



The *Prairie Astronomer*

The Official Newsletter Of The Prairie Astronomy Club, Inc.

June 1999

Volume 40 Issue #6

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MEETINGS & EVENTS

PAC MEETING

TUESDAY, JUNE 29, 1999, 7:30 PM
at Hyde Memorial Observatory

NSP PLANNING COMMITTEE MEETING

THURSDAY, JULY 8, 1999, 7:30 PM
At Mahoney State Park Lodge

CLUB STAR PARTY

FRIDAY, JULY 9, 1999 SUNSET UNTIL??
Olive Creek SRA
(See directions on back page)

UNL STUDENT OBSERVATORY

FRIDAY, JULY 9, 1999, SUNSET UNTIL 11:00 PM
Open to the public

MAHONEY STAR PARTY

FRIDAY, JULY 16, 1999, BEGINNING AT SUNSET
at Mahoney State Park

PAC MEETING

TUESDAY, JULY 27, 1999, 7:30 PM
at Hyde Memorial Observatory

NSP PLANNING COMMITTEE MEETING

THURSDAY, JULY 29, 1999, 7:30 PM
At Mahoney State Park Lodge

JUNE'S PROGRAM:

Professor Thomas Winter

UNL Classics Professor Thomas Winter will give a presentation entitled "Hercules, Hero of the Sky" for the June program. The talk will focus on the mythology of the summer constellations.

REPORTING PROBLEM LIGHTING: If you find

a new violation of the lighting ordinance, the person to call is Rodger Harris in the City Offices. His number is 441-6450.

Or you may contact one of the following:

Hyde Steering Committee

Erik Hubl, Supervisor
624 South 51st
Lincoln, NE 68510
(402) 488-1698

Prairie Astronomy Club

Doug Bell
3721 Timberline Ct.
Lincoln, NE 68506
(402) 489-8197

LIGHT POLLUTION ISSUE: With urban sprawl

affecting the outskirts of Lincoln, the ever increasing light pollution problem is not going to go away on its own. Please review the articles in this month's *The Prairie Astronomer*, check out the International Dark Sky Association's web site and let Erik and Doug know they can count on you to help. Also, be sure to review Lincoln's Lighting Ordinance reprinted in this issue.

www.darksky.org

PAC'S NEW CLUB LIBRARIAN: Andrew Stoddard

has agreed to become the new club librarian. Andrew is looking forward to reorganizing the library to attract more interest by members. Andrew is also going to look into ways of enhancing the club library and welcomes any suggestions from club members.

PAC-LIST: See page 11 for instructions on how to subscribe to the PAC-LIST.

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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 and renewals to: **The Prairie Astronomy Club, Inc., PO Box 5585, Lincoln, NE 68505-0585.** For other club information, please contact one of the club officers listed on the last page of this newsletter. Newsletter comments and articles should be submitted to: **Jeff King, 4018 South 83rd Street, Lincoln, NE 68506-5973 or jeffrey892@aol.com**, no less than ten days prior to the club meeting. The Prairie Astronomy Club meets the last Tuesday of each month at Hyde Memorial Observatory in Lincoln, NE.

Secretary's Report

By: Willa Penney

Dave Knisely opened the meeting. We had one guest, David Brokofsky.

Dave reported that Mars is showing a lot of detail; the north polar cap appears to be getting bigger. Venus is also showing some detail, with a very fine dusky streak across the planet.

The May Mahoney Star Party had a good turnout with 7 from PAC and 8 OAS members. There were about 100 people there from the general public. The seeing was exceptionally good. Friday, June 18, will be the next one; Dave said that it is a good opportunity to meet people from the Omaha Astronomical Society.

Jack Dunn passed around pictures and reported on Astronomy Day. The attendance was about double that of the previous year. The big hit was the mirror grinding demonstration by Martin Gaskell. Jack is anticipating that next year will be even bigger, perhaps held over several days and with several guest speakers.

It was suggested that we develop a small "science fair type" display about amateur astronomy and also have a large sign made "Prairie Astronomy Club".

Asteroid 1996 RS5, minor planet # 10195, has a new name: Nebraska.

The next PAC Star Party will be June 11 at Olive Creek. The UNL student observatory will also be open that evening.

Dave invited everyone to the Village Inn at 66th & "O" after the meeting.

Be sure to register for the Nebraska Star Party before June 15 as the price goes up \$5 then. See Tom Miller for registration forms. Doug Bell has been appointed the "Clear Skies Coordinator" for NSP 6. Tom reported that there are 65 registrations so far, which include about 130 people.

Jeff King was complimented for the really nice newsletter in May.

Liz Bergstrom reported that we have \$441 in our club treasury; however, our Astronomical League membership dues will take about \$220 of that.

Larry Hancock has a couple of T-shirts left for sale; Mark Dahmke has a few CD's at \$15 with pictures from the last 3 Nebraska Star Parties. Also, see Larry for registrations for the PAC/OAS dinner on October 8. Cost is \$7.

Mark Fairchild, volunteer coordinator for Hyde, said that volunteer training is held the 2nd Sunday of each month.

We adjourned to our program: Dr. Kevin Lee, UNL Physics Professor, on "Detecting Extrasolar Planets".

Another Star Child for the Hubl Family

On Thursday, May 27th, 1999 at 3:10:30 AM CDT our little baby girl Lyra Aloisha Hubl was born. She is named after the Golden Lyre constellation that is currently high overhead at sunrise. She was born on a waxing gibbous moon with Mars nearby and at its brightest. At birth,

Lyra weighed 6 lbs, 4 oz with a length of 20 inches. Lyra's mother Tamara is doing just fine. Lyra has 3 Brothers: Orion (the Hunter) age 16, Corvus (the Crow) age 14 and Caelum (the Dagger) age 2. This is the 16th grandchild for Alois and Randi Hubl, Red Cloud NE.

Congratulations to the Hubl Family. For more on the Lyra Constellation, see page 8

Just a reminder to all PAC & OAS members and their families that your welcome to a 4th of July dinner and fireworks display at our farm starting at 6 pm on the 4th. If you can't make the dinner your still welcome to come for the display which will start about the time Holmes ends their display. It will probably last between 1 and 2 hours. We test fired an 8 inch ball the other evening (it was glorious). We should also have a portable toilet available near the observing area. Bring lawn chairs and or blankets. RSVP me at tmiller232@aol.com if you'd like to join the celebration. TOM MILLER

Deep Sky Observations



DS061499

DEEP-SKY OBSERVATIONS
by David Knisely

DATE: June 14th, 1999, 0530 to 0730 hrs UTC.

LOCATION: Rockford Lake, Nebr. 40.227N, 96.581W, 1400 ft. elevation.

INSTRUMENT: 10 inch f/5.6 Newtonian, 59x, 94x, 141x, 220x, 282x, 310x, 440x

CONDITIONS: Clear, Temp. 58 deg. F. Wind Calm.

UNAIDED EYE LIMITING MAGNITUDE: 6.9

SEEING: 0.5 arc seconds (variable).

OBSERVATIONS: After the cold front came through (and some rains cleaned and stabilized the local atmosphere), I was treated to an absolutely wonderful night of observing, including FINALLY seeing the central star of M57 in my lowly ten inch. I was surprised when checking my chart of the area around the north celestial pole that I was seeing stars as faint as 6.9 with my unaided eye. Checking the images at high power revealed nice diffraction disks on stars, so things looked promising. I resumed my Herschel II search once again (after having run out of tape on my recorder the last time I was out), and found a couple of old favorites among the NGC numbers. My first target was the large dim galaxy NGC 4236, a monster of a tilted spiral in Draco not too far from Kappa Draconis. At 59x, the galaxy appeared as a large roughly cigar-shaped diffuse fuzzy area of low surface brightness with some weak brightness variations along its length. 94x revealed extensive mottling with slightly brighter areas located in the northern and southern portions of the object. 141x did reveal a very faint star-like nucleus in a small central patch, but that power was a bit high for viewing all the detail in the galaxy. My next target was the fairly bright edge-on spiral NGC 4244 in Canes Venatici. I was surprised that this one didn't make the original Herschel 400 list, but I guess this one makes up for all of the "duds" in the Herschel II program. Even at 59x, this object appeared as a nice narrow streak of light with a brighter almost spindle-like middle. 141x made the northeastern extension look a bit brighter and slightly broader than the southwestern one, but otherwise, there were only a few hints of brightness variations along the length of the galaxy.

Going back into Draco, I picked up NGC 4250, a barred spiral which showed just a hint of the central bar in the form of an elongated or spindle-like middle and an irregular outer haze. A real treat was the smaller but fairly easy NGC 4256. It is a marvelous edge-on spiral which stands high power very well. Even at 59x, I could see its small needle-like form which seemed to have a few small brighter pips near its middle. The object was even better at 141x, looking similar to NGC 4565. It has a very pronounced oval nuclear bulge with a star like center and narrow extensions to the northeast and southwest of the core. 220x showed hints of a narrow dark lane across the nuclear bulge, and an extension

of the lane in the northeastern portion of the galaxy. This lane seemed odd, in that it didn't seem to go on into the southwestern "spike" of the galaxy.

After that, I looked up NGC 4271 in Ursa Major, a small faint but fairly easy oval fuzzy patch which showed a faint pip of light at its center, but not much else. NGC 4290 and NGC 4284 made a nice pair of galaxies to view at moderate to high power. NGC 4290 was the larger and brighter of the pair, and showed a star-like nucleus surrounded by an elongated (N-S) core which may have been the central bar. The outer haze was diffuse and roughly circular. NGC 4284 was just to the west, appearing as a very faint small diffuse oval fuzzy patch with a brighter middle. An even better pair of galaxies were NGC's 4291 and 4319. NGC 4291 was a fairly bright oval fuzzy patch with a small brighter core that seemed almost stellar at 141x. To the east was NGC 4319, a somewhat larger and slightly fainter diffuse fuzzy patch with a small brighter center. 141x revealed a star-like nucleus which was encased in a rather elongated core which appeared spindle like. The outer haze was roughly circular, and the spindle-like middle seemed to be the central bar of a barred spiral galaxy.

Once I had these under my belt, I decided that it was time to tackle the central star of the Ring Nebula. As some of you who have been reading the group over the past few weeks may recall, I have never managed to see the central star with my ten inch, or any other scope smaller than 17 inches. However, with such good conditions (and after all the discussion on the newsgroup), I thought I should give it another try. I have not used narrow-band filters on M57 very often, as it is bright enough and big enough not to really need them. However, this evening using about 141x with my Lumicon multi-filter adapter, I did a little looking for the faint outer shell around the Ring. It was hinted at with the Deep-Sky, but was seen with some certainty using the UHC filter, although it was extremely faint. It appeared to be nearly twice the radius of the main ring, and seemed to have a sharper outer edge with a more diffuse patchy inner side. Indeed, part of the outer shell near one "end" of the ring seemed somewhat irregular. Using the multi-filter adapter to do a quick switch to the OIII made the field darker and made the outer shell stand out somewhat better, although

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Continued from page 3

again, it was never very bright and was only just visible with averted vision. Taking the filters out, I then used my variable aperture off-axis stop to see how the ring and the surrounding stars would look using smaller apertures. Even at only 50mm of aperture, M57 showed its ring form at 94x. The faint 13th magnitude star just off the southeast edge of the Ring was still just visible at 70mm, but not quite at 60mm, leading me to conclude that many formulae for limiting magnitudes for various apertures need to be worked on a little!

Having completed that little test, I removed the hardware and kicked up the power to start looking for the central star. At 310x, the Ring was nice and large, with the magnitude 14.6 star north of the ring being quite easy to see. In fact, I could now see some stars around the Ring that I hadn't last week, making me more certain I was going to at least 15th magnitude. The Ring itself showed some interesting structure, with the north and south sides being brighter. Occasionally, small brighter patches could be seen in these sides, with one near the southeast side looking almost stellar. I could also catch the galaxy IC 1296 some distance to the west-northwest of M57 as a very faint diffuse patch with a small slightly brighter core, although it was better seen at 141x or 220x. While looking around the Ring's main annulus, my eye caught a very faint tiny flash at the center of the ring. I watched for a while, not seeing anything unusual, when it suddenly happened again. This pinpoint behaved just like the central star had done when I first viewed it many years ago in the 17 inch, so I kicked the power to 440x and carefully focused the eyepiece to watch again. This time, BANG!: the tiny dim central star appeared for about one second before vanishing instantly. There was no doubt this time: I had indeed bagged my quarry! Continuing to watch, the star would come and go, never appearing for more than a couple of seconds (and very frequently, for much less than a second). It was very very faint, but its behavior was unmistakable; winking on suddenly and then winking out as

quickly as if somebody had turned off a switch. At one point, the star "turned-on" for a full three seconds before once again quickly vanishing again for about a minute. There were times when it would be 3 to 5 minutes between sightings, followed by a group of "flashes". Clearly, this behavior was seeing related, but the seeing had to be ABSOLUTELY perfect for the star to appear, so last week, when I thought I had good seeing and I had failed with the central star, the seeing just wasn't quite good enough. From the faintness of the star compared to the other faint stars in the field, I would say that I still doubt the star would be visible in apertures smaller than ten inches. It was much more difficult to make out than the 15th magnitude field stars due to the overlying nebulosity glowing inside the ring, but at least conditions finally let me see it in my ten.

Enjoying the afterglow of this success, I spent some time cruising the Summer Milky Way. I checked out the small open cluster NGC 6649 in Scutum. Brian Skiff's book has a photograph of it with the magnitudes of the stars listed, so once again using high power, I decided to see exactly how faint I was going. The cluster contains about 25 stars ranging in brightness from 9.7 to fainter than 16th magnitude. I managed to see two stars of magnitudes 15.6 and 15.7, but was unable to break 16th magnitude. Still, that's going a LOT deeper than I had once thought the ten inch would go. I made the usual stops at M8 and M20, viewing M20 at 141x. It seemed to benefit somewhat from the use of the Lumicon filters, but even without them, the dark lanes were clearly visible. I topped off the evening with a high power look at M22. This object is simply GLORIOUS! With the stable seeing and high transparency, thousands upon thousands of stars filled the 220x field. I could have spent hours just looking at that one object, but it was approaching 3 a.m. local time, so I had to pack up so I could be awake enough to get some work done in the morning. Still, I had managed to do everything I had set out to do this night, so I could definitely sleep well. Clear skies to you.

David Knisely

Various Light Pollution Bill Successes

May 25, 1999

NEWS FLASH: This evening, the Ames City Council voted unanimously to approve the Ames Outdoor Lighting Ordinance!!! Now, it must go through three readings (everyone anticipates this to go smoothly), and it should be enacted into law sometime in July.

David Oesper
Ames, Iowa

New Mexico Dark-Sky Bill Signed into Law

We have received word that New Mexico Governor Johnson signed the New Mexico Dark-Sky Protection Act into law on the evening of April 6th. New Mexico now joins Connecticut, Maine, and Arizona in having a state wide outdoor lighting law.

HB916 passed the Texas Senate today, May 26th. The remaining step, Governor George Bush's approval, should be accomplished by June 16th. Actually it also becomes law even if he doesn't sign it... as long as he doesn't explicitly veto it in 20 days.

For more information, check out these websites:

<http://www.fc.net/~eolc/index.html>

<http://www.seeNstars.org/lights/99bill.htm>

The Light Pollution Issue



STARGAZERS today face a problem that barely existed only a generation ago. *Light pollution* has spread so much in the last few decades that it compromises our view of the stars. For about half of us, the stars no longer really come out at all.

Yet most light pollution is unnecessary. It is not an inevitable result of having well-lit streets and cities. As much as three fourths of the murky glow you see in the sky at night is waste light beamed directly skyward from poorly designed or improperly installed light fixtures. A standard security light, for instance, may send roughly half its rays above horizontal -- directly into the sky -- rather than down toward the ground where the light does any good. The upward half is pure waste. If the fixture is replaced with a well-designed, "full-cutoff shielded" fixture of various types now available -- one

that directs all the light down where it's supposed to go -the bulb wattage can be cut by half for a big savings of electricity and money. The quality of illumination is actually improved because of the reduction in glare, the near-horizontal beams that dazzle

your eyes directly from a bulb. And we regain some of the lost starry heavens.

America wastes about \$1.5 billion per year in electricity bills needlessly spilling light into the sky, according to a study by the International Dark-Sky Association (IDA), a nonprofit group founded to educate the public and industry about light pollution. More on light pollution is available from the IDA at 3225 N. First Ave., Tucson, AZ 85719, U.S.A. Or point your Web browser to <http://www.darksky.org/~ida/>

14 Things You Can Do to Help From the International Dark-Sky Association

The most important (and easiest) thing you can do is to become a member of the International Dark-Sky Association, and to promptly renew your membership each year. The more members we have the more effective we will be in our efforts to darken the sky and sensibly light the ground. Annual dues are \$30. Please join us today!

Get at least one person to become a new member of the IDA each year.

Order all the IDA information sheets, and read them carefully.

Become an outdoor lighting educator. Become knowledgeable about the issues, and then tell everybody the good news. Eliminating light pollution is a win-win situation!

If you are going to college, consider majoring in illuminating engineering, lighting design, or a related area.

If you are a researcher, we are desperately in need of more research in the following areas: the effects of outdoor lighting on flora and fauna; the relationship between lighting and crime; the physiology of human vision at low light levels; and the development of a new energy efficient white light source with just three or four very narrow spectral lines.

Consider becoming an outdoor lighting specialist, either as a sideline business or full time. Become an outdoor lighting consultant, supplier, or manufacturer, or go to work for a company that does one or more of these things.

If you have the means, leave a legacy for your community that is even greater than having an observatory named after you: provide your community with some or all of the funds necessary to change all the streetlights to full-cutoff units which do not produce glare or uplight. Everyone in the community will benefit from your generosity because they will once again be able to see the stars and they will have better visibility (because of the reduction in glare) and a more appealing nighttime environment.

Every community should have an outdoor lighting code. Work diligently towards that goal. Be a part of the process.

Build alliances with local environmental groups and others interested in quality-of- life issues.

Write a letter to the editor about light pollution for your local newspaper. Encourage others to do the same. Be positive. Be an educator.

If you have an incandescent outdoor light fixture, install a lower-wattage bulb. You will most always find that you can see well enough with less light.

If you are a rural resident, contact your electric utility and request that they begin offering full-cutoff security lights (such as the [Hubbell Skycap](#)) to their customers.

Become knowledgeable about the subject, abide by the golden rule, and persist, persist, persist!

LINCOLN



Lincoln's Lighting Ordinance ATTACHMENT "A"

LIGHTING

Lighting which illuminates parking lots shall conform to these City standards for parking lot lighting and shall be so positioned as to direct lighting away from the immediately abutting properties and public ways.

The purpose of parking lot lighting is to provide adequate visibility within parking lots and to deter crime. Its purpose is not to cause visual interference on public thoroughfares or encroach on the visual privacy of adjacent residents.

The aim of these standards is to provide guidelines to insure that parking lot lighting in the City of Lincoln is adequate and to minimize its adverse impact upon adjacent residential uses. It is also the purpose and intent of this standard to minimize light pollution which has a detrimental effect on astronomical observations. Except as noted in these standards, the parking lot will be lit in accordance with the 8th Edition of the Illuminating Engineering Society of North America (I.E.S.), "Lighting Handbook".

Airport parking lots shall be excluded from the restrictions of these lighting standards. Airport lighting requires special considerations and should be left to the control of the Airport Authority.

There are three major controllable components of a lighting system that directly affect the quality of a light system. These are: light intensity level, uniformity of light distribution, and glare. When these factors in a lighting system are managed in an appropriate way, intended use of the system is maximized and misuse is minimized.

EVALUATION WILL BE BASED ON THE FOLLOWING CRITERIA:

- I. Light Intensity Level:
 - A. Illumination level. Not greater than four (4.0) horizontal footcandles, average maintained, nor less than two-tenths (0.2) horizontal footcandles average maintained.
 - B. Illumination levels beyond the property line of parking lot. Illumination levels, attributable to a parking lot lighting system shall not exceed one-half (0.5) maintained horizontal footcandle on other properties, except public ways, within a residential zoning district.
- II. Uniformity ratio: No greater than four to one (4:1), average to minimum footcandles over the entire parking lot.
- III. Glare control: Luminaires shall have a cutoff classification with no more than 2.5 percent of the candle power above 90' from vertical nor more than 10 percent above 80' from vertical. As an alternative, shields may be installed on the luminaires to achieve the cutoff requirements, or non-cutoff luminaire shall have a light source that emits no more than 10,000 lumens at each pole location. The luminaires shall be designed to eliminate glare.

Continuation of Nonconforming Lighting

The lawful use of parking lot lighting existing immediately prior to the effective date of this resolution may be continued although such use does not conform to this standard. When any fixture is replaced at its existing location, the design shall meet the parameters of Paragraph I-B and III above.

Lincoln's Lighting Ordinance Cont'd..

ATTACHMENT "B"

OUTDOOR RECREATIONAL LIGHTING

Lighting which illuminates outdoor recreational facilities shall conform to these City standards.

The aim of these standards is to provide guidelines to insure that lighting of recreational facilities in the City of Lincoln is adequate, does not cause visual interference on public thoroughfares, and minimizes its adverse impact upon adjacent residential uses. The entire lighting system shall be so positioned as to direct lighting away from the immediately abutting properties and public ways. It is also the purpose and intent of this standard to minimize light pollution which has a detrimental effect on astronomical observations. Except as noted in these standards, the recreational facility will be lit in accordance with the Eighth Edition of the Illuminating Engineering Society of North America (IES), "Lighting Handbook".

There are three major controllable components of a lighting system that directly affect the quality of a lighting system. These are: Light intensity levels, uniformity of light distribution, and glare. When these factors in a lighting system are managed in an appropriate way, intended use of a system is maximized and misuse is minimized.

The goal for lighting recreational activities is to provide an appropriate light environment so the event will appear clear and sharp to the players and spectators.

Except by special permission of the City, no outdoor recreational facility, public or private, shall be illuminated after twelve (12:00) midnight except to conclude a specific activity which is in progress under such illumination prior to twelve (12:00) midnight.

EVALUATION WILL BE BASED ON THE FOLLOWING CRITERIA:

I. Light Intensity Level:

A. Illumination level.

The illumination level shall not exceed the minimum of the IES specifications by more than 20%.

B. Illumination Levels Beyond the Property Line of the Recreation Facility.

Illumination levels, attributable to the recreational facility lighting system, shall not exceed one-half (0.5) maintained horizontal footcandle nor two (2.00) initial vertical footcandles on other properties, except public ways, within a residential zoning district. Vertical footcandles shall be the initial footcandle levels measured at thirty-six inches (36") above the ground with a meter aimed toward the brightest light bank.

II. Uniformity ratio

The uniformity ratio shall be in conformance with the IES standard.

III. Glare Control

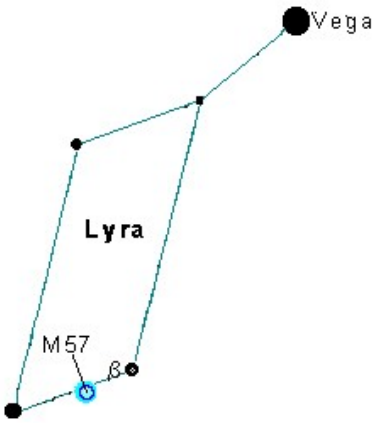
The luminaires shall meet and shall be installed to operate as I.E.S. "Cutoff" category criteria luminaires and aimed two (2) mounting heights or less ahead of the fixture. The "Cutoff" type luminaire designation is when the candlepower of the lamp does not numerically exceed 2.5% of the total lamp lumens at an angle of ninety degrees (90') above nadir (horizontal) and 10% at a vertical angle of eighty degrees (80') above nadir.

The luminaires shall shield the light source above seventy-two (72') above nadir. This shielding angle is required to minimize the discomfort glare to the observer at normal viewing angle.

Shields may be installed on the luminaires to achieve these requirements.

Continuation of Nonconforming Lighting

The lawful use of existing lighted outdoor recreational facilities may be continued. Future renovations or upgrades to such facilities in use prior to the effective date of this Resolution shall not exceed existing illumination levels or I-B above whichever is greater, beyond the perimeter of the recreational facility.



Abbreviation: Lyr

Lyra

Particulars:

- Spectroscopic binary *beta Lyr*
- Binaries *delta Lyr, zeta Lyr, a 11871*
- Quadruple star *epsilon Lyr*
- Planetary nebula *M 57*
- Globular star cluster *M 56*
- Meteor Showers: Lyrids, June Lyrids, Alpha Lyrids
- Lincoln Child named Lyra after this constellation

General:

A small but bright northern constellation lying between DECL=+30 and DECL=+40 and RA=18h and RA=19h. The fifth-brightest star of the sky, alpha Lyr, called *Vega* (arabic for "stone eagle"), radiates from the top Lyra with a pure white color. Together with *alpha Cyg, Deneb*, and *alpha Aql, Atair*, Vega forms the Summer Triangle.

Stars and other objects

Beta Lyr is a half separated (i.e. one of the stars reached its Roche volume) eclipsing binary of a cream-white color. The brightness varies from 3.4 mag to 4.3 mag every twelve days and 22 hours. With larger telescopes *beta Lyr* is resolved as an attractive double star with an blue companion of 8th mag. Additionally two other 9th mag companions can be seen in small telescopes).

Another double variable is *delta Lyr*. With the help of binoculars you can view a blue-white star of 6th mag and a semi-regular red giant. The brightness of the latter varies erratically from 4th to 5th magnitude.

An easy object with binoculars or small telescopes is *zeta Lyr* consisting of a 4th and a 6th mag star.

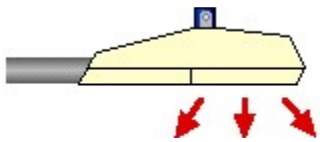
One of the most celebrated quadruple stars in the sky is *epsilon Lyr*. It is commonly known as the *Double Double*. In a very clear, moonless night it is possible to see the wide pair of 5th mag stars. Each star of this double is an double itself. But to resolve them a telescope with at least 60 mm aperture and a high magnification is needed.

The binary *a 11871* requires telescopes with an aperture of at least 12cm for resolution. The two stars orbit each other with a period of 62 years.

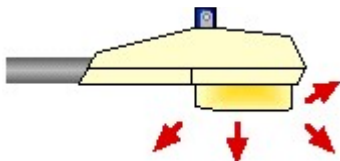
The famous *Ring Nebula*, M 57, is perhaps somewhat disappointing when viewed through amateur telescopes but really terrific on long-exposure photographs. In small telescopes it presents itself on dark nights as a ghostly elliptical disk. Its apparent size is larger than that of Jupiter. To see the central hole a telescope of at least 150 mm aperture is needed. The central, very blue star is so faint that it is beyond the power of amateur telescopes to be revealed. The nebula can be found half way between *beta Lyr* and *gamma Lyr*.

Three meteor showers seem to radiate from this constellation: the Lyrids, the June Lyrids and the Alpha Lyrids. The latter two are active in the summer time. The *Alpha Lyrids* are visible from July, 9th, to July, 20th, and reach their maximum activity on the 14th of July. As the name suggests the *June Lyrids* can be observed in June, from the 10th to the 21st reaching the maximum on the 15th with an hourly rate of about 8 meteors. The Lyrids are typically visible from April, 16th, to April 25th, with its maximum around the 20th to 21st.

On a "Lighter" Side....Identifying Different Fixtures



Full-cutoff optics are the most efficient way to put light on the ground. Full-cutoff optics do not emit light above 90 degrees. Cutoff optics are gaining popularity around the USA, to the delight of astronomers. These optics direct light to the ground, significantly reducing sky glow. Cutoff optics also reduce glare for drivers. Cutoff fixtures generally have more defined light patterns, which allow for excellent light control.



Semi-cutoff optics, allow most of the light to be emitted below 90 degrees, but some light to be emitted above 90 degrees. These types of optics are commonly used in cobra-head style streetlighting. They are quite effective at diffusing the light over a large, directed area on the ground. These lights still contribute to light pollution, although not as much as non-cutoff lights. There is still significant glare from these fixtures, but often, they are mounted on taller poles, which remove them from the driver's field of vision.



Non-cutoff optics, allow light to be emitted in all directions. Many decorative fixtures use non-cutoff fixtures. Non-cutoff optics are the least efficient way to put light on the ground. They are generally effective at throwing light up into trees, and create a large amount of light pollution and glare.

Day	Time (CST)	July Celestial Events
1	10 p.m.	The moon passes 0.4 degree north of Uranus
7	10 a.m.	The moon passes 4 degrees south of Jupiter
8	10 a.m.	The moon passes 3 degrees south of Saturn
10	4 a.m.	The moon passes 0.8 degree north of Aldebaran
13	2 a.m.	Venus passes 1.5 degrees south of Regulus
14	4 a.m.	The moon passes 3 degrees north of Mercury
	2 p.m.	Venus is at greatest brilliancy (Mag -4.5)
15	4 p.m.	The moon passes 1.1 degrees north of Regulus
	6 p.m.	The moon passes 3 degrees north of Venus
20	5 p.m.	The moon passes 7 degrees north of mars
26	5 a.m.	Mercury is in inferior conjunction
28	7 a.m.	Partial lunar eclipse

"Family Telescope Making" Program for July PAC Meeting

At the July PAC meeting (July 27), Martin Gaskell, with the help of his children, will present a program about how you can build telescopes with your children (or grandchildren) for a tiny fraction of the cost of commercial telescopes. Martin says:

"I meet many people who want to get into amateur astronomy but are deterred by the high cost of telescopes. This is especially true of junior high schoolers, high schoolers, and families on tight budgets. I want them to realize that building their own telescope is not hard and also that it makes a great project to do with your children, even little pre-school children"

Club members who've attended some of Martin's previous club programs on telescope making or who've come to Astronomy Days over the last few years will have seen some of the telescopes the Gaskells have made (remember "Tel'Poke" the 6-inch equatorial Newtonian made for less than \$50?!).

The July meeting is something you'll want to bring your children to. In fact, have your friends and neighbor come with their kids too! There'll be some "hands-on" stuff.

As a "warm-up" for the July program Martin has a bold plan. Last year he won a 6-inch mirror making kit from Newport glass works. The Gaskells have a friend called Kelly who has just graduated from high school and who would like her own telescope. The plan is to have Kelly and some of her family, and other interested people, come round to the Gaskells on Saturday July 24th at 9 am in the morning to start grinding the 6-inch mirror. Martin hopes to have a 6-inch reflector completely finished (and the mirror aluminized!) ready to observe by sunset!!! Martin doesn't know of anyone who's done this before so if they really do this he's hoping to document it with photos and video and write an article about it to inspire other would-be telescope makers. If the Gaskells do indeed go ahead with this telescope making marathon as planned and if you'd like to take part, give Martin a call at 464-9664 or send him an e-mail at MGASKELL1@UNL.EDU. If the response is overwhelming they'll just have to make TWO telescopes!



Holly Johnson and Michelle Guittar fine grinding a 12-inch telescope mirror during our 1999 "Astronomy Day"
(Photo: Jack Dunn)

July's Sky Show

By **Martin Ratcliffe and Alister Ling**

Warm summer evenings are the perfect time to learn or reacquaint yourself with the stars of summer. Begin the journey with the bright gems that are obvious at first glance. Face south and the rich Milky Way will be easily visible to country residents. City and town dwellers will have to be satisfied with a view of the brighter stars that merely hint at the splendor seen in a dark country sky. Even so, a city view is ideal for the beginner who is learning his or her way around the night sky.

Late in the evening, check overhead for the brightest of the summer stars, Vega. It lies 24 light-years away and is part of the constellation Lyra the Harp. Near Vega is the famous double-double, Epsilon (ε) Lyrae. These two 5th-magnitude stars lie just over 3' apart and can be split in binoculars. Each of these stars is itself a double, but you need a telescope to split them into their component stars.

To Vega's northeast you'll find Deneb in Cygnus the Swan. Deneb marks the tail of an elegant swan that flies along the Milky Way. In fact, Deneb and Cygnus can help city residents locate the Milky Way. The swan's wings are spread perpendicular to the faint band, while her long graceful neck runs parallel to it.

Those who pointed their telescopes toward Epsilon Lyrae should also take a look at the swan's head, the incomparable double star Albireo. This twosome pairs a 3rd-magnitude yellow star with a 5th-magnitude blue star. It offers observers one of the finest color contrasts in the sky.

High in the southeast, about halfway up from the horizon, is Altair in Aquila the Eagle. Star Trek fans may notice Aquila's resemblance to the communication badges crew members wear on their uniforms. To the ancient Greeks, Aquila was known as the Thunderbird who returned the lightning bolts Zeus threw at Earth.

Vega, Deneb, and Altair mark the three stars of the Summer Triangle. This asterism represents an easy branching point to locating other stars. It takes time to learn the fainter groups of stars. Start with what is easiest and you'll soon find your way around the summer sky.

When looking at Mars, you might think you've found the twin of Arcturus. Mars and Arcturus appear about the same brilliance this month, though Mars will shift its position nightly. July begins with the planet roughly 5° east of Spica. On July 20, the 30th anniversary of the first moon landing, a first quarter moon forms a nice triangle with Mars and Spica. By July 31, Mars has moved into Libra and lies 4° west of the beautiful double star, Zubenelgenubi (Alpha [α] Librae). Over the course of the month, Mars dims from magnitude -0.4 to 0. Viewing details on the planet's surface becomes a challenge as its apparent diameter shrinks to under 10".

If you catch Spica and Mars soon after dusk, say around 10:30 p.m. local time, you won't be able to miss the brilliance of Venus low in the west. It outshines everything in the sky except the moon. The brightest Venus can become is magnitude -4.5, which is achieved on July 17. During the week leading up to this date, Venus lingers close to Regulus, the first magnitude star leading Leo the Lion toward the western horizon. On July 11, Venus lies a mere 1.2° away from the Lion's heart. It shines a staggering two hundred times brighter than Regulus.

A telescopic view of Venus shows a phase similar to that of the moon. The planet's crescent phase undergoes rapid changes this month -- shrinking from 37-percent illumination to a mere 12 percent (similar to the moon's July 15 appearance). At the same time, its apparent size grows noticeably. Venus reaches 48" on July 31. (See "Venus Rising," February 1999, for further details.) Mercury remains briefly visible in the evening sky before heading toward a July 26 inferior conjunction with the sun. Look for it low in the west 45 minutes after sunset during the first few days of July. It fades quickly, below first magnitude, by July 5.

After Mercury and Venus have set, focus on the southern region of the sky. Here, within the constellations Scorpius and Sagittarius, the

Milky Way is at its richest. The brightest star in the region is magnitude 1.0 Antares, part of Scorpius the Scorpion. The star's name means "rival of Mars."

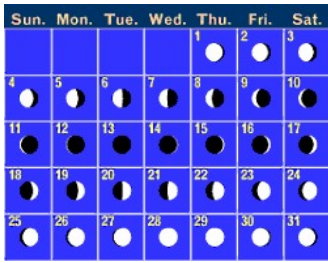
If the Milky Way is overshadowed by light pollution, use a pair of binoculars to increase your observing prowess. Scan the region to the east of Antares. Open star clusters and nebulae abound there. Lying above the tail of the Scorpion are M6 (NGC 6405) and M7 (NGC 6475), a pair of wonderful open clusters that are easily seen in binoculars. A couple degrees east of the 3rd-magnitude star Lambda (λ) Sagittarii is M22 (NGC 6656), the brightest globular cluster in the Archer.

Above Sagittarius's teapot shape is the Lagoon Nebula (M8) -- a striking object in both binoculars and a telescope. Only 1° north of the Lagoon lies the Trifid Nebula (M20), laced with dark tendrils. North and slightly east of M20 are two more fairly bright and famous nebulae. The Omega Nebula (M17) is the southernmost object. Just to its north is the Eagle Nebula (M16). This mélange of gas and dust was made famous by Hubble Space Telescope images. As is the case with nebulae, the telescopic view will never match the photographic one. Yet seeing these objects personally and recognizing their true nature and scale is a satisfying experience.

Closer to home, two planets attract special attention. Rising in the southeast among the stars of Capricornus the Sea Goat are Neptune and Uranus. Both planets will be occulted this month by an intervening moon. The events take place just one day apart, on July 28 and July 29. The first event occurs roughly one hour before the moon enters Earth's penumbral shadow -- the beginning of a partial lunar eclipse. The disappearance of dim 7.8-magnitude Neptune takes place near local midnight on the west coast and shortly after 4 a.m. local time on the east coast. Its faintness will make seeing the occultation a challenge for small scopes. The reappearance of Neptune occurs after the moon has entered Earth's penumbral shadow for the eastern half of the United States. Check the International Occultation Timing Association's (IOTA) website for local times of events (<http://lunar-occultations.com/iota/iotandx.htm>).

During the early hours of July 29, the moon occults Uranus almost exactly 12 hours after the Neptune event. Uranus shines at magnitude 5.7, making it an easier object to view close to the nearly full moon. Using high magnification helps to shift most of the moon's brilliance outside the field of view, making Uranus easier to observe.

The beginning of the partial lunar eclipse is visible from most of the United States. East coast observers see first contact with the umbral shadow of Earth as the moon sets, while the entire eclipse is visible from the Pacific coast and the Hawaiian islands. The event begins at 10:22 UT or 3:22 a.m. Pacific Daylight Time (PDT). Maximum eclipse occurs at 4:34 a.m. PDT, and ends at 5:46 a.m. PDT. At maximum, 40 percent of the moon's diameter will be in shadow. Observing Jupiter and Saturn calls for an early start in July. By 3 a.m. local time, both planets are well clear of the horizon. Saturn's rings present their widest guise since 1991 -- showing off a 20° tilt to earthbound observers. There isn't much time to take in the view as the brightening eastern horizon indicates dawn is fast approaching. Jupiter and Saturn are only 12° apart and both lie within the constellation boundaries of Aries the Ram. Finally, observers in the extreme northeastern United States might be able to see the occultation of Aldebaran by a waning crescent moon on the morning of July 10. The event for Boston occurs within minutes of moonrise, which leaves little room for adjusting the telescope. You will need an exceptionally clear view to the eastern horizon (find a coastal observing location with a view out to sea) to see the event. It occurs shortly after 3 a.m. Eastern Daylight Time. For observers in northern Europe, the event may be seen in daylight.



THE PRAIRIE ASTRONOMY CLUB CALENDAR

For July 1999

Sun Mon Tue Wed Thu Fri Sat

<u>UNIVERSE'S EXPANSION CLOCKED:</u>				1	2	3
If the universe deserves to get a speeding ticket, then no one is in a better position to levy the fine than Wendy Freedman of the Carnegie Observatories. Head of the Hubble Space Telescope (HST) Key Project on the Extragalactic Distance Scale, Freedman has declared a definitive value for the Hubble constant (H0), which describes the universe's expansion rate. "Our final result [for H0] is 70 kilometers per second per megaparsec," Freedman announced May 25th during a press conference at NASA's Washington, D.C., headquarters. The result is good to 10 percent, says Freedman, and is in reasonable agreement with another ongoing HST study being led by Allan Sandage, also at Carnegie. (Sandage's study suggests a slightly lower H0 value of 58, also said to be good to about ten percent).				REMAINING 1999 MAHONEY STAR PARTY DATES: FRIDAY, JULY 16 FRIDAY, SEPT 10 FRIDAY, OCT 8		Hyde Observatory open to the public sunset-11 PM
4 See the bottom of page two for information on Tom Miller's 4th of July Party.		6 3 RD QUARTER 	7	8 NSP Planning Meeting 7:30 PM	9 UNL Student Observatory open to the public 9:00 PM - 11:00 PM Club Star Party Olive Creek SRA	10 Hyde Observatory open to the public sunset-11 PM
11 Hyde volunteer night 8:30 PM - 10:00 PM	12 NEW MOON 				16 Mahoney Star Party Sunset until ??	17 Hyde Observatory open to the public sunset-11 PM
		20 1 ST QUARTER 				24 Hyde Observatory open to the public sunset-11 PM
		27 PAC Meeting 7:30 PM Hyde Observatory	28 FULL MOON 	29 NSP Planning Meeting 7:30 PM	30	31 Hyde Observatory open to the public sunset-11 PM

Hyde Volunteer Schedule for July 1999

- July 03: Mark Fairchild, Travis Miller, Don Gasparetti, Lee Taylor
- July 10: Dave & Joey Churilla, Bob Leavitt, Tiffany Christatos, Deepali Gangahar
- July 17: Travis Miller, Mel & Rosemary Thorton, Alex Starace
- July 24: Don Gasparetti, Ben Rush, Mark & Michael Fairchild, Harve Deogun
- July 31: Lee Taylor, Jim & Laura Woodson, Elaine Klage

Volunteer Night: July 11, 8:30 pm to 10.

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.

DIRECTIONS TO OLIVE CREEK SRA

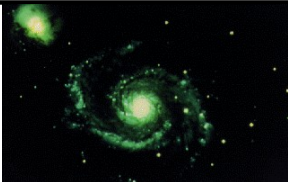
From Lincoln, take Hwy 77 south to Hwy 33. Take Hwy 33 west (toward Crete) for 9 miles to SW 114th St. Take SW 114th Street south 4 miles (almost to Kramer). Go east 1 mile on W. Panama Rd, then south 1.5 miles on SW 100th. We set up in area 1 on the west side of the lake.



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- | | |
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First Class Mail

Next PAC Meeting
June 29, 1999
7:30 PM
Hyde Observatory

NSP 6 Countdown
Less Than 38 days
August 7-14, 1999
Merritt Reservoir