The Prairie Astronomer

The Official Newsletter Of The Prairie Astronomy Club, Inc.

April 1999 **Volume 40 Issue #4**

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MEETINGS & EVENTS

PAC MEETING
TUESDAY, APRIL 27, 1999, 7:30 PM
at Hyde Memorial Observatory

NSP PLANNING COMMITTEE MEETING
THURSDAY, MAY 13, 1999, 7:30 PM
At Mahoney State Park Lodge

CLUB STAR PARTY
FRIDAY, MAY 14, 1999 SUNSET UNTIL ??
Olive Creek SRA

UNL STUDENT OBSERVATORY
FRIDAY, MAY 14, 1999, SUNSET UNTIL 11:30 PM
Open to the public

ASTRONOMY/SPACE DAY 99
FRIDAY AND SATURDAY, MAY 14-15
NE ANG, Duncan Aviation, and Mueller Planetarium
See schedule on page 8 for details

MAHONEY STAR PARTY
FRIDAY, MAY 21, 1999, BEGINNING AT SUNSET
at Mahoney State Park

PAC MEETING
TUESDAY, MAY 25, 1999, 7:30 PM
at Hyde Memorial Observatory

APRIL'S PROGRAM:
Stephanie Snedden

This month Stephanie Snedden, a graduate student at UNL working on the astrophysics of quasar broad-line regions, will give a presentation on ground based sky surveys. Surveys such as the Sloan Digital Sky Survey and NOAO's Wide Deep Field Survey are pushing the frontiers of our understanding of the universe. The Sloan Digital Sky Survey, for instance, has recently discovered the furthest known quasar, with a record-shattering redshift of 5.0.

SPACE DAY 1999: NASA Astronaut Kenneth D. Cockrell, pilot of space shuttle mission STS-69, mission commander of mission STS-80, and future commander of STS-98, will be with us at this years Astronomy/Space Day 99 in Lincoln. Read more about him inside. For the latest about Space Day, see page 8 or go to the calendar on the PAC website.

WHERE TO FIND PLUTO: If there's a time to easily find and track diminutive Pluto, this is it. Pluto spends all of May less than 1° (two moonwidths) from the bright star Zeta (z) Ophiuchi, which is better known as "the middle of the three bright stars lying along the base of Ophiuchus." See the finder charts on page 4.

MARS: The planet Mars begins its travel across the sky in the evening hours during May. Check out Dave Knisely's report on page 3 and the Planetary Events for May on page 10.

NEXT MONTH: The sky is never the limit...only the beginning at the nationally recognized Powell Observatory near Louisburg, KS. Read about this and the Kansas Astrophotographers and Observers Society's (KOAS) **Scopeville USA** viewing site.

CONTENTS:

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

Photo courtesy: Mark Fairchild

Dave Knisely opened the meeting. He reported that the “Stars of the Prairie” night at the Homestead National Monument in Beatrice brought in about 40 people, even though it was a cloudy and rainy evening. Another event is planned in September and they invite PAC members to come and bring their telescopes.

The next PAC Star Party will be April 9 at Olive Creek State Recreation Area.

Jack Dunn passed around a sign-up sheet for the Cosmosphere trip, April 17-18. Those attending will need to make their own motel reservations; check with Jack for information. The website for the Cosmosphere is www.cosmo.org. The IMAX films shown that weekend will be on Alaska and T-Rex.

Jack went over plans for Astronomy Day, May 15. Setup will begin in the planetarium lobby at 8:00 a.m., with the display open from 9:00 - 4:30. He needs display items such as telescopes, pictures and computers, as well as help during the day. Jack will have a B2 model set up in the lobby. An astronaut is being “assigned” to us and a bio will be forwarded soon. A Tuskeegee airman will also be a guest. The astronaut will be at the Planetarium Saturday morning and at the airbase on Saturday afternoon, which is Armed Forces Day. Activities for schools will be held Friday, May 14, at the Air Base.

Friday night there will be a reception for the astronaut and other guests. This reception will not be open to the public; PAC and OAS members, as well as members of other sponsoring organizations, will be invited.

Jeff King reported a correction to the times listed in the newsletter for the UNL observatory: it will be open from sunset to 11:00 on April 16. Please continue to submit articles for the newsletter to Jeff.

The next NSP committee meeting will be Thursday, April 8, at Mahoney State Park Lodge. Tom Miller reported that registrations are running ahead of this time last year. The keynote speaker for the NSP will be Brian Skiff from the Lowell Observatory.

Mark Fairchild, Hyde volunteer coordinator, held an orientation on March 16th for volunteers. He plans further training on Sunday evenings, the 2nd Sunday of each month, beginning in April.

Larry Hancock handed out information and a registration form for the PAC/OAS banquet. He has organized a buffet dinner, speaker (our own Martin Gaskell) and door prizes for the October 8 event. There will be observing afterwards if the weather permits. The banquet will be in the Riverview Lodge (not the main lodge) at Mahoney State Park. The lodge is reserved from 10:00 a.m. - 10:00 p.m. Come out and enjoy the park that day!

Larry also had a handout on Messier objects.

Our program was a video tape of a talk by Rebecca Lindell Adrian to Hyde volunteers at the March orientation. Her presentation dealt with common misconceptions about celestial motions.

Hyde Observatory; A Volunteer's Experience

By Dave Churilla

While manning the club's 13" scope at Hyde Observatory, a rather hyper young girl bumped it, moving the view of the M-3 I had so painstakingly labored to find. Our fearless leader, Mark, asked what I was looking for and I took the blame for bumping the scope to save the youthful adult's pride. A little while later, a few people asked if we were going to put any of the scopes on any galaxies, so I dutifully began looking for M81 and M82. They were becoming regulars.

Far from a seasoned veteran of volunteering at Hyde Observatory, I nonetheless have found the experience thus far very satisfying on the one hand, and quite fascinating on the other. Besides the obvious enjoyment of working at Hyde with my 10-year-old son, Joey, and the other Hyde volunteers (who are, to say the least, some of the best people I've ever met), there's the enjoyment of the public's wonder of the universe. I couldn't say just how wonderful it makes me and Joey feel to see a spark of interest in someone's eyes (young and old alike) when they look at M44...or the wonderment that you can feel from them looking at the Orion Nebula or the Andromeda Galaxy, especially when you explain its distance from us. One woman, who said she's seen a lot in her life time looked at me the other night after seeing M81 and M82, smiled and quietly said "It's rather like seeing heaven, isn't it."

I couldn't get that thought out of my mind as Joey and I drove home from Hyde that night, planning to take our own scope out to view the heavens. It made me think about what I was seeing through the telescope. Joey and I are rank amateurs and still have a lot to learn about stargazing. Lately we've been drawn in by the need to find as many objects as possible...or should I say, I have. Joey has his favorites that he can look at for hours on end, as do I. But it seems we work harder at lengthening our list than really observing. I decided that was going to change.

We got home, and after having a bite to eat we took our equipment out and set up on our driveway. The night started off on a down note. We were having a lot of trouble with the computer locating system we purchased. I suspect I need an eyepiece with a cross hair (anyone have one they could lend to me to try it out?). After being tempted to toss it in the trash, we decided it's more rewarding to find the objects ourselves (pretty noble huh, since it wasn't working anyway!) But we'd decided on doing that every other time out anyway.

We began looking for objects. We located our favorites, M81, M82, M51, etc. We hadn't realized Bootes had turned sideways so we couldn't find M-3. Joey decided to look for M-13, and found it (after we realized the chart wasn't positioned right). It looked much like M-3 did earlier in the evening, so we can only speculate how beautiful it will look when it gets higher and darker. We had located a few new objects and recorded them in our observing log.

Then we decided to look for M-3 again. Joey noticed it's tilted attitude, and adjusted his view through the Telrad....eureka...he finds it (I told you we were rank amateurs). I'm sure most, if not all of you have seen it before, but it was incredible! After centering it in our 10" Dob with the 26mm (44x) I added the Barlow. It was transformed. You could barely make out the individual stars, but it was beautiful. Well, that made me daring enough to try putting the 17mm (67x) into the barlow, making the power 134x. I couldn't believe it! It was gorgeous! I have to say it was the most beautiful thing I've seen yet. The size of the object was bigger now since I could see many individual stars, and it got more compact toward the center. The neat thing was you could still make out stars at the center (sort of like looking at a ball of sugar). I'll bet you could make out hundreds of individual stars.

I looked at it for a long time. Joey was preparing to find M104. I was captured by its beauty and blazing magnificence. Ok, ok...so it wasn't so blazing in the light polluted Lincoln sky and being 35,000 light years away, but I've seen Hubble photos of it and my imagination ran away with me. I thought of that wise woman I'd spoken to at Hyde and of her words, and I have to confess I was a little choked up looking at such a sight so far from home. And yet, in the general scheme of the Universe it was really part of my home...part of my own galaxy and in a way, right in my own back yard. I stopped seeing it, and other objects we looked at that night, as just things to find, to gaze at for a few seconds. They really are something special to see, wondrous creations in the heavens to savor and enjoy, not just find and mark down.

The really sad thing is, I could have learned this lesson all along from Joey. It's the way he's always looked at the Universe, with wondering eyes full of imagination and respect and curiosity for what's out there. He's never been afraid to just scan the sky with the scope, enjoying the view in space.

And who knows. Maybe there's a Dave and Joey nearby looking out into their own backyard, marveling at the sight of the Milky Way and wondering if they're alone in the Universe. We may still be rank amateurs, but perhaps we have taken a step up. My hope is that when I talk to people at Hyde I can make them feel what I felt the night I REALLY looked at M3...for the 10th time...and yet for the first time.

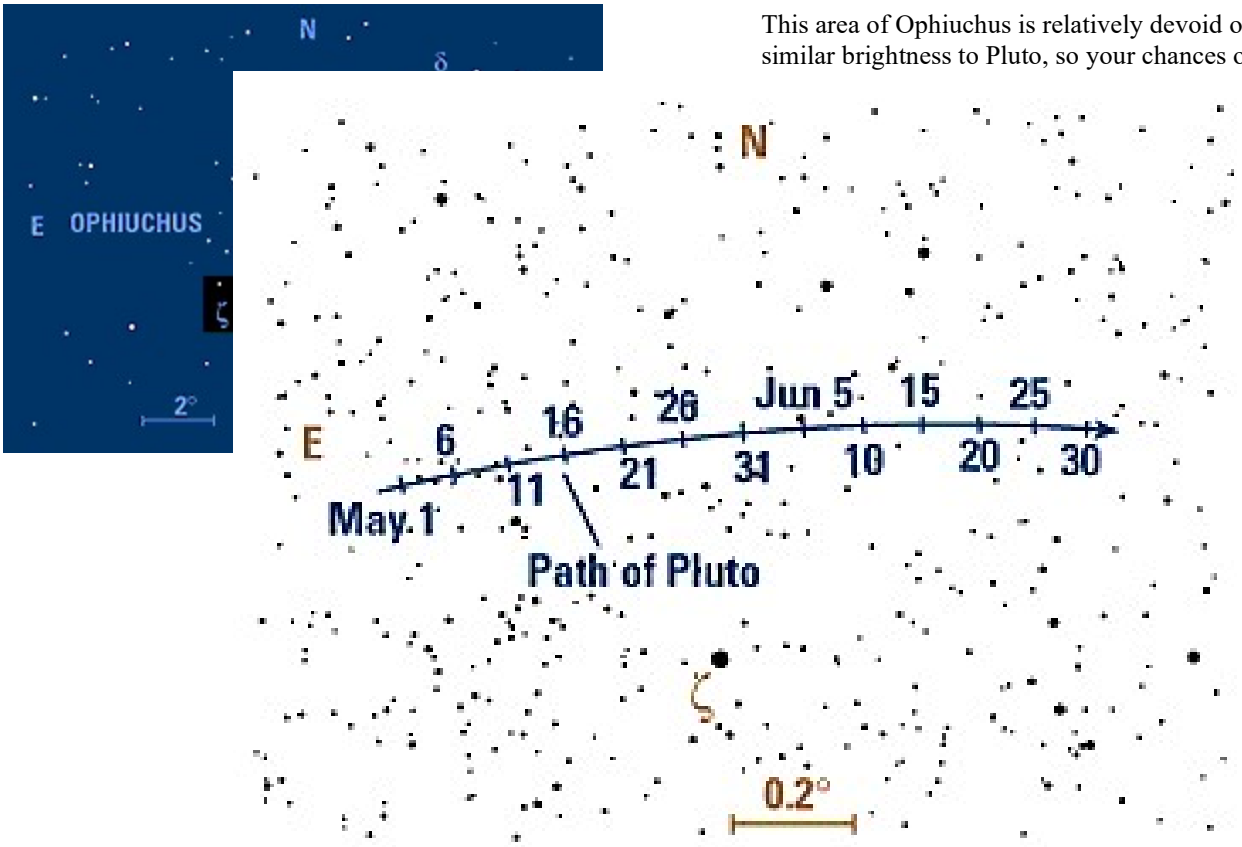
Dave Churilla

Where to Find Pluto.....

From Astronomy Magazines Website at:
www.kalmbach.com/astro/astronomy.html

If there's a time to easily find and track diminutive Pluto, this is it. Pluto spends all of May less than 1° (two moonwidths) from the bright star Zeta (z) Ophiuchi, which is better known as "the middle of the three bright stars lying along the base of Ophiuchus."

At magnitude 13.7, Pluto is generally not an easy target. A dark sky and an 8-inch telescope are typically considered necessary for success.

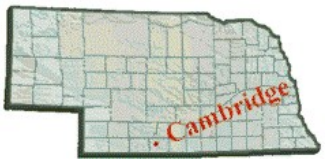


Hopping to Pluto is a snap. Start at 2.6-magnitude Zeta and shift 1/2° to the northeast. There you'll find an isosceles triangle of stars that spans roughly 1/4°. The triangle is headed by an 8th-magnitude star. Flaring back toward Zeta are the two other 9th-magnitude stars. These three stars will act as reference posts to help you see Pluto's gradual displacement across the starfield.

Bigger telescopes usually invoke more confidence as to which faint "star" is a planet. The most instructive method of identification is to make a sketch of the field and then come back a night or two later to see which object has moved. On May 8, Pluto inches 1' north of a 12.4-magnitude star. On May 10, it grazes a mere 9" south of an 11.6-magnitude field star.

This area of Ophiuchus is relatively devoid of stars that are of similar brightness to Pluto, so your chances of mistaking it are relatively slim -- even more incentive to try for it this year.

Lime Creek Observatory and Asteriod 10195



By Bob Lindholm

Cambridge, NE

Let me start by saying that, to me, the best thing about astronomy is that it provides for a number of interests - just visual viewing, photography, collecting and making notes on types such as Messier, nova hunting, asteroid hunting, comet hunting, etc. The only real difference among the many related amateur interests is that to be somewhat successful in locating new objects, it takes a more systematic approach.

My personal interest in astronomy is hunting asteroids. My equipment consists of a permanent polar mounted Meade LX200 10" F10 reduced to 3.3 with an OpticsInc reducer, and a Santa Barbara Instruments Group ST7 CCD camera. This setup provides a field of view of about 28 x 18 minutes. The camera is self-guiding, and this allows long exposures (I use 10 minutes for standard) which yield, on good seeing conditions, objects to mag 19. For software, I use Earth Centered Universe for remote telescope control, and the camera is also cabled to the same computer where images are downloaded via the camera software. The images are then processed (dark subtract and flat fielded. I take a series of adjacent images in the chosen area and then repeat the same location an hour later. Using an astrometrics program (Herbert Raab's Astrometrica) the images are "blink" compared to locate a moving object, and measure it.

In Sep 1996 I located an asteroid which received a provisional designation (1996 RS5) from the MPC. This object had been sighted several years previous, but there was insufficient information about it to attempt to establish a good predictable orbit.

The 1996 observations from Lime Creek provided the required information; since then, other observatories located it and added to the data. In early 1999, 5 oppositions of this asteroid had been established and it was given a permanent number, (10195). The following quote from the MPC web site explains how the numbered planet is awarded to the discoverer:
"When several provisional designations belong to the same numbered minor planet, one of these provisional designations is defined as the principal designations and it is the discoverer of this principally-designated object that is defined as the discoverer of the numbered object."

Although I have received several dozen "provisional designations" from the MPC, I consider it fortunate to have located and measured one which was eventually numbered, and, as discoverer of a numbered object, the discoverer has the opportunity to name the object. As far as I know, this is the first astronomical object to receive a permanent number and name discovered from a Nebraska observatory. I have not, to date, decided on a name.

For those people who may be interested in tracking and measurements of asteroids (minor planets) I'd first recommend going to
http://cfa-www.harvard.edu/iau/info/Astrometry.html
This is the web site of the IAU Minor Planet Center and it fully describes what an amateur needs to know to get started.

Lime Creek 721 is the name and number of the location here (Long. & Lat.), registered with the Minor Planet Center at the Harvard/Smithsonian observatory. The MPC is a branch or division of the IAU (International Astronomical Union. Anyone who wishes to send in observations of minor planets can apply for a site name and number. I think there are about 60 active sites around the world - including many research/professional sites. To qualify for a site number, the applicant is furnished with the general location of a minor planet. Then the applicant furnishes the exact coordinates and if successful, a site name and number is given. LC 721 was applied for and granted in March of 1996.
My interest in providing you with the image and information is to help encourage others to get involved in this area. It's a lot of fun and a way to contribute data to the bank.

Editors Note: My thanks to Bob Lindholm for writing the article and supplying the great picture.

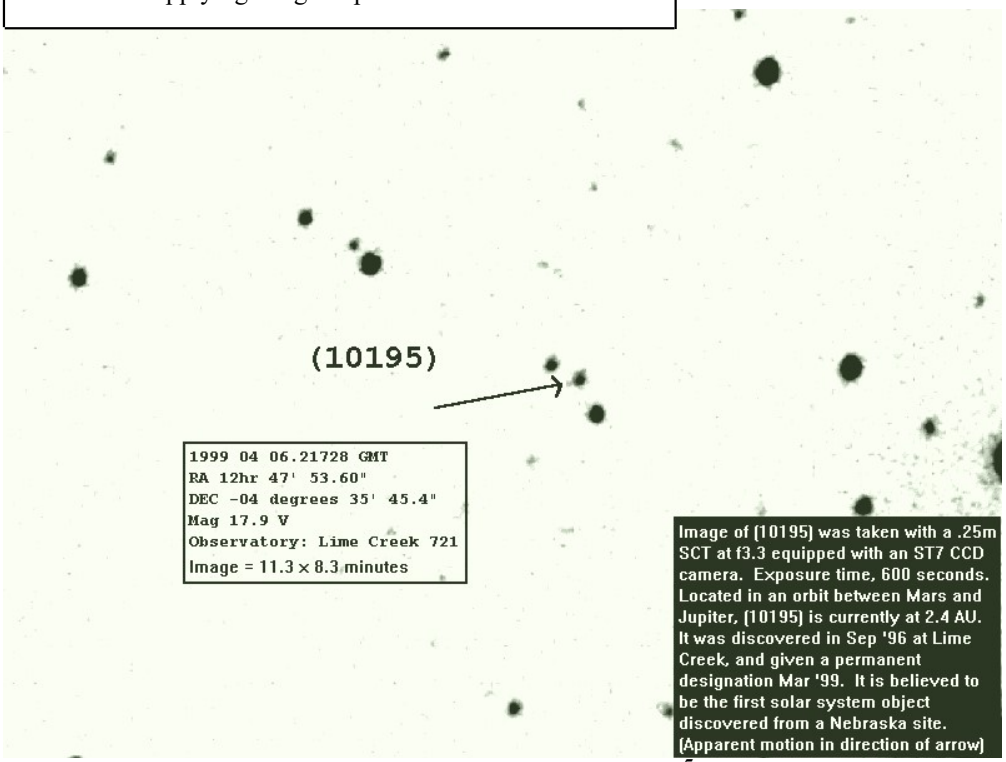


Image of (10195) was taken with a .25m SCT at f3.3 equipped with an ST7 CCD camera. Exposure time, 600 seconds. Located in an orbit between Mars and Jupiter, (10195) is currently at 2.4 AU. It was discovered in Sep '96 at Lime Creek, and given a permanent designation Mar '99. It is believed to be the first solar system object discovered from a Nebraska site. (Apparent motion in direction of arrow)

19th Century Astronomy in Nebraska

By Mark Fairchild

Nebraska became a U.S. Territory in 1854, and a state in 1867. Within two decades several observatories had sprung into existence with the educational institutions that hosted them.

This simple fact places the origins of the study of astronomy (as most people think of this branch of science) in Nebraska firmly in the realm of 19th century astronomy. It is necessary then to start by looking briefly at the nature of 19th century astronomy.

It is worth noting that none of Nebraska's observatories during this early period were research observatories. In fact there were no research observatories west of the Mississippi river until Lick Observatory was built in California. They were, rather, educational observatories. Their major contributions took the form of the instructors and students who worked and studied in them; and some of these students went on to make significant contributions to the science of astronomy--most notably Joel Stebbins and Edgar Pettit.

Most of us do not appreciate how significantly different the study of astronomy was in the 1800s from what it has become today. We know, of course, that electronics, computers and space travel have had major impacts on the information available to us. Certainly these thing alone have profoundly changed the nature of the study of astronomy since the 19th century.

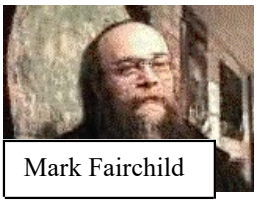
But not as much as one might think.

The really profound changes in the human understanding of the universe were culminating at about the time that the first observatories were built in Nebraska. In order to understand what they were it would be best to step even further back in the history of astronomy. There had existed for several centuries two basic approaches to astronomy called positional astronomy and descriptive astronomy, often referred to as "practical" and "observational" astronomy by 19th century practitioners.

Positional astronomy was a relatively conservative and practical science that characterized 19th century astronomy as taught at most colleges. When the first observatories in Nebraska were built, it was the study of positional astronomy that justified them. It was (and is) a science that focuses on how the universe appears. Note that this is very different from what the universe actually is. Most stars reveal themselves to us as mere streams of photons which originate at such vast distances that their point of origin appears as just that--a point. This has been true for almost every star (Betelgeuse being the notable exception) right up to the time of the Hubble Space Telescope.

Limiting themselves to the physical evidence available to them (these streams of photons from point sources), astronomers studied a variety of questions that dealt primarily with the positions of these points called stars. And the study was very revealing. It gave rise to Kepler's Laws, Newton's Laws of Gravity, was used to make the first reasonably accurate estimate for the speed of light, detected the orbit of the earth around the sun, was used to map the earth and set the modern standards for time, to name but a few of its achievements. This was an ancient and time-honored science and often Hipparchus is deemed the "father of astronomy" referring to positional astronomy, since it was he who created the magnitude system for measuring the brightness of stars, made the earliest known catalog of stars, and used his study of the positions of these stars to discover the procession of the equinoxes.

Descriptive astronomy, on the other hand, was the more liberal cousin of positional astronomy. This was more like "pure science" in so far as there were no real, tangible benefits to society to be derived from it. It inquired into the true nature of the objects spitting out these streams of photons. As the 19th century began, this inquiry usually took the form of speculation, but by the end of the century it was giving way to a new, and more scientific, discipline called "astrophysics." Normally, William Herschel is called the "father of modern astronomy" because of his incessant study of the many non-point objects in the universe, mostly termed nebulae (a general classification in the late 18th and early 19th centuries, which has since been broken down into a vast array of classes of objects--galaxies, diffuse nebulae, planetary nebulae, clusters, etc.) He was not really the first "descriptive astronomer" any more than Hipparchus of Nicaea was the first "positional astronomer" but each man revealed to humanity the value of their approach to the science in a way that inspired generations that followed. Galileo might lay as much claim to the title "father of descriptive astronomy" as Herschel when you consider the place in the history of astronomy of his *Siderius Nuncius* (The Starry Messenger), in which he related the discoveries which resulted from turning his telescope towards the heavens.



Mark Fairchild

The two sciences are not, however, divorced from each other. The *Siderius Nuncius* might have insured wonder at the universe, but no one could explore the descriptive aspects of astronomy without first improving the tools (mechanical and conceptual) for studying it. Appearances are important in science if only because they must be explained by any theory that purports to explain the causes behind them. No theory about the nature of the mysterious nebulae would be of any value until the Copernican theory that the earth revolved around the sun could be proved (and it was not proved until the mid 19th century!)

Besides, the existence of science was (and all to often is) held hostage to the pragmatic application of its findings. For the most part, humans are understandably motivated by the practical value of learning. A 19th century farmer struggling to feed the few children who had not died in infancy might be fascinated by Herschel's "nebulae", but he would be hard pressed to contribute to financing anyone's studies of them. On the other hand, positional astronomy would help him set his clock (and therefore catch his train and keep his appointments), survey his land (so he got a solid price for it) and keep ships from sinking at sea (not nice for commerce.) This farmer would not be so likely to object to some of the taxes he could ill afford to pay being spent on positional astronomy.

So this was the point in the history of astronomy where Nebraska entered the picture. For the first time no Cassini could easily maintain that Copernicus was wrong and the earth really was at the center of the solar system. Positional astronomy made this state of affairs possible. Yet, no one could yet prove that the solar system was not at the center of the universe. All physical and positional evidence indicated that it was. Even in 1920 astronomers had to admit that the evidence indicated this (despite their uneasiness with the concept.)

What then was the practice of positional astronomy like? For one thing there was much more emphasis on the instruments; if you were present during an observing session in the 19th century you might be surprised at how much attention was paid to the instrument. The star visible in the eyepiece of the telescope might seem almost like an afterthought. This surprise is in part due to the fact that most of us encounter telescopes in the context of public education; where we learn about the nature of the stars themselves. Research astronomy is, however, is concerned with **gathering data about the stars**. This mandates focusing attention on the

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instruments that are collecting the data.
This focus on the instruments in a 19th century observatory would have been even more intense, because the intent was to **gather data on the positions of the stars** being viewed. And whereas today information about the instruments can, to some degree, be recorded for later study, back in the 1800's everything had to be noted as it happened.

There were two major instruments at any 19th century observatory, neither of which were the large aperture telescopes that we tend to think of in connection with these centers of study. The telescopes were important, but they tended to be more of an educational instrument, and in some cases (not so much in Nebraska) they were a primary instrument in the pursuit of the more liberal and cutting edge descriptive astronomy that was emerging and just beginning to meld with more traditional studies. Here in Nebraska, as in most under funded areas, the primary instruments were the "zenith telescope" (or "meridian circle", "prime vertical instrument", "meridian transit", etc.) and the clock.
Yes, the clock. There were generally two clocks in an observatory. One was the "astronomical clock" which was a sidereal clock that kept "star time" and the other was the "standard time clock" which kept solar time-- which is what most non-astronomers mean when they hear the word "clock."
The zenith instrument was usually a smaller instrument than the main telescope and used an altazimuth mount. That is to say, it could only move vertically and horizontally--usually only vertically. The aperture was not nearly so important as the mounting, which had to be precisely aligned for perfect vertical movement, and the attachments which were used to measure the position of the telescope. The primary attachment was the filar micrometer, which was like an eyepiece with cross hairs. Of course this is a very loose description. The filar micrometer was a fairly elaborate device. In its most basic form there were two vertical and one horizontal cross hairs. These were usually made by spiders--they were literally spider silk from spider webs! Each thread was moveable in relation to the others. Their position in the field of view could be adjusted by a threaded screw. Everything about the device had to be known with great precision: the number of threads on the screw, the amount of the change in position of the crosshair produced by one turn of the screw, the dimensions of each optical element, the temperature and humidity during use (since this would change the dimensions of the optical elements) and so on.
When in use the instrument would be pointed at a known star, and the position of the instrument noted. As the star drifted across the field of view it would be occulted (hidden) by the spider thread in the filar micrometer. When this happened, a reading would have to be immediately made indicating the exact time, of the position of the instrument and of the star's position relative to the spider thread in the field of view. The position of the telescope involved reading the "setting circles" through a small microscope permanently attached to the instrument. It was really quite an involved and grueling procedure; I am sure that my description does not do it justice. To top it off, many readings would have to be made on a given night so that the resultant data could be properly reduced to eliminate errors.
Which stars were observed and when depended on the reason for the session. Of course most observatories in Nebraska were connected with colleges, so some sessions would be primarily of educational value. One use, for instance, was that of determining latitude. Now you only need to determine the latitude of a fixed instrument just so many times before the act of doing so becomes strictly "academic." But at an academic institution, that would make sense! It was training for the students. In a pragmatic mode, stellar positions would be noted as part of the procedure for accurately determining the time. Mechanical clocks "run down" and are subject to a variety of natural forces that alter their accuracy. Readings of stellar positions was one of the few ways to set the clocks with any accuracy. This is why observatories tended to also host the local "Time Service Station." Likewise, because weather conditions such as temperature, humidity and barometric pressure changed the mechanical and optical attributes of the instruments, the observatory also often hosted the local "Weather Service Station."
Studies which were oriented more towards research would involve searching for stellar parallax, observing the effects of the aberration, and sometimes perhaps proving and improving both instruments and procedures.
As alluded to earlier, this was a pivotal period in the history of astronomy. Great leaps were made in the area of descriptive astronomy; advances which brought it out of the realm of speculation on the nature of celestial objects and into the realm of investigative science. The two greatest advances were the advent of photography and spectroscopy.
Photography allowed astronomers to **collect** the photons from the stars and thus see vastly fainter objects. Many more stars were revealed as a result, and nebulae were often revealed as much more extensive objects when their faint light accumulated on a camera's film. Photography also had the added benefit of providing a visual and measurable record of the positions of objects in the sky. Successive photographs could reveal very small changes in the positions of celestial objects relative to each other; what would have previously required years of numerous and painstaking visual observations could now be accomplished with numerous camera exposures. The visual observations still had a major place, but they could be planned and directed far more effectively.
Spectroscopy allowed scientists to study the composition of stars. Of course, the road to understanding spectroscopic data took many decades; but in the end it was this development (especially when combined with photography) that allowed astronomers to determine the composition, temperatures, velocities, and evolutionary patterns of the stars. Hubble could not have even begun to estimate the distances involved in interstellar space if it were not for these two developments, both of which occurred in the 19th century.
People who took on the study of astronomy during this early period of Nebraska's history, generally found themselves studying the very intricate methodology of positional astronomy which was heavily laden with mathematical inference and physics, mostly applied to the instruments of the investigation. But they also found themselves in a world where the universe was just beginning to surrender its secrets to the new advances made in the realm of descriptive astronomy, which was adding astrophysics to its toolkit.

Space Day '99 Activities and Schedule

Lincoln, Nebraska

Friday, May 14

2:00 pm - 4:00 pm
Telescopes set up at Muell

Sponsored By:
Duncan Aviation

6:30 pm - 7:30 pm
Astronaut and B2 crew reception

7:30 pm -
Astronaut and B2 crew presentation

9:30 pm - 11:00 pm
UNL Student Observatory open to the public

Saturday, May 15

8:30 am - 9:30 am
Set up telescopes at Mueller Planetarium

9:30 am - 4:00 pm
Mueller Planetarium open to the public

12:30 pm - 3:30 pm
Greet Astronaut at Mueller Planetarium

4:00 pm
Drawing for Door Prize(s)

Friday, May 14

10:00 am - 2:00 pm
Bear in the Air program, school kids arrive
Static aircraft display

11:30 am - 1:00 pm
Feed students

12:00 pm
B-2 Flyover

Saturday, May 15

9:00 am - 12:00 pm
EAA Young Eagle Flights
Static aircraft display

At:

Keep in mind that this is the tentative schedule and at the time of printing is not the final schedule. It's printed here to give you an idea of what is expected to occur.

NAME: Kenneth D. Cockrell (Mr.)

NASA Astronaut

PERSONAL DATA:

Born April 9, 1950, in Austin, Texas. Married to the former Joan Denice Raines of Houston, Texas. Two children. He enjoys sport flying, snow skiing, water skiing, tennis. His parents, Dale and Jewell Cockrell, reside in Westminster, South Carolina. Her parents, Leon and Rosemary Raines, reside in Houston.

EDUCATION:

Graduated from Rockdale High School, Rockdale, Texas, in 1968; received a bachelor of science degree in mechanical engineering from University of Texas in 1972, and a master of science degree in aeronautical systems from the University of West Florida in 1974.

ORGANIZATIONS:

Member, Society of Experimental Test Pilots (SETP), and Association of Space Explorers (ASE).

SPECIAL HONORS:

Awarded the Armed Forces Meritorious Service Medal, the Navy Commendation Medal, the Armed Forces Expeditionary Medal, and the Humanitarian Service Medal. Received the Alcoa Foundation Scholarship upon graduating from high school.

EXPERIENCE:

Cockrell received his commission through the Naval Aviation Reserve Officer Candidate Program at Naval Air Station Pensacola, Florida, in December 1972. He was designated a naval aviator in August 1974 at Naval Air Station Pensacola. Following type training in the A-7 aircraft, he flew the Corsair II from 1975 to 1978 aboard the USS Midway in the Western Pacific and Indian Oceans. In 1978 he reported to the United States Naval Test Pilot School at Patuxent River, Maryland. After graduation in 1979, he remained at the Naval Air Test Center conducting a variety of flight tests on the A-4, A-7, F-4, and F/A-18 aircraft through mid-1982. He then reported to Naval Station, San Diego, for duty as a staff officer for the Commander of the USS Ranger and subsequently the USS Kitty Hawk Battle Groups. Cockrell was then assigned as a pilot in an operational F/A-18 squadron and made two cruises on the USS Constellation in 1985 and 1987. He resigned his commission in 1987 and accepted a position at the Aircraft Operations Division of the Johnson Space Center. Cockrell is a captain in the United States Naval Reserve. He has logged over 6,300 flying hours and 650 carrier landings.

NASA EXPERIENCE:

From November 1987 to July 1990, Cockrell worked as an aerospace engineer and research pilot at Ellington Field, Houston. He was an instructor pilot and functional check pilot in NASA T-38 aircraft. He conducted air sampling and other high altitude research while piloting the WB-57 and was an aircraft commander in the Gulfstream I administrative transport aircraft.

Selected by NASA in January 1990, Cockrell became an astronaut in July 1991. He is qualified for assignment as a pilot on future Space Shuttle flight crews. His technical assignments to date include: duties in the Astronaut Office Operations Development Branch, working on landing, rollout, tires and brakes issues; CAPCOM in Mission Control for ascent and entry; Astronaut Office representative for Flight Data File, the numerous books of procedures carried aboard Shuttle flights. He served as Assistant to the Chief of the Astronaut Office for Shuttle operations and hardware, and has served as Chief of the Astronaut Office Operations Development Branch.

A veteran of three space flights, he has logged over 906 hours in space. He served as a mission specialist on STS-56 (April 8-17, 1993), was the pilot on STS-69 (September 7-18, 1995), and was the mission commander on STS-80 (November 19 to December 7, 1996). He presently serves as Chief of the Astronaut Office. Cockrell is assigned to command the crew of STS-98. The crew will continue the task of building and enhancing the International Space Station by delivering the U.S. laboratory module. The Shuttle will spend six days docked to the station while the laboratory is attached and three spacewalks are conducted to complete its assembly. The STS-98 mission will occur while the first station crew is aboard the new spacecraft. Launch is targeted for October 1999.

SPACEFLIGHT EXPERIENCE:

STS-56, carrying ATLAS-2 was a nine-day mission during which the crew of Discovery conducted atmospheric and solar studies in order to better understand the effect of solar activity on the Earth's climate and environment. STS-56 launched April 8, 1993, and landed April 17, 1993. Mission duration was 9 days, 6 hours, 9 minutes, 21 seconds.

The primary objective of STS-69 (September 7-18, 1995) was the successful deployment and retrieval of a SPARTAN satellite and the Wake Shield Facility (WSF). The WSF is designed to evaluate the effectiveness of using this free-flying experiment to grow semiconductors, high temperature superconductors and other materials using the ultra-high vacuum created behind the spacecraft near the experiment package. Mission duration was 10 days, 20 hours, 28 minutes.

During STS-80 (November 19 to December 7, 1996) the crew deployed and retrieved the Wake Shield Facility (WSF) and the Orbiting Retrievable Far and Extreme Ultraviolet Spectrometer (ORFEUS) satellites. The WSF is designed to fly free of the Shuttle, creating a super vacuum in its wake in which to grow thin film wafers for use in semiconductors and other high-tech electrical components. The ORFEUS instruments, mounted on the reusable Shuttle Pallet Satellite, will study the origin and makeup of stars. Mission duration was a record breaking 17 days, 15 hours, 53 minutes.

Planetary Events for May

by Martin Ratcliffe and Alister Ling

May is a month of contrasts. A cooling shower of rain can quickly interrupt the warmth of the coming summer. Longer periods of daylight precede shorter nighttime hours. In the sky, the relatively nearby planets gleam and dazzle, while the dim and far-off galaxies act as a backdrop.

The planets continue their wonderful performance as orangy-red Mars greets the darkening southeastern sky after sunset, while blazing-white Venus vies for equal attention high in the west.

Venus begins the month at magnitude -4.1 between the two stars that mark the horns of Taurus the Bull. By May 9, this "evening star" lies less than 2° north of the open star cluster M35 in the constellation Gemini the Twins. Two days later, on May 11, Venus lies at its northernmost declination of the year (26°) -- a position that helps make this the best time to view Venus from the Northern Hemisphere. Venus ends the month just 4° south of the bright star Pollux in Gemini and will reach its greatest elongation east of the sun in the second week of June.

Even in a small telescope, observers can see a noticeable change in the phase of. Early in May, Venus displays a 69-percent-illuminated gibbous phase that shrinks to 55-percent by the end of the month.

You'll also see a change in the planet's apparent size as it moves closer to Earth -- Venus grows from 16" to 21" across. The increasing size more than makes up for the shrinking phase, causing the planet to brighten slightly this month, to magnitude -4.2. Start following Venus through a telescope now; next month its rate of growth will double. On May 18, a crescent moon glides slightly more than 5° south of Venus. The planet also passes 0.7° south of the faint 8.9-magnitude asteroid Ceres on May 5.

While Venus is the focus in the western sky, the growing altitude of Mars draws the eye to the east. The Red Planet is moving toward the 1st-magnitude star Spica, whose contrasting white color draws attention further. Mars begins May shining at its opposition magnitude of -1.6. Its motion against the stars brings it to within 2° of Spica by May 31 and continues to close the gap early next month. A gibbous moon joins this dramatic pairing on May 25.

Normally a planet's position relative to the stars in the night sky shifts daily to the east. Mars, however, is currently moving in retrograde motion against the stars -- from east to west. Retrograde motion is a result of the planet's and Earth's combined motion around the sun. Earth's smaller orbit allows it to overtake Mars every 780 days. For a period of two months, Mars appears to move in an opposite direction relative to the stars. Its path loops back in on itself in a westerly direction.

Retrograde motion is the path of the planet relative to the stars, not the daily motion that causes the planet to rise and set, which is always from east to west. You can see this effect by marking the position of Mars relative to the stars of Virgo from late March to June. Another option is to take a series of photographs of Virgo -- one every two or three days. Then you'll have a fine sequence of the planet's retrograde motion. Such images will prove useful for talks at local schools and clubs.

Mars remains a superb sight when viewed through a telescope during May. On the 1st it lies closer to Earth than at any other time during this apparition, some 53.8 million miles away, which makes the planet's disk appear largest. During the first eleven days of the month, Mars stays above 16" in diameter -- its best since 1990.

Many of Mars's dark features are most evident in telescopes with apertures of 6 inches and larger. Yet a small telescope can still resolve the major features such as Syrtis Major. Syrtis Major lies at a martian longitude of 300°. This places the dark feature within the visible hemisphere of Mars as seen by observers in the United States during the last week of May and by Europeans in the third week of May.

May Celestial Events

Day	Time (CST)	
3	2 a.m.	The moon passes 3 degrees north of Mars
10	4 a.m.	The moon passes 1.1 degrees north of Neptune
11	2 a.m.	The moon passes 1.0 degree north of Uranus
13	11 p.m.	The moon passes 1.1 degrees south of Mercury
16	11 a.m.	Mercury is at greatest western elongation (28 degrees, morning)
18	4 p.m.	The moon passes 7 degrees south of Venus
	9 p.m.	The moon passes 0.7 degrees north of Aldebaran
20	6 p.m.	Pallas is in conjunction with the sun
21	3 p.m.	Venus passes 7 degrees north of Aldebaran
22		Lyrid meteor shower peaks
24	1 p.m.	Mars is at opposition
29	5 p.m.	The moon passes 4 degrees north of Mars

THE PRAIRIE ASTRONOMY CLUB CALENDAR
For May 1999

Sun	*Mon*	*Tue*	*Wed*	*Thu*	*Fri*	*Sat*
This shower is visible during the period of April 21 to May 12. It reaches maximum on May 5 (Solar Longitude=45.5 deg), from an average radiant of RA=337 deg, DECL=-1 deg. During the period of greatest activity hourly rates usually reach 20 for observers in the northern hemisphere and 50 for observers in the southern hemisphere. The radiant's daily motion is +0.96 deg in RA and +0.37 deg in DECL.				**1999 MAHONEY STAR PARTY DATES:** **FRIDAY, MAY 21** **FRIDAY, JUNE 18** **FRIDAY, JULY 16** **FRIDAY, SEPT 10** **FRIDAY, OCT 8**		**1** **Hyde Observatory open to the public sunset-11 PM**
2	**3**	**4**	**5** **Eta Aquarids Meteor Shower Peak**	**6**	**7**	**8** **Hyde Observatory open to the public sunset-11 PM** **3RD QUARTER**
9 Don't forget Mother's Day	**10**	**11**	**12**	**13** **NSP Planning Meeting 7:30 PM**	**14** **Space Day Events at Mueller Planetarium/ Nebraska Air National Guard**	**15** **Space Day events at Mueller Planetarium** **Hyde Observatory open to the public sunset-11 PM** **NEW MOON**
16	**17**	**18**	**19**	**20**	**21** **Mahoney Star Party** **Regulus Occultation this evening** **1ST QUARTER**	**22** **Hyde Observatory open to the public sunset-11 PM**
23 **FULL MOON** **30**	**24** **31**	**25** **PAC Meeting 7:30 PM Hyde Observatory**	**26**	**27**	**28**	**29** **Hyde Observatory open to the public sunset-11 PM**

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.

OFFICERS
OF THE PRAIRIE ASTRONOMY CLUB

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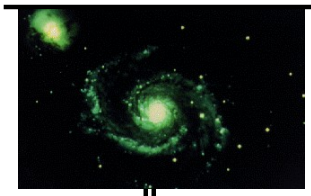

The Prairie Astronomer
c/o The Prairie Astronomy Club, Inc.
P.O. Box 5585
Lincoln, NE 68505-0585

First Class Mail

Next PAC Meeting
April 27, 1999
7:30 PM
Hyde Observatory

NSP 6 Countdown
Less Than 100 days
August 7-14, 1999
Merritt Reservoir