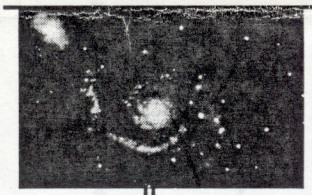

The Prairie Astronomer
c/o The Prairie Astronomy Club, Inc.
P.O. Box 80553
Lincoln, NE 68501

LINCOLN NE 685
PM 1
AUG 22
1998

Next PAC Meeting
August 25, 1998
7:30 PM
Hyde Observatory

EARL MOSER 9/99
P O BOX 162
HICKMAN NE 68372-0162