The Prairie Astronomer

The Official Newsletter Of The Prairie Astronomy Club, Inc.

July 1998 **Volume 39 Issue #7**

Internet Addresses:

PAC Web Page:	http://www.4w.com/pac/
PAC E-Mail:	pac@infoanalytic.com
NSP Web Page:	http://www.4w.com/nsp/
NSP E-Mail:	nsp@4w.com
OAS Web Page:	http://www.top.net/cdcheney

MEETINGS & EVENTS

PAC MEETING
TUESDAY JULY 28, 1998, 7:30 PM
at Hyde Memorial Observatory

NEBRASKA STAR PARTY
JULY 18 - 25, 1998
at Merritt Reservoir

PAC PICNIC & STAR PARTY
SATURDAY AUGUST 15, 1998, 6:00 PM
Picnic at Hyde Memorial Observatory
Observing at Wagontrain Lake (near Dam on the south end)

MAHONEY STAR PARTY
FRIDAY AUGUST 21, 1998, SUNSET
Mahoney State Park – Driving Range

PAC MEETING
TUESDAY AUGUST 25, 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.

July's Program:

At the July PAC meeting we will have a recap of the 5th annual Nebraska Star Party. This nationally recognized star party is beginning to draw in people from other countries and may soon claim international fame. **Dave Hamilton** will provide a synopsis of a fun filled week of stars, beautiful scenery, good food and lots of great activities.

Have you ever heard about the Draconid Meteor Shower? Probably not because it's hourly rate on an annual basis is hardly perceptible. But, once every 52 years it's hourly rate can increase to 10,000 or more. **Earl Moser** witnessed an impressive display in 1946. At the July PAC meeting Earl will tell us all about his experience and he will discuss the prospects for the upcoming October 8th, 1998 return of the Draconid meteor shower.

*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 Prairie Astronomy Club will be selling club t-shirts again. Orders will be taken at the July and August meetings and the order will be placed in September. If you can't make either meeting, contact Dave Knisely or Larry Hancock to place your order.

If you would like to design a new PAC logo, then please bring your design to either the July or August meeting for the club to vote on. If your design is accepted, then your T-shirt will be free.

If no new designs are submitted, then we will go with the style already on file. This is the shirt you typically see Dave Knisely wearing at the PAC meetings. It is sky-blue with the PAC logo in the upper left on the front side.

T-shirts will be $7 and Polo shirts $14. Please specify size. All members are urged to buy a shirt, which will help promote the club.

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DON'T FORGET THE
PAC PICNIC
Hyde Observatory, August 15th, 6PM
Followed By Observing At Wagontrain Lake

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.

PRACTICAL MAGNIFICATION LIMITS

By: Dave Knisely

The maximum useful magnification, which a telescope can provide, depends on a number of things, such as the size and type of the instrument, as well as the type of object is being observed. A certain upper limit comes at the point where the eye can see a star's diffraction disk clearly. This disk is caused by the interference of light gathered by the telescope, and has a certain well-defined size, which is determined by the telescope's aperture (the telescope's main lens or mirror diameter). The larger the aperture is, the smaller the disk will be. Going to a power much higher than that needed to clearly show the diffraction disk will only make the disk look bigger, and will add no further detail, since the wave nature of light will tend to obscure any fine detail much smaller than this disk. The radius of the disk (to the first minimum) is the resolution limit given by the Rayleigh Criterion:

$$\theta = (1.22\ \lambda) / D$$

where θ is the size (in radians), λ is the wavelength of the light, and D is the aperture of the instrument. For those of us who like inches, seconds of arc, and a common visible wavelength (5500 Angstroms), the formula becomes:

$$\theta = 5.44/D$$

where θ is in seconds of arc, and D is in inches.

A more common formula is the so-called "Dawes Limit", and is based on observations of double stars:

$$\text{Dawes Limit: } \theta = 4.56/D$$

Dawes Limit gives a somewhat higher resolution and may reflect observational reality a bit more than the Rayleigh formula. If we use it as the basis for our power "limit", all we have to ask is how much power do we need to employ to get this " θ " up to a point where the human eye can clearly see it. If "S" is the eye's unaided effective resolution, then all we have to do is boost, or "multiply" S to the point where it equals our telescope's θ, hence, that power becomes:

$$M_{limit} = (D * S)/4.56$$

Now comes the question: exactly what is S? As for my own eyes, I can see the wide components of ε Lyrae, 3.5 minutes of arc apart, so I could set S = 3.5 minutes of arc (210 seconds of arc in our formula) and probably be fairly accurate. If I am using a one inch (50 mm) telescope, the maximum power I could effectively use would be approximately:

$$M_{limit} = (1 * 210)/4.56 = 46 \text{ power for a one inch aperture.}$$

A ten inch aperture would have about a 460x limit. Thus for my example, the maximum effective power would be about 46x per inch of aperture. This would just barely make the diffraction pattern visible. To make the diffraction disk itself easier to see would probably mean that we would need to boost S up to around 4 minutes (240 seconds) of arc. This is somewhat more reasonable, especially considering many people's eyes may not be that good. Setting S=4 makes M_{limit} = 52.6x per inch. An "average" of these two figures (46x and 52.6x) would be about 49x per inch. This is where the "maximum" power limit of "50x per inch" comes from. It is NOT a hard and fast rule, but it is a very good guide to how high you can go. Smaller quality telescopes are often pushed to, or slightly past this limit, since they are not usually limited by seeing, and require such powers to make detail in lunar or planetary images easier for the beginner to see. The overall view of certain objects like Saturn and the Moon seems to stand up better under higher powers than other objects, since their contrast is fairly high to begin with. For viewing close double stars, powers from 60x to 100x per inch may sometimes be used, but the views of most other "extended" objects generally suffer much beyond 50x per inch. The images become very dim and fuzzy, so the extra power does nothing for the view. A good 2.4 inch aperture refractor should work well up to about 120x, but some less-reputable manufacturers and retailers frequently list these scopes having usable powers of 400x or more! We refer to these rather ridiculous powers as "empty magnification", since they are used to just sell telescopes and are totally useless for viewing the heavens. If you want to use more power, you need to get a bigger telescope with a larger diameter lens or mirror.

For viewing some of the detail on the planets, going too close to the 50x per inch mark can make the image a bit fainter, with lower apparent contrast. A good tradeoff between planetary image contrast, brightness, and image scale seems to be around 30x to 40x per inch of aperture, but again, it depends on a person's eyes and the type of instrument that is being used. Many deep-sky objects usually must be viewed at low powers just to be visible, thus using much more than 30x per inch on them may not work at all (except for resolving tight globular clusters or viewing small planetary nebulae with moderate to large telescopes). Those with poorer eyesight may need to kick the power up slightly higher than these "limits". However, contrary to what some department store telescope distributors say, THERE IS A PRACTICAL UPPER LIMIT TO POWER, and it is about 50X PER INCH (2x per mm) of aperture.

The PRAIRIE ASTRONOMY CLUB CALENDAR for AUGUST 1998

SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
For you hearty astronomers, there's an occultation of Jupiter by the Moon on August 11th. Of course it's only visible from eastern Antarctica, which, by the way, is in the dead of winter. What? You'd like something warmer? OK, there's an annular eclipse visible from Malaysia & Indonesia on August 22nd.			July 29 δ-Aquarids Meteor Shower Peaks	July 30 δ Aquarids	July 31 δ Aquarids	1 δ Aquarids
2 δ Aquarids	3 δ Aquarids	4 δ Aquarids	5 δ Aquarids	6 Southern ι Aquarids Peak	7	8 FULL MOON
9	10 Perseids	11 Perseids Moon 0.9° from Jupiter	12 Perseids Meteor Shower Peaks	13 Perseids	14 3RD QUARTER Perseids	15 PAC PICNIC & OBSERVING
16 Moon 0.2° from Aldebaran	17	18	19	20	21 MAHONEY STAR PARTY	22 NEW MOON Double Shadow Transit 10:20PM
23 Double Shadow Transit On Jupiter 02h20m UT (10:20PM Sat)	24	25 PAC Meeting 7:30 PM Hyde Observatory	26 Northern ι Aquarids Peak (August 25)	27	28	29
30 1ST QUARTER	31 Mercury at Greatest W. Elongation (18°)					

LONG-TERM CALENDAR

Saturday Aug 15	PAC PICNIC & STAR PARTY	- Hyde Observatory
Friday Aug 21	MAHONEY STAR PARTY	- Mahoney State Park
Friday Sept 25	MAHONEY STAR PARTY	- Mahoney State Park
Friday Oct 23	MAHONEY STAR PARTY	- Mahoney State Park

WHAT'S UP. . .

Planets:

Mercury is visible in the eastern morning twilight the last week of August. On the 30th, it's only 2.6° to the right (SE) of Venus.
Venus is up in the morning, but by month's end, it rises only 1.5 hours before the Sun.
Jupiter rises as evening twilight ends and is visible the rest of the night. It will be near the Pisces/Aquarius border.
Saturn rises in late evening, in the constellation Cetus, and is visible the rest of the night.

Meteors:

August is a good month for observing cometary debris! The **Perseids** meteor shower will peak on the night of August 12/13 and will be visible a few days before and after the peak. This annual shower produces close to 100 meteors per hour at its peak. Always a good show.... Don't miss it. Also look for meteors associated with the δ **Aquarids** meteor shower the first week in August. It peaks on July 29th with a zenithal hourly rate of 20 and a duration of 14 days (7 days each side of peak). Also the Southern ι **Aquarids** peak on August 6th and Northern ι **Aquarids** on Aug 25th.

SECRETARY'S REPORT

Minutes of the June 30, 1998 PAC Meeting

Dave Knisely opened the meeting at 7:30 PM, by first welcoming and introducing our visitors.

Larry Hancock purchased and donated a cabinet for storing the PAC library. It will be kept at Hyde, making it possible for PAC members to check out books at the monthly meetings. Thanks Larry.

Liz Bergstrom presented the Treasurer's report and gave an update on the search for a new observing site. Liz found another potential observing site near Martell. At the meeting, it was decided to hold the observing session there, following the PAC picnic August 15th. However, nobody supplied me with directions to publish in the newsletter, so I'm going to change the location to Wagon Train Lake.

Dave Hamilton and Dave Scherping gave an update on the Nebraska Star Party plans. Dave S. described the door prizes for kids that were purchased with money donated by PAC. Thanks PAC.

The meeting closed somewhere around 8:00 PM and was turned over to Program Coordinator, Erik Hubl who introduced this month's speaker, Ron Veys. Ron gave a nice presentation describing the many observing awards available through the Astronomical League. Hopefully it will spark some interest in serious observing.

- By Dave Scherping

OFFICERS

OF THE PRAIRIE ASTRONOMY CLUB

PRESIDENT: Dave Knisely
223-3968
dk84538@ltec.net

VICE PRESIDENT: Doug Bell
(402)489-8197
db16696@ltec.net

2nd VICE PRESIDENT (PROGRAM CHAIR): Erik Hubl
(402) 488-1698
ehubl@netinfo.ci.lincoln.ne.us

SECRETARY: Dave Scherping
(402) 477-2596
dscherp1@aol.com

TREASURER: Liz Bergstrom
(402) 464-2038

Please send all submissions for The Prairie Astronomer to:
Dave Scherping
640 S. 30th St., Lincoln, NE 68510
(402) 477-2596
scherpid@squared.com -or- dscherp1@aol.com

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

Next PAC Meeting
July 28, 1998
7:30 PM
Hyde Observatory

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