

7-78

THE PRAIRIE ASTRONOMER

Volume 18, Number 8

July 25, 1978

A MOON FOR PLUTO...AND A BONE OF CONTENTION FOR ASTRONOMERS!

Since its discovery in 1930, Pluto has made little progress in its 288-year orbit around the sun...and astronomers have made little progress in finding out the planet's secrets. It was assumed, for example, that Pluto was about the size of Mars, or perhaps as large as Earth, and with at least a near Earthlike mass.

Now, J.W. Christy of the U.S. Naval Observatory has discovered a 500-mile-diameter moon circling Pluto at a distance of 12,000 miles from the planet. At least, those are the estimates based on observations with the 61-inch reflecting telescope at Flagstaff, Arizona.

Christy noted that there was a peculiar elongation to the image of Pluto on a plate taken May 12. Checking back to photographs made in 1965 and 1970, Christy confirmed the same stretched image, always elongated in a north-south direction relative to earth. The conclusion: a satellite circling Pluto in an orbit so close that it could never be resolved by earth-based telescopes (magnitude 16 and 0.9 arc seconds from the planet.) The period of rotation is 6.3867 days, in the assumed plane of Pluto's equator. The rotation period also coincides with the assumed period of rotation for the planet itself, which

has been derived from photometric observations of light variations. This method, of course, is subject to considerable error because Pluto is so small and so distant that the largest earth-based telescopes never manage to resolve more than a very tiny disc.

More important than the discovery of the moon--tentatively named Charon, after the mythological boatman who ferried the souls of the dead across the River Styx to the underworld ruled over by the god Pluto -- is the fact that it has allowed calculations of the planet's size and mass. The size, about 1,200 miles, and mass, .023 that of earth, imply a much smaller planet--and one that could not possibly account for the perturbations in the orbits of Uranus and Neptune that led to the search for a planet X, and the eventual discovery of Pluto.

JULY MEETING NOTICE

The July meeting of the Prairie Astronomy Club will be held at Hyde Memorial Observatory Tuesday, July 25, at 7:30 p.m. This time, we have made arrangements to have air conditioning!

At presstime, Jack Dunn was not
(Continued on Page 8)

VEEPEE'S REPORT:

Since our erstwhile president, Rick Johnson, is still galavanting through the wilds of Minnesota, the report-writing duties seem to fall on me this month. I haven't heard one word from Rick since he left in early June, so let us suppose that no news is good news and wish him well for the rest of his vacation. I do know he had planned to go to the National Convention of Amateur Astronomers in Madison, Wisconsin, at the end of June, so we can look forward to his comments on that when (or if) he returns in August.

The big news this month is the upcoming star party at Wagon Train Lake on August 12. The Omaha and St. Joe, Missouri, clubs have been invited and we hope to have a good turn-out of both guests and club members. The combination picnic and star party will gear up around 3:00 or 4:00 p.m. The club will provide free cold pop and you should bring whatever food you want to eat. Bring a dish to share with the others if you want to participate in the pot luck dinner. We plan on eating about 5:30 after which a delegation will take guests from the other clubs on a tour of our new Hyde Observatory. Then, of course, the rest of the evening at Wagon Train will be devoted to star gazing and telescope comparisons. So bring your frisbees, footballs, telescopes, whatever, and come out and have a good time.

Some confusion has arisen over park entry fees for our star party: Since Wagon Train is a state park, it is subject to the Game & Park Commission's new entry fees. You can buy a season sticker for your vehicle for \$7.50 or you can get a one-day pass to the park for \$1.50 per vehicle. (I think you get these at the park entrance.) It's possible to save some money by teaming up and sharing a ride with other club members. We'll discuss this at our next meeting.

I'd also like to report on the huge success of the first Special Public Night at the observatory on Monday, July 10. We had well over 400 people come through in an hour-and-a-half, and cars were parked on both sides of the street all the way to the boat ramp. Apparently, the public liked the

(Continued on Page 8)

THE PRAIRIE ASTRONOMER is published monthly by the Prairie Astronomy Club, and is free to club members. Yearly subscription without club membership is \$4.00. Regular membership (includes one-year subscription to Sky & Telescope, club newsletter, and four quarterly issues of the Astronomical League newsletter), is \$12.00. Family membership (includes all regular privileges, plus one additional vote in club elections) is \$14.00. Newsletter Editor, Lee Thomas (489-3855). Address all correspondence to PRAIRIE ASTRONOMY CLUB INC., P.O. Box 80553, Lincoln, Nebraska 68501.

HELPFUL HINTS ON EYEPIECE SELECTION (PART 5)

(Editor's note: This is the fifth in a series of articles on selecting the proper eyepiece for your telescope by club president Rick Johnson. See Prairie Astronomer issues Volume 18, Nos. 4-7, March-June, for the first four parts of this article. The article will conclude in our August issue.)

EXTENDING THE FOCAL LENGTH OF THE TELESCOPE

So far, I have talked about the inability of even the best eyepieces, performing well at focal lengths of less than 8mm. This, though, is not a sudden transition. When using affordable eyepieces, the loss of image quality begins long before the focal length is as short as 8mm. I have never seen an eyepiece of less than 16mm focal length that I felt was giving an image as sharp and contrasty as that provided by the objective except for the movie camera lens mentioned earlier. But this lens is good only for high power work where field of view is not important. A 16mm eyepiece in an f/8 telescope gives only 12.7 power per inch which is about 76 power for a 6" f/8 telescope. This is far from high power. What's to be done for the middle powers? The answer lies with the much maligned barlow lens. The barlow lens is just a lens version of the secondary of a cassegrain but without the added defraction due to the large secondary required in the cassegrain. Thus, a newtonian plus barlow should outperform a cassegrain. Usually, this is not the case and the barlow takes the blame. There are several

reasons why the barlow seems to be a poor solution. First, most observers resort to the barlow for very high power. Thus, they combine a 6mm eyepiece with a barlow and expect results. I've already mentioned that there is no such thing as a commercially made 6mm eyepiece of good image quality. Second, this combination will result in 68 power per inch in an f/8 telescope and an exit pupil of only 3/8mm, far smaller than the minimum allowed by defraction. It's no wonder the image is lousy!

All this is not to say the barlow could not be at fault. There are many lousy barlow lenses on the market today--but there are some good barlows on the market also. A barlow lens should be achromatic and the lenses should be at least 25mm in diameter. Any smaller than this and light and resolution are lost. The same as would happen if the secondary of the cassegrain were reduced in size. The barlow lens should be mounted loosely in a tube which is threaded and painted flat black. Two barlow lenses which meet these requirements are the "Dakin Barlow," sold by Vernonscope and the Meade Research Grade 2 power barlow system. Meade also sells a 3 power barlow but

(Continued on Page 4)

EYEPIECE SELECTION HINTS (CONTINUED).....

it requires you to focus so far inside of prime focus you might need to move your mirror to use it.

A good barlow lens on a reflecting telescope will:

1) Increase the effective f ratio into the region of best performance for all types of eyepieces.

2) Allow the use of long focal length eyepieces which have the best correction and eye relief. Long eye relief is a great aid to those who wear glasses.

3) Result in a very slight loss of contrast due to the light scattering of an additional optical element. This loss of contrast is not as great as the defects caused by using short focal length eyepieces, or caused by the large secondary of a cassegrain.

As mentioned before, barlow lenses come in various magnification ranges. Magnification is related to the distance between the barlow and the eyepiece. The wider the separation, the higher the magnification factor. Meade takes advantage of this by selling one barlow lens and two extension tubes which result in both a 2 and 3 power system. As you separate the eyepiece from the barlow lens you must move the barlow lense inside of normal prime focus of the telescope. At three power the barlow is well inside of prime focus and this may require you to move your mirror forward an inch or so in the telescope tube. With very short focal

length instruments such a move might not be needed. If you have an f/5 or faster telescope the 3 power barlow is almost a must in order to reach higher powers effectively. The "Dakin" barlow is 2.4 power. Many eyepiece sets are designed so each eyepiece is half the focal length of the preceding eyepiece, for instance a set might include eyepieces in the following focal lengths: 32mm, 16mm, 8 mm, and 4mm. A two-power barlow would add little to such a set except to make the 16mm and 4mm eyepieces useless. A 2.4 power barlow would add inbetween powers which really is more of a luxury than a real benefit.

I just mentioned a typical eyepiece set of 32, 16, 8 and 4mm focal lengths which, in an f/8 telescope, give powers per inch of objective diameter of 6, 13, 25 and 50 power per inch--the perfect range for most amateur size telescopes. Rather than buy these four eyepieces including an imperfect 4mm one, let's buy only two and a 2 power barlow lens. Such a three-lens set is cheaper than the 4-lens set and a better performer since we omitted the imperfect 4mm lens.

Now it comes time to name brand names! The following comments are limited to eyepieces that I am familiar with, thus many possible choices may be omitted from this discussion.

The best economical 32mm eyepiece is the plössl sold by Jaegers for about \$20.00. Don't let the low

EYEPIECE SELECTION HINTS (CONTINUED).....

price fool you, it's an excellent eyepiece with a 50° field of view and perfect correction to the edge of the field. The only possible drawback is that the eye relief is so long that inexperienced observers tend to get too close to it and lose the large field of view.

The 8mm poses more of a problem. I already mentioned that eyepieces tend to get slightly poorer as the focal length decreases till 8mm is reached, at which time they suddenly start a rapid deterioration in quality. The cheapest solution is the movie camera lens mentioned earlier. Most common focal lengths are about 5.5-6.5mm, which is a bit short for an f/8 telescope but is an excellent value for shorter focal lengths such as f/5-6. So far I have seen only two commercially made 8mm eyepieces that managed to give excellent images and both are expensive. One is the Clavé Plössl, which costs about \$70! The other is the Brandon which sells for about 3/4 of that price, though it is slightly inferior. Many other 8mm eyepieces are available, but their quality is dubious.

Several other alternatives are available if you go to the 3 power barlow. One obvious series is a 25mm and 12.5mm eyepiece plus the 3x barlow. This will result in the following powers per inch of objective diameter at f/8: 8, 16, 24, 49. An acceptable and inexpensive 12.5mm

eyepiece is the Jaegers Symmetrical which costs \$16.00 postpaid. This eyepiece has no in-focus field stop so the edge of the field is ill-defined. It does have an unusually wide field of view for such an inexpensive eyepiece and performs well when used for eyepiece projection. I have had too little experience with 25mm eyepieces to make a recommendation here, except to stick with orthoscopic or plössl designs unless you are very sure what you are doing. Later, as money permits, add the 32mm Jaegers plössl for low power work. If you can afford to buy three eyepieces and the 3x barlow at one time then I'd get the 32mm plössl by Jaegers, the 20mm erfle by Meade and the 12.5mm Jaegers symmetrical. Such a series is ideal for an f/8 telescope, resulting in powers of 6, 10, 16, 19, 30 and 49 per inch of aperture. Yes, some of the powers are luxuries, but they are reasonably priced and the extra powers are concentrated below 25 power per inch, where most all observing is done.

And now for an absolutely ludicrous suggestion. Keep in mind that what I am suggesting should only be done to get powers above 30 per inch when using telescopes of f/8 or faster! What I am suggesting is stacking two barlow lenses one atop the other and putting the eyepiece on top of that!!!!!! I have been doing this

(Continued on Page 6)

EYEPiece SELECTION HINTS (CONTINUED).....

now for about a year with surprisingly excellent results and now rarely ever use an eyepiece of less than 16mm focal length except for my 5.5mm movie camera objective. You must use good quality, well baffled barlow lenses of at least 1" aperture to get good results. I use a Cave 2x barlow and a Meade combination 2x and 3x barlow to get the result of 4x and 6x respectively. Actually, it makes a difference in which order unlike barlow lenses are stacked, and I can get 5x and 7x by reversing the order of the two lenses. When combined with a 20mm Meade erfle on an f/8 telescope, the result is 10, 20, 30, 40 and 60 power per inch. You then have 5 well spaced magnifications from only one eyepiece with a 65° field of view and long eye relief, even at maximum powers. On an f/6 telescope the result is even better: 8, 15, 23, 30 and 45 power per inch. Like any erfle when used at f/6 or faster, it shows some coma near the edge of the field which is eliminated once a barlow lens is used in the optical train. For very low power, you might wish to add the 32mm plossl. At f/6 it will perform better at the edge of the field than the erfle. At f/7 or f/8, the erfle should do just as well as the plossl. A good 20 mm orthoscopic or plossl should work just as well as the erfle, though the field of view will be somewhat restricted.

EYEPiece SETS

There are three sets of eyepieces marketed as top quality and selling with rather steep prices. In order of cost they are: Meade research grade orthoscopics, Brandons, and Clavé plössl eyepieces.

Meade: Grapevine information has it that this entire series including the 20mm erfle mentioned earlier is made by Nikon. The 28mm and 16.8 mm are both excellent eyepieces and well worth their cost. The series also includes a 10.5mm, a 7mm and a 4mm but these tend to suffer from the same faults all shorter focal length eyepieces do. They are as good as any at their focal lengths but long focal length eyepieces plus barlow will do better in most cases.

Brandon: These eyepieces are of a modified plössl design and cost about \$10 more per eyepiece than do the Meade eyepieces. The Brandons might be slightly better in telescopes of f/7 or slower, while the Meade are slightly better at f/6 or faster. Such differences are minor. If you are sold on Brandon they can be bought for about the same price as the Meade eyepieces if you get them without the eyecup and non-parfocal. \$10 per eyepiece seems steep for a rubber eyecup and semi-parfocal convenience.

Clavé: These are so expensive I am not about to buy one to experiment

(Continued on Page 7)

EYEPIECE SELECTION HINTS (PART 5 CONTINUED).....

so my observations are limited to what I have seen at conventions. Apparently, current production models are recessed so that you cannot accidentally touch the lens with your eye. Also this is helpful in placing your eye the proper distance from the eyepiece for the exit pupil size. This eyecup is fine if you do not need glasses when observing. Those needing glasses like myself find the recessed eye lens to be annoying. I don't know if they can be ordered without the eyecup. If the f ratio of your telescope is at least $f/6$ or slower these probab-y are the best eyepieces available. Prices start about \$70 and go up rapidly. A 2x barlow is well over \$150!

Other eyepiece sets:

Edmunds is coming out with a set of specially designed kellners which closely resemble the plössl in performance characteristics and which cost \$30 apiece. The 28mm version of this series has been donated to us by the company and is currently on loan at the observatory. Its only drawback is mechanical. Apparently an optical edge is catching light near the edge of the field and this is turned into a rainbow around the field of view when a brilliant object is at the edge of the field. I believe Jaegers' 32 mm plössl to be somewhat superior and it is \$10 less. I haven't had a chance to see through any of the other eyepieces in the series.

While I have not been able to look through all possible sets of eyepieces on the market I have looked through several eyepieces from most sources and have come to the conclusion that no matter who makes the set some of the eye pieces in them are better than others. Thus, to buy a complete set from one manufacturer, you are giving up something at one of the power levels that you could gain by picking and choosing among the best that each manufacturer offers. This applies even to the Clavé plössl eyepiece sets. The result is that the set you end up with will be all different types and the image planes will differ so that major re-focusing will be necessary when you change eyepieces. I believe this a minor thing to suffer through in order to have the best set of eyepieces you can afford. Once acquired, the eyepieces should last a lifetime, so be sure you pick quality that you can live with for that long!

(--TO BE CONCLUDED NEXT MONTH)

PICNIC AND STAR PARTY--REMEMBER!

The PAC regular annual picnic and star party will be held at Wagontrain Lake, east of Hickman, Saturday, August 12. Details are in Ron Veys' Vice President's Message, on Page 2. This is our annual gigantic shindig, so be sure to mark your calendar!

VICE PRESIDENT'S REPORT (CONTINUED)

idea of having the observatory open on a weeknight. We'll try to do more of these in the future. A special thanks to the telescope operators (especially Doc Manthey, Walt Baumann, Jeff Mallett, and Curt Roelle) for their help that night.

That's about all the tripe I have for this month. See you at the meeting.

--Ron Veys, Vice President

JULY MEETING NOTICE

(Continued from Page 1)

certain what the program would be
---and took the opportunity to remind everyone that programs from

the members are welcome--urged, even. Check with Jack if you have a program idea.

THE PRAIRIE ASTRONOMER
c/o The Prairie Astronomy Club
P.O. Box 80553
Lincoln, Nebraska 68501



FIRST CLASS MAIL



Mr. Earl Moser
Hickman,
Nebraska 68372

9/78