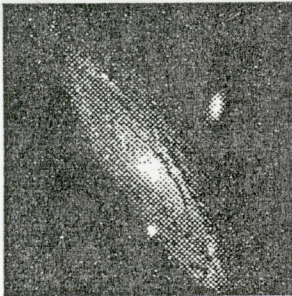


The **Prairie Astronomer**



# 1st Annual Nebraska Star Party Is Huge Success!

by Dave Scherping

**T**he 1st Annual Nebraska Star Party turned out to be a huge success. We attracted 73 attendees from Lincoln, Omaha, Chadron, & Amarillo. Thanks to the star party's designated "Clear Skies Coordinator", Jason Stahl, attendees enjoyed 2-1/2 out of 3 nights of fantastic observing with the Milky Way straight overhead. He got off to a slow start though.... Thursday night was cloudy until midnight. Friday and Saturday nights were crystal clear.

On Friday, about one-third of the attendees went canoeing and tubing down the Niabrara River. Friday evening featured the star party barbecue. On Saturday evening, we gave away a substantial number of door prizes and several awards. Bill Canady of Amarillo, who failed to show up, was awarded the "1,000,000 B.C." award, including a tee-shirt showing the cave man at Morrill Hall using the Canady Star Pointer. Alan Scruggs, also from Amarillo, received the "Gaseous Nebula Award" for his notorious reactions to the food at the Prude Ranch. Tom Miller received by far the most awards, including the "Big Dob Award" for largest telescope, the "Al Nagler Award" for most eyepieces, the "Largest Telescope Without Optics Award" for his innovative 30" mirrorless telescope, and the "Obsessed telescope Buyer Award". His wife, Jennifer, received the "Wife Of The Man With The Most Toys Award".

Saturday night ended with a spectacular fireball, which cast shadows on the ground as the last of the die-hard observers finished packing up their equipment and were raising a toast to next year's NSP.

There are still a few tee-shirts that were ordered and were not picked up. Please make arrangements to pick them up at the July meeting or contact me asap. We sold all of the extra tee-shirts. Several people have requested additional tee-shirts. If there are a minimum of 24 additional shirts requested, we will place an-

other order. Cost is \$8.50 per shirt. Contact Jason Stahl at the July meeting or call me at 477-2596.

At the July meeting, we will discuss hosting the 2nd annual NSP next year. We will be seeking several volunteers to help coordinate registrations, reservations, programs, tee-shirts, publicity, and door prizes, etc.



### LAST MONTH....

At the June meeting, there was an excellent demonstration of Dance Of The Planets by David Knisley and a humorous video tour of Car-Henge by Ron Veys. Both presentations were great and well appreciated.

### THIS MONTH....

At the July meeting, we will see a video tape of the Nebraska Star Party, by Earl Moser.

# Welcome!

David Nolte  
1640 So. 38th St.  
Lincoln, NE 68506

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# While You Were Gone...

by Jason Stahl

## Reminders for August

- ☉ August 2nd The moon passes 3 degrees south of Mars around 2300 hrs.
- ☉ August 3rd Asteroid Psyche is at opposition. (see page 52 in Astronomy, August '94 for complete details on Asteroid Psyche and Asteroid Amphitrite.)
- ☉ August 5th PAC Star Party at Atlas Site
- ☉ August 6th PAC Annual Picnic/Star Party
- ☉ August 7th New Moon 3h 46m
- ☉ August 10th Asteroid Amphitrite is at opposition. (see August 3rd)
- ☉ August 11-12 Perseid meteor shower peaks in the early morning hours. (Waxing crescent Moon) Perseid Meteor Watch at PAC Atlas Site.
- ☉ August 14th First Quarter 0h 58m
- ☉ August 21 Full Moon 1h 47m
- ☉ August 26th Mahoney Star Party, sunset- 11p.m.
- ☉ August 29th Last Quarter 1h 42m
- ☉ August 30th Club Meeting at Hyde Observatory, 7:30p.m.

## Star Party Results

If you were unable to attend the First Nebraska Star Party at Merritt Reservoir, you should give yourself several kicks in the butt.

Thursday afternoon was spent settling in for the few nights of spectacular observing. After touring the area of the observing site, several of the attenders stared in wonder. Eagerly waiting for the Clear Skies Coordinator to part the few clouds that threatened our first night. As the group began to feel the pain of a sleep shortage plow over their racing bodies, the clouds grew even more deadly for the Clear Skies Coordinator (me). By seven p.m. several people went to the Snake River Falls restaurant for dinner. After waiting a couple hours for the one man chef to prepare their meals, each ventured into what would be an amazing hike. As you take the short tangled trail down the steep dirt terrain, your view was incredible. Who would have thought that a water fall, that appeared to belong deep in the Allegany Mountains, is here in Nebraska.

After the three hour dinner for some, thoughts of finding the Clear Skies Coordinator became reality. The group stormed all over the country side, tasting the blood on their lips and smelling death in their noses, hunted me down and threw the rope over the highest limb they could find. Facing death before my eyes, I looked toward the heavens for my last prayer. The crowd was growing in size, as was their chanting, the flashlights were illuminating my pail face, and someone asked, "Any last words Clear Skies Guy?" I said yes, and asked for a moment to ponder my thoughts. I looked once more towards the heavens for one last hope. Could it be I asked to myself, clear skies above my once worthless body, yes!! I looked down to where the flashlights were coming from, and said, "Shut off your lights and behold, above you I give you what you are here for. Untie me and I will continue to give you Clear Skies. If you do kill me, when I am dead, I will give you the worst storms this area has ever seen for the next three days." Quickly I was untied and cared for my wounds, the mob broke apart and began to enter their vehicles and race to the observing site. Some stayed behind and observed from the cabins. I remained behind, because I only granted them a large "sucker" hole that lasted only half and hour.

Friday was a much better day for all of us. After a long sleep, many of us were ready to brave the cold water of the Niabrara River. The many people who did go down the river, whether in canoe or tube, enjoyed every minute of the trip. Bob Leavitt and family did a fantastic job organizing and executing the trip. Thanks Bob for a fun time on the river.

Friday night's BBQ was one of the best many of us has had in a long time. The food was plenty and good. According to the

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(Continued from page 2)

TSP attenders, this was beyond first class. Through the BBQ hours, the skies cleared amazingly fast and stayed clear, I guess my Clear Skies Dance works. The night was superior, the Texas group said this was as dark if not darker than the skies at TSP!! People asked where the dimmer switch was for the Milky Way. At one point, M57, the Ring, was in a 17.5" scope with newly coated optics to 96% reflectivity, and without a filter it looked much brighter than from our site with the same scope with a filter. Someone got a pair of sunglasses out and looked at M57, and said they helped a little but not much. The highlight for observers was a view of AB 2065 the galaxy cluster in Coma Berenices. It could only be seen in Tom Miller's 20". Even with that size of a scope, AB 2065 proved to be a challenge to find. With the help of the Mega Star program and a large selection of eyepieces at hand, it did not take long to locate the correct area and see half a dozen galaxies.

Friday was the shortest sleeping day for the entire trip. Most people stayed out until 3:00a.m., but several stayed until 4:00a.m. Saturday morning. By eight Saturday morning we were up exploring our Resort in more detail than Thursday. Some rented boats and gave three hour tours, while others fished or relaxed. If you did not like to go on a boat, some went on the 4x4 trails and had a great time driving around the Reservoir. Others just did some sight seeing and sleep the day away. By Saturday evening, it was time for the door prizes, with a total number of seventy people accounted for, the prizes were accepted by the winners with great joy. It was time again for more observing, but first I was asked to do my Clear Skies Don't Go Away Dance. It worked and with twenty scopes trained on the sky, this was the best night for observing. On this night we saw two meteors that were the best many of us have ever seen. The first one lasted a long ten seconds, breaking up twice, dieing out then re-firing once again to continue its path. The second one was about -3 in magnitude when it started, it then exploded and casted shadows on the cars and ground. WOW.

Well, Sunday came all to soon, the trip home was long and tiring. Every one made it home with memories that will last a life time. We can not wait until next year for this trip to the darkest skies in the Northern U.S.

### What's up in the Oberving Chairman's Report

For those who went to Merritt, you probably don't want to observe in skies like ours ever again, but don't feel bad, many of us feel the same way you do.

- ✓ We start this month with NGC 6543=PK 96+29.1 (Cat's eye) Draco, PN, 17h 58.6, 66deg38m, 8.8mag., size >18". This is a bright geen PN with a bright Geen central star giving the reason why it is the Cat's eye.
- ✓ Next is the complete area for the Veil Nebula. NGC 6992,6979,6960,6995.
- ✓ 6960 is the western Veil Nebula in Cygnus, 20h 45.7, 30deg43m, size 70x6'. pretty bright #52 Cygni is the source star. 6992 is the northeast portion, 20h 56.4,31deg43m size 60x8'. This portion is fainter than 6960. 6995 is the east portion, 20h 57.1, 31deg13m, size 12'. If you have an OIII filter, use that to see more detail in structure.
- ✓ NGC 6826=PK 83+12.1 is also in Cygnus, PN, 19h 44.8, 50deg31m, 9.8mag., size >30". Under high power, you can see some small "arms" extending from the main part. You will need stable air and dark skies to see it.
- ✓ NGC 6891=PK 54-12.1, Delphinus, 20h 15.2, 12deg42m, 11.7mag., size>12". This is called the "Blue Nebula" because it is a bright blue in color, nice to look at for color contrast.
- ✓ NGC 6888 "Crescent Nebula" in Cygnus, 20h 12.0, 38deg21m, size 20x10' is faint and will need an OIII filter to see it. When you do see it, it looks like the northern half of the Veil.
- ✓ NGC 6853=M27=PK60-3.1 Dumbbell Nebula (Dougbell Nebula) Vulpecula, 19h 59.6, 22deg43m, 7.5mag., size 8x5' At Merritt, we could see four stars arround the central star and many more within the Nebula without an OIII filter. From here you will need and OIII filter to see that much detail.
- ✓ NGC 6705=M11 "Wild Duck Cluster" Scutum, Open Cluster, 18h 51.1, -6deg16m, 5.8mag., size 14' >500 stars.
- ✓ NGC 6712 Scutum Globular Cluster, 18h 53.1, -8deg42m, 8.2mag., size 7.2' >15mag stars at core.
- ✓ B118=LDN 509 Scutum, Dark Nebula 18h 53.9, -7deg27m., very Opaque, size 1' This will be somewhat difficult to find in the heart of the Milky Way, but can be seen.
- ✓ B 133=LDN 531 Aquila, Dark Nebula, 19h 06.1, -6deg50m, size 10x3', very Opaque, Oval shape, (Bok globule present)
- ✓ B 134=LDN 134 Aquila Dark Nebula, 19h 06.9, -6deg14m, size 6', again very Opaque.
- ✓ The last three objects will take some time and hard searching to find these void spaces within the realm of thousands of stars. If you take your time, you will find them and be happy with what you see.

*Good luck and Happy Observing. See you at the July Meeting.*

# 70 Ophiuchi - A Double Star To Follow

by Martin Gaskell

Double stars. Every amateur astronomer has heard of them. Every star atlas lists them. We've probably all glanced at a few of them. We know, in theory at least, that they orbit each other, but what about really following them as they orbit each other with a telescope? When I started out in astronomy at Junior High School age I felt that actually following a pair orbiting was something totally out of my reach. I thought I needed something costly called a filar micrometer costing \$1000 and a bit refractor on a solid German equatorial mount with an accurate clock drive (costing many thousands of dollars). When I was a freshman in college I did get access to such a setup and making a few measurements satisfied me for a while.

More recently I've also learned that you don't need a \$1000 filar micrometer to measure double stars and you can use a cheap homemade equatorial. I'm now measuring the separations and position angles of double stars to an accuracy several times greater than the resolution of the Hubble Space Telescope just using a piece of cardboard and a home-made paper degree scale on "Tel'Poke" our homemade 6" f/8 Newtonian! Ask me if you'd like to know how to do this (my phone number is 464-9664). A great thing about observing double stars is that light pollution is almost never a problem.

There was another problem though that I had as a beginning amateur in addition to lack of equipment, and this was knowing which stars were interesting to follow. I don't think this is explained in any book, so I'm going to tell you about the best double star to follow in the late summer: 70 Ophiuchi.

70 Ophiuchi is the (eastern) left-most star of a triangle of 4th magnitude stars a few degrees to the east (left) of  $\beta$  and  $\gamma$  Ophiuchi below Hercules. It is shown on all star charts. At the beginning of August it is on the meridian at midnight (CDT).

70 Oph is one of the most interesting binaries in the sky for an amateur-sized telescope for several reasons: both components are fairly bright, it has a large separation and it appears to move rapidly. All this is because 70 Oph is only 16.7 light years away from us. The closest the stars ever appear to be is 1.53" (which happened in June 1989) and the widest they get is 6.75" (which will occur in 2024). The A component is mag. 4.3 and the B component is mag. 6.0. The system has been followed since the first observations by William Herschel in 1779 so the stars have been followed for over two orbits.

The true orbit has a periastron distance (distance of closest approach) of 11.7 au (astronomical units; 1 au = the mean

earth-sun distance) and an apastron distance (when they are furthest apart) of 35.0 au. The orbital period is 88.30 years with an uncertainty of about 6 months. To give a sense of the scale of the system this corresponds to the B star orbiting the A star in an orbit which in our solar system would go from just outside the orbit of Saturn to between the orbits of Neptune and Pluto. This is an interesting fact to bear in mind when looking at the system and a good thing to share with any friends looking at 70 Oph with you. 70 Oph A is a little less than half the luminosity of the sun and 70 Oph B is less than 1/10th of the luminosity of the sun. Both stars are redder and less massive than our sun.

Stars orbit most quickly when they are near periastron and we are now (1994) closer to periastron than apastron so the stars are still moving fairly quickly. The orbit is also inclined to our line of sight by 59.2 degrees and this tilt has been making the angular speed of the star appear faster the last few years. The results of this are that if you are careful you can detect the orbital motion of the system even during a single observing season!

As seen in an inverting equatorial telescope (no star diagonal), B is almost directly above A right now, almost at "one o'clock" (PA 180 is straight up). If you don't have a drive or if you turn your drive off you will see that B is approximately perpendicular to the direction the stars are drifting. The system is rotating clockwise (PA decreasing). By next spring the B star will be noticeably further to the right of vertical. In a year it is currently moving about the amount the hour hand on a clock moves in half an hour. This should be obvious even without making any sort of measurement of the angle. Just make your "first epoch" observations now with a careful drawing in your observing book and wait until next year. You will have seen a double star move in its orbit! Of course, if you can make an actual measurement of the angle then the orbital motion will be even more obvious (see me if you want to learn how to measure double stars with a piece of cardboard!).

To get the best view of close double stars leave your telescope outside for a couple of hours before you observe (re reduce local seeing), make sure it is VERY well collimated, and use a VERY high magnification. With our 6" Newtonian I like to use 500x. With a 10" I like to use 700x. At these high powers an equatorial mount and drive are a big help.

Here are two sets of predictions of the separation and position angle. They are based on two different calculations of the orbit. The second one is the most recent but a comparison gives you an idea of the uncertainty and also why double star measurement are still needed. The differences between the two predictions are several times the accuracy which can be achieved with a 10" telescope and a piece of cardboard so low budget amateur observations could be useful here (I usually get

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## HOW GOOD IS GOOD?

by David Knisely

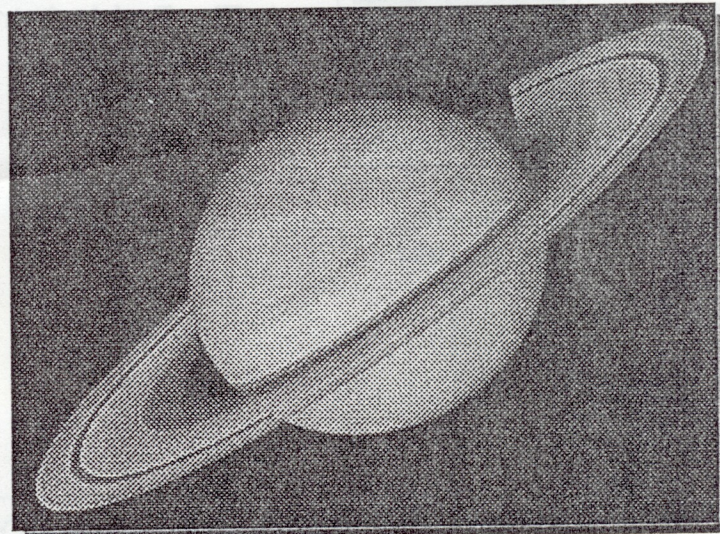
Ever since I first got my little 2.4 inch refractor, I have worried about exactly how good my telescope's optics really are. Many years and several telescopes later, I was still worrying. I learned the hard way about poor equipment when I purchased a ten inch Newtonian from a former club member a few years ago. He had done a few things wrong in building it, but it wasn't anything I couldn't fix fairly easily with a few hand tools and some wood. However, the primary mirror was something else again. It showed obvious signs of severe spherical aberration in the star test, and I wasn't sure of the cause. The previous owner had glued the ENTIRE mirror to the back of the simple wood mirror cell, and I figured once I got it cut loose and in a proper mirror cell, the mirror would perform better. Unfortunately, when I got done "fixing" things, the spherical aberration remained. I pulled the mirror out of the telescope, borrowed a mirror test rig, and began to read up on optical testing procedures. After learning how to use the Caustic test (and spending a lot of time in the basement squinting at a brilliantly illuminated mirror), I came to the agonizing conclusion that the primary was woefully bad and needed to be refigured. A quick trip to Enterprise optics produced a refigured 10" mirror that was a good deal better than it used to be, but still not quite up to the 1/20th wave peak-value wavefront error I had been hoping for, although its figure was fairly smooth otherwise. Using the star test, I thought I could detect a small amount of spherical aberration still present in the mirror. Even after using it successfully for a while, I still wondered how much better the mirror could have ended up, and whether it's slightly imperfect figure could be affecting my high power viewing. These impressions of imperfection continued to bother me for several years, until one memorable night, when I found out the real truth.

It was a pleasant June evening just after sundown, with a four day old moon shining in the still blue sky. What it turned out to be was one of those one-nights-in-a-hundred when the air stands perfectly still and the seeing is rock solid. After collimating things a bit, I took a look at the moon to check the finder alignment at 230x, and was blown away by an incredible scene which changed my outlook completely. I simply cannot describe how fantastically sharp and detailed the view was, with hundreds of tiny craters dotting areas which I had previously thought were relatively smooth and uninteresting. The giant rugged walled plains and rolling highland regions were also dotted with tiny pits and rich detail, as I pushed the scope to 400x without the image degrading. Tiny cracks, ridges, and rilles wound around the edges of the mares, and incredibly sharp vistas filled my field of view. The tiny one-mile-wide crater Linne was easily revealed as a sharp-rimmed pit near the west edge of Mare Serenitatis, as were numerous smaller pits and ridges. I could easily see the two tiny craters which the Apollo 16 astronauts landed in between and then drove to in the Lunar rover. As I was examining the bright east limb, a 10th magnitude star appeared from behind the moon,

showing a nice round Airy disk and two or three well-defined diffraction rings. In short, the view through my "imperfect" telescope was essentially PERFECT!

The impression of perfection continued when I pointed the telescope at Jupiter. I am usually fairly good at doing quick drawings of the planet, but that night, there was far too much detail visible to be recorded in any sketch I might make. The orangish equatorial belts showed numerous rifts, festoons, spots, and bluish clouds, which laced the planet's lower latitudes. The narrow mid-latitude belts were quite prominent, and color in the details was the best I have ever seen. The high latitude regions which are normally fairly dull had a number of tiny white ovals and a few small dark spots visible. All four Galilean moons had well-defined disks, each of differing size, making it easy to tell which satellite was which. I even amazed a young couple who were out for an evening walk with a high power look at both our moon and Jupiter. For once, I didn't have to explain to them why seeing would cause the view to blur, because each object was picture perfect in every detail. Not bad for an "average" mirror!

How good is my 10" mirror? The mean wavefront error is 1/25th wave, the RMS error is 1/11th wave, and the maximum peak wavefront error is 1/6th wave (take your pick), but what all this really means is that it is GOOD ENOUGH. As for the rest of you, QUIT WORRYING ABOUT YOUR MIRRORS! It is how the optics perform on the real sky that is most important. If they give you good diffraction disks, good contrast, and only a little spherical aberration, they too will be "good enough" for you.

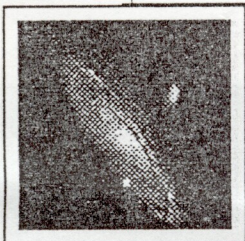
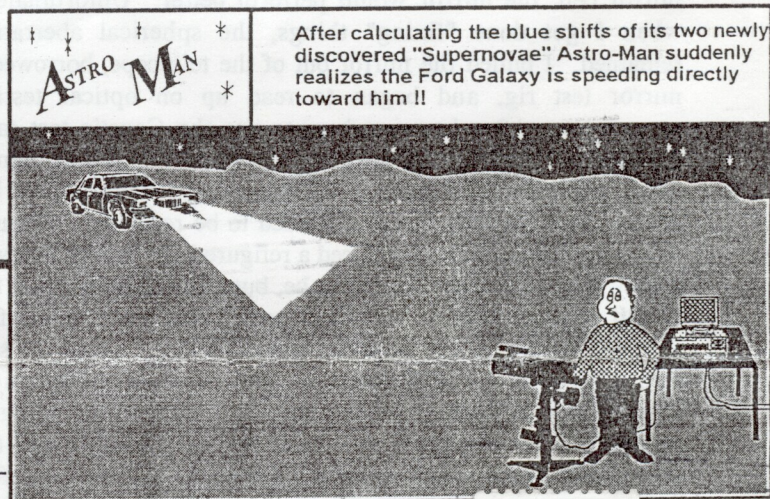


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results to a fraction of a degree in PA and to a few hundredths of an arcsec in separation).

		Prediction 1		Prediction 2	
		PA	Sep	PA	Sep
1994					
August 1	= 1994.58	168.6	2.44"	173.2	2.25"
September 1	= 1994.67	168.1	2.46	172.6	2.27
October 1	= 1994.75	167.6	2.48	171.9	2.30
1995					
June 1	= 1995.42	163.7	2.66	167.5	2.47
July 1	= 1995.50	163.3	2.69	167.0	2.49
August 1	= 1995.58	166.9	2.71	166.5	2.51
September 1	= 1995.67	162.4	2.73	166.0	2.54
October 1	= 1995.75	162.0	2.75	165.5	2.56

70 Oph has a long history of not conforming to the expected orbit. The orbit appears to have changed since 1878. This is a big mystery. Were observations before 1878 simply systematically in error? Or was there an encounter with an intruder to the system, an interstellar *Nemesis* star? Only time and more observations will tell.



The Prairie Astronomer  
 c/o The Prairie Astronomy Club, Inc.  
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 Lincoln, NE 68501



Next Meeting  
 July 26, 1994

94027 09/95 FS 08  
 Mr. Earl Moser  
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 Hickman NE 68372

7-94

Please Notice: If there is an asterisk on your mailing label it is time for you to renew your PAC membership!

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