The Prairie Astronomer

The Official Newsletter Of The Prairie Astronomy Club, Inc.

February 1999 **Volume 40 Issue #2**

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MEETINGS & EVENTS

PAC MEETING
TUESDAY, FEBRUARY 23, 1999, 7:30 PM
at Hyde Memorial Observatory

NSP PLANNING COMMITTEE MEETING
THURSDAY, MARCH 11, 1999, 7:30 PM
At Mahoney State Park Lodge

CLUB STAR PARTY
FRIDAY, MARCH 12, 1999, Sunset 'till ?
(See January newsletter for directions)

UNL STUDENT OBSERVATORY
NOT OPEN IN MARCH DUE TO SPRING BREAK

UNL BEHLEN OBSERVATORY OPEN HOUSE
FRIDAY, MARCH 26, 1999, 7-10 PM
(See page 12 for directions)

PAC MEETING
TUESDAY, MARCH 30, 1999, 7:30 PM
At Hyde Memorial Observatory

FEBRUARY'S PROGRAM:
Tom Gehringer

Tom Gehringer, astronomy instructor at Burke High School in Omaha, will speak at the February meeting about various astronomy projects he and his students are involved in. One of these projects, "The Use of Astronomy in Research Based Science Education" (RBSE) is sponsored by the National Observational Astronomy Observatories (NOAO) and is mentored by astronomers at the University of Nebraska. Another project, the "Telescopes in Education" (TIE) Project, sponsored by the Jet Propulsion Laboratory (NASA-JPL) and Mount Wilson Observatory, allows Burke students to use the 24" reflecting telescope at Mount Wilson from their Omaha classroom. Gehringer is also vice president of the Omaha Astronomical Society and director of Burke planetarium.

PAC WEBSITE UPDATE: Mark Dahmke has been working arduously at updating the Prairie Astronomy Club website. If it's been a while since you've surfed the site, take another look. If you have never logged on to the site before, you're missing out! Several articles, up-to-date club activities, and many interesting astronomy links can be found. The club website URL can be found in the box just to the upper left of this article.

VOLUNTEERS NEEDED: Hyde Observatory is in need of volunteers. Activities include running the telescopes, overseeing the slide show, or answering questions from the public. If you would like to become involved, please contact Mark Fairchild, Hyde Volunteer Coordinator (a.k.a. our very own 2nd VP/Program Chair), or any member of the Hyde Steering Committee. Mark will have a sign-up list at the February Meeting.

YOUTH GROUP: Mark Fairchild has been working on organizing a Youth Astronomy Group and is in need of ideas as well as volunteers. If you wish to get in on the ground floor of an exciting way to help the up and coming young amateur astronomers of Lincoln, please contact him through e-mail or phone, both which are listed on page 12.

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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 68505-5585**. 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 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

President Dave Knisely called the meeting to order. We had one guest: Dave Churilla.
Dave Knisely thanked Dave Scherping for all his work in doing the newsletter for the past several years.

Dave K. reported that the January Star Party was clouded out. The sun has been very active. There is a Venus/Jupiter conjunction on February 23, which is the date of our next regular meeting. He suggested that we come out early for viewing. Martin Gaskell said that the best time would be between 7-8:00 and that it would be the most spectacular in 50 years.

The next Star Party is scheduled for February 12 at Olive Creek State Recreation area. The Game & Parks Commission is beginning to drain the lake and kill off the fish because the lake is full of carp and very muddy. The Commission has "no plans for physical improvement" at the area, which means no lights!!

The UNL observatory will be open on February 19 from 7-10:00 p.m.

It was decided to take the Cosmosphere Trip on April 17-18. Jack Dunn reported that it is about 230 miles to Hutchinson, KS; he will prepare a map. (The Cosmosphere is the premier space museum in the U.S.) Plans include a tour of the museum, 1-2 IMAX films, as well as a trip to an observatory near Wichita.

It is still not certain if Astronomy Day will be May 15 or 20; however, Jack Dunn reported that our Space Day will be held May 15. The Air Force Association is planning to bring in 1-2 astronauts: there will be a reception and talk on Friday night at Morrill Hall. PAC members will be invited. There will be events scheduled both Friday and Saturday at Morrill Hall and the air base.

A Hyde Volunteer Appreciation Night is scheduled for February 16; this is by invitation only. Hyde Observatory always needs more volunteers; Mark Fairchild is the new volunteer coordinator. He will bring a sign-up list to the next meeting.

Larry Hancock reported that there are a few club T-shirts left, but no hats.

Liz Bergman, Treasurer, reported that all subscriptions are in. The club has a new mailing address: P.O. Box 5585, Lincoln, 68505-5585.

The next NSP meeting is scheduled for 7:30 on February 11 at the Mahoney State Park Lodge. Tom Miller reported that registrations for NSP are starting to come in. Cabins will be held until Friday, January 29; after that, you must make reservations through Merritt Reservoir.

Larry Hancock suggested that the club hold an annual banquet, in addition to, or in lieu of, the club picnic. It was suggested that it be sometime in September at the Mahoney State Park Lodge. Larry will investigate this further.

Please see Mark Fairchild if you are interested in helping organize a youth astronomy club.

Dave invited everyone to Village Inn after the meeting.

Mark Fairchild introduced our program: Jack Dunn, Director of the Mueller Planetarium, presented a slide show of his visits to various astronomical sites and his trip to Amsterdam for the International Laser Display Association conference.

Breaking news

Nine stars whose only common thread seems to be an innate similarity to our sun have witnessed "superflares" -- huge explosions that release massive quantities of subatomic particles and radiation. If such a flare happened on our own Sun, it would destroy Earth's ozone layer and melt the ice on the daylight side of Saturn's moons.

After only a few months in operation, the Sloan Digital Survey has found three of the four most distant quasars ever observed.

Initial observations from NASA's newest Earth-orbiting satellite show that molecular clouds-regions in our galaxy out of which stars and planets are born-is saturated with water but contains little molecular oxygen.

Viewing With Binoculars

By Alan MacRobert. Reprinted from Sky and Telescope

ONE DECEMBER evening when I was 14 years old, I was playing with a large magnifying glass and happened to hold it up in line with a Christmas light at the other end of the house. Suddenly the lens was filled with a blinding glare. How could such a dim little light, I wondered, produce such a dazzle? Would it work on an even fainter light -- a distant streetlight, say, or a star? I ran out into the cold night to try. The results were disappointing. But my father, who came out to see me holding the magnifying glass up to the stars, suggested I try the family binoculars instead. I did, and the sight that night of Jupiter, the Pleiades, and the Belt of Orion helped start me on an astronomical path that continues to this day.

It seemed so easy! I had never realized that ordinary binoculars could be an astronomical instrument. Like most kids I knew a little astronomy from books. But *observing* celestial objects first-hand seemed to be something only scientists could do. As I found out in the following weeks, however, a pair of binoculars opens up endless opportunities for serious sky exploring.

Binoculars are the ideal starter instrument because they are so simple to use. You see the image right side up and in front of you. The large field of view makes it easy to find what you point at. Yet binoculars reveal many sights that most people think require a telescope -- including craters, mountains, and plains on the Moon, planets and their satellites, the brightest asteroids at favorable times, the occasional comet, countless double and variable stars, dozens of star clusters, and some nebulae and galaxies.

The observing and chart-reading skills you'll gain from searching out these things are the same skills needed to put a telescope to good use. But binoculars are far cheaper as a first investment -- not to mention being much more convenient to carry in and out and store in a closet.

In fact, a good pair of binoculars gives as much improvement over the naked-eye view as a large amateur telescope gives over the binoculars. In other words binoculars get you halfway there -- but for a lot less than half the price.

These instruments are so useful and handy, yet so often unappreciated by beginners fixated on the idea of a telescope, that it's worth reviewing some of the things they can do.

The Solar System

The brightest sights are the easiest to begin with. The **Moon** shows at least as much detail in binoculars as Galileo saw with his primitive telescopes. The mountains, craters, and plains he discovered in 1610 established for the first time that the Moon is a world, like the Earth, overturning the long-established belief that it was a perfect sphere made of some ideal heavenly substance.

The first glance through binoculars reveals the major dark areas, the so-called seas or *maria* (plural of the Latin word for sea, *mare,* pronounced MAH-ray). The maria are flat lava plains. After you spend a few nights outdoors identifying the Moon's features, its geography will begin to grow as familiar as that of the Earth.

When the Moon is a waxing crescent in the western evening sky a couple of days after new, only Mare Crisium is visible. The *terminator,* the line dividing lunar day and night, moves across the disk to unveil ever more features as the Moon's phase grows to first quarter, gibbous, then full. Night by night more seas are revealed -- Mare Tranquillitatis, Serenitatis, Imbrium, and finally Oceanus Procellarum. Near the terminator the slanting sunlight casts long shadows, so here mountains and valleys stand out prominently. They become more easily visible if you brace the binoculars tightly against something to hold them very still.

The planet **Mercury** can sometimes be located during twilight with the naked eye, but binoculars make it much easier to pick up. Once found, however, this little planet only appears starlike. As with many astronomical objects, the accomplishment lies in finding it at all. Every month the "Stars and Planets" pages of *Sky & Telescope* tell where to locate this and other planets.

Venus, on the other hand, will show its crescent phase in high-quality binoculars. In the summer and fall of 1610, Galileo watched Venus change phases in the evening sky. If the traditional Earth-centered idea of the solar system had been correct, with Venus always staying between us and the Sun, Venus would *always* appear as a crescent. Instead Galileo saw it as gibbous -- proving that it circles behind the Sun, thus providing crucial evidence for the Copernican system that would shake European beliefs for the next century. Can you repeat Galileo's observation?

Mars just looks like a bright orange star. **Jupiter,** on the other hand, is one of the binocular showpieces of the sky. Its four bright Galilean moons (so named for their discoverer) are lined up on either side of the planet in patterns that change every night. The outer two moons of Jupiter, Ganymede and Callisto, are the most easily seen in binoculars. Europa and Io remain hidden in Jupiter's bright glare until you catch them near their greatest elongation (distance) from the planet. The monthly Jupiter's Satellites diagram in *Sky & Telescope* can be used to identify the ones you spot.

All four are roughly the size of our own Moon or a little larger. Comparing these tiny pinpoints with the full Moon itself in binoculars dramatizes how much farther away they are.

A much more difficult achievement is finding Titan, the lone binocular moon of **Saturn.** This 8th-magnitude speck only gets about as far from Saturn as 6th-magnitude Europa does from Jupiter. It needs large, high-power binoculars. Saturn's rings, unfortunately, cannot be seen very definitely with magnifications less than about 20x or 30x.

Uranus, Neptune, and the half dozen or so **asteroids** that reach 8th magnitude or brighter look like faint stars. Uranus and Neptune can be found in binoculars with the aid of the charts printed in the April *Sky & Telescope.* Charts for bright asteroids are also printed in the magazine from time to time. To be sure which "star" is the object you're looking for, draw a map of the stars you see near the correct location and watch for the one that moves from night to night. This is the method by which all the major asteroids were originally discovered.

Deep-Sky Objects

A different kind of reward comes from seeking out the vanishingly faint glows of star clusters and galaxies thousands or millions of light-years away. Merely finding these eerie phosphorescences amid vast expanses of stars is most of the fun. To do this you will need to become handy with sky charts and adept at finding your way through star fields. This is much easier with binoculars than a telescope, so the binoculars are excellent training.

If you have already learned some of the constellations with the naked eye, you'll discover that binoculars show countless new stars in what used to be blank spaces. Sweep from one bright star to another in familiar constellations to get used to finding your way around.

Pay attention to the size of your field of view; keep in mind how much sky it covers as shown on the map you're using. Locate two bright stars that just fit in the edges of your binoculars' field and see how many degrees apart they are on your map. You can make a wire ring with this diameter and place it on the map. It will instantly show the binoculars' field. By sliding the ring around on the map, you'll see how much territory you have to cross to get from one place to another.

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If your sky is fairly dark and free of light pollution, a pair of 8 x 50 or 10 x 50 binoculars should show all stars 9th magnitude and brighter and most deep-sky objects that are described as 8th magnitude or brighter.
As with a telescope, your charts and reference books are crucial to success.

Usage Tips

The biggest problem with binoculars, you'll quickly discover, is holding them steady. The constant dancing of the view prevents you from seeing the faintest objects and the finest detail. As a teenager I followed the moons of Jupiter by holding my binoculars against the side of a tree or wedging them between slats of a fence. Lying on your back and resting their weight on the bones below your eyes will reduce the dancing to a wiggle in time with your heartbeat.
Many binoculars can be attached to a photographic tripod with an adapter. This holds them perfectly still for near-horizontal viewing, but you can't get underneath a tripod to look up. In recent years a number of special binocular mounts for astronomers have begun to be sold. They're advertised in *Sky & Telescope.* A half dozen were reviewed in the June 1993 issue. These mounts tend to be a bit large and expensive, but the best of them work extremely well.
Short of buying a binocular mount, the usual way of coping with the shakes is to observe from a reclining lawn chair that has arms. By resting both elbows on the chair arms and the eyepieces against your face, the dancing is greatly reduced.
You probably won't be able to set up a tripod over the lawn chair. But even if the binoculars are attached to a photographic tripod lying across your lap with its legs sticking sideways into the air, the images become wonderfully still. Merely attaching the binoculars to such a large, rigid object is enough to stop the troublesome rapid jittering. Many amateurs have constructed homemade supports that work well too.
With the glasses held still, their performance will seem *at least doubled.* Compare the detail visible in solidly mounted 6 x 30 binoculars with hand-held 10 x 50s.
The comfort provided by the chair is also vital. Some of the most satisfying observations are made at the limit of visibility, where all your powers of concentration are called into play. The slightest discomfort or strain will interfere with this concentration and blind you to faint detail. This loss is critical. Half of the astronomical objects visible with *any* instrument -- from opera glasses to the Hubble Space Telescope -- are within ½ magnitude of the instrument's faint limit. (The reason is that by seeing ½ magnitude deeper, you double the volume of space examined.)
Rubber eyecups are also a boon, especially if artificial lights intrude on your observing site.
Charts and notes should be handy, so you can glance back and forth from sky to chart without moving the binoculars. Your lap works fine in a lawn chair, whereas a telescope really requires a separate chart table.
Lastly, start keeping an observing notebook or diary right away -- even if you only write down the date, time, observing instrument, and such comments as "Sinus Iridum standing out prominently on Moon's terminator," or "M35 in Gemini a big, dim glow," or "NGC 457 not found." This turns an evening's sightseeing into a permanent collection of observations that will grow in value to you with the passage of time. A plain spiral-bound notebook is ideal for this purpose. The more structured records that some amateurs keep (such as a separate page or file card for each object) are best copied out later; they are a chore to organize in the dark and constrain your freedom to write down off-the-cuff remarks. It is often these asides -- your first bright meteor, an especially clear, starry sky after a snowstorm, a night at a memorable site -- that often mean the most when you look back on them in years to come.

Behlen's Open House Observing Schedule

From UNL's Behlen Web Page

Through the 30-inch Reflector

We will start the evening by viewing the Orion Nebula (M42). It is a giant cloud of gas where it is thought that stars are still forming today. Four hot stars known as the trapezium heat up the surrounding gas and give the Orion Nebula its eerie glow.
Later in the evening (if time and moonlight allows), we will move on to the Whirlpool Galaxy (M51 or the bright globular cluster M3.

Through Smaller Telescopes

A special treat of recent public nights at Behlen Observatory has been the presence of amateur astronomers from the Lincoln and Omaha astronomy clubs, who bring their telescopes to share astronomical viewing with the public. Look for them outside near the south end of the observatory. You will be impressed by how much an amateur's telescope can show you and also learn about the fascinating hobby of amateur astronomy. The small telescopes should yield good views of the first quarter moon, several star clusters (M44 and M67), and three planets that will be too low in the sky to observe with the 30-inch. Saturn and Venus should be visible in the western sky in the first hour after sunset and Mars will rise in the east just a little after 9:00.

Slide Show Talks

The following speakers are tentatively scheduled to give talks (in the North Concourse):

- Dr. Martin Gaskell "Quasars" 7:00 - 7:30 p.m.
- Dr. Daniel Claes "Kids and Cosmic Rays" 7:45 - 8:15 p.m.
- Dr. Kevin Lee "A Star's Life in HST Images" 8:30 - 9:00 p.m.

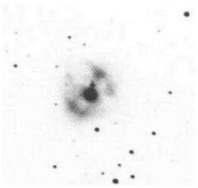
At least one slide show talk will be given by the astronomy faculty regardless of whether the weather allows telescopic viewing.

Demonstrations

The following demonstrations are tentatively scheduled to be set up (in the South East Lecture Hall):

- Multiple Demos will be setup by the Society of Physics Students
  "Extraterrestrial Life" - Mr. Chris Smith

Deep-Sky Observations



NGC1514

By Dave Knisely
DS012099
DATE: January 20th 1999, 0430 to 0600 hrs UTC.
LOCATION: Rockford Lake, Nebr. 40.227N, 96.581W, 1400 ft. Elevation
INSTRUMENT: 10 inch f/5.6 Newtonian, 47x, 59x, 94x, 141x, 220x
CONDITIONS: Clear, Temp. 28 deg. F. wind calm, Humidity 78%
UNAIDED EYE LIMITING MAGNITUDE: +6.8
SEEING: 0.7 arc seconds (variable).

OBSERVATIONS: After a late observatory committee meeting in Lincoln, I hurried out to my dark sky site to try and get a few more Herschel II objects in before the next storm system clouded up the sky (as has happened twice this past week). With the scope being in the unheated van, it required little time for cooldown, and enabled me to quickly begin observations. A little sight seeing convinced me that I had a very good night for observing. M42 was spectacular in the ten, showing almost as much detail without a filter as with one. The huge southern loop was easy, and faint reddish hues could be seen with the Lumicon OIII filter, especially in the areas outside the bluish central core. I moved the scope up to Zeta Orionis, and was blown away by the "Flame" nebula NGC 2024. Even without a filter, the object appeared quite detailed, showing the broad north-south curving dark lane and two or three others which extended off to the northeast from the main lane into the eastern portion of the cloud. The outer areas of the nebula looked wisy, with some interesting fine dark detail. Of course, while in the area, I went looking for the Horsehead, and found it fairly quickly. It was dimly but plainly visible as a dark gap in the nebulosity of IC 434 without a filter, and the UHC did help boost the contrast a bit, making the horse's "snout" easier to see. I also enjoyed the view of the jewel-like multi-component star Sigma Orionis. Just for fun, I went up to M78, and was pleasantly surprised as to how well that nebula stood out. Its broad rounded "comet-head" shape was quite obvious, with the hint of a faint internal loop-like structure running as an arc in the brighter northern edge and then looping around towards the southern and eastern edges. Just to the northeast of M78, the nebula NGC 2071 was visible as a small oval or rectangular faint patch around a faint star, with hints of very diffuse extensions to the northwest and southeast.

After this sight-seeing, I went back to my search for the Herschel II objects. NGC 1348 was (suprise!) a dim and small open star cluster in a rather blank area in northern Perseus. Low power only showed it as a faint small misty or granular area with a few faint stars involved. 94x revealed about 5 core stars of moderate brightness with a faint granular glow, but it took about 141x to reveal many more stars. The entire group may have had only 15 to 20 stars in it. I then tried my luck at the larger cluster NGC 1382 in Auriga. This one was fairly easy, appearing as an elongated group of perhaps 20 stars in a squashed sinuous "S" form. The field was fairly rich, so it was unclear which stars were members and which were not. A second grouping of stars was noted to the south. Also in the area well to the north was the much smaller and fainter open cluster NGC 1605. This one was really tough, being barely visible at 59x as a small very dim diffuse glow with a few imbedded stars. 94x showed a brighter middle region of 5 or 6 stars in a granular haze, while 141x revealed a number of very faint members. The middle portion seemed to have a darker inclusion or a "hole" with none of the 20 to maybe 40 stars visible being very bright.

After this change of pace, the Herschel II list once again reverted to its usual fare of small faint galaxies. NGC 1353 in Eridanus appeared as a small faint oval fuzzy patch with a slightly brighter middle. 141x did show a small brighter core and a suggestion of mottling, but little other detail.
NGC 1400 was also small, but brighter, appearing as a dim roughly circular fuzzy patch with a small brighter center. 141x showed a dim star-like nucleus in the core. A somewhat brighter elliptical galaxy, NGC 1407, was seen in the same field to the northeast, appearing as a moderate-sized roughly circular fuzzy patch with a somewhat brighter middle. 1407 was quite easy to see, which again makes me wonder about the object selection for the Herschel II list (why did NGC 1400 make the list when NGC 1407 didn't?). A third galaxy in the group, NGC 1402, was a tiny very dim spot which made a nice triangle with the other two objects. A few other faint galaxies were also in the area.

Farther north, I ran into the small nearly edge-on spiral galaxy NGC 1507. Although visible at 59x, its overall form was much better seen at 141x, revealing its needle-like shape and some weak brightness variations along its length. NGC 1618 was another rather tiny dim target, appearing as a faint elongated fuzzy patch which was difficult to see due to the nearby presence of Nu Eridani. Once again, an easier galaxy, NGC 1625, lay to the east, which again makes me wonder who in the world worked out this list. This one was also somewhat elongated, but made difficult to observe due to Nu's scattered light. Between NGC 1618 and 1625 was a fainter galaxy NGC 1622. It was barely visible, and showed just some elongation. A nice surprise came when I found NGC 1637. This one was fairly easy, appearing as a moderate-sized faint hazy oval patch with diffuse outer edges

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and a brighter middle. 141x showed a well-defined inner core with some weak mottling around it into the outer haze.

When I hit my next Herschel II target, I immediately recognized the number; NGC 1514 in Taurus. It has long been a favorite of mine, and I often call this fairly big planetary nebula "The Crystal Ball", because of its unique appearance. It was visible even without filters as a hazy circular glow around a 9th magnitude star, but higher power reveals some vague dark detail in the interior. Add the Lumicon OIII filter, and the object's detail is startling to say the least. Two brighter arcs mark the east and west sides of the nebula, with a darker ring around the central star. The arc on the east appeared slightly brighter, thicker and somewhat irregular, but the west arc was also quite prominent. Both arcs are imbedded in the soft circular glow of the nebula, with the darker zone around the central star making it look like the venerable crystal ball. The UHC filter helped as well, but the contrast really goes up with the OIII filter in place.

Going back to Eridanus, I hit another faint group of galaxies. The Herschel II target was NGC 1587, a small dim roughly round patch with a small brighter middle. Right next to it on the east was the very small faint galaxy NGC 1588, appearing as tiny fuzz spot. Well to the north of these two objects was the rather elongated galaxy NGC 1589, which would have been a good addition to the Herschel II list.

As a final target, I looked for the small open cluster NGC 1663 in north-western Orion. It was rather faint and not very rich, being barely visible at 59x as a dim granular patch. 94x and 141x revealed perhaps 15 to 20 total members, but none of the stars was very bright, and the object appeared to be somewhat irregular in overall form. Hopefully, there will be a few more pleasant suprises in the Herschel II list coming up.

Clear skies to you.

David Knisely.

Victory For the Fight Against Light Pollution

For the first time in more than 25 years the Pima County Board of Supervisors voted against a rezoning requested by a developer. This rezoning would have allowed for the development of a high-density community at the base of Mt. Hopkins and Whipple Observatory (home of the Multiple Mirror Telescope and future home of the 6.5m). The light pollution would have washed out the sky. One of the principal reasons given was the preservation of our major observatories and optics industry. The huge response of the astronomical community around the world to our petition as well as the numerous letters received from our colleagues and friends played a significant role in convincing the Board that their decision would have more than just a local impact, it would have an international impact as well. Articles on the petition appeared in both local papers. We will be working with county, city and other governmental agencies to hopefully ensure that growth in Arizona will occur in a way that does not threaten our astronomical resources in the future.

Thank you all for your support of the Tucson astronomical community! The response by the international astronomical community was amazing. Over 2200 people responded, representing 44 states in the US and 29 other countries around the world. We also recieved around 80 letters to the Board of Supervisors protesting the Fairfield

legal threat as well as the threat of light pollution to our observatories.

Letter From Plutonius

Dear Mark Anthony,

Are you still working on the Y zero K problem? This change from BC to AD is giving us a lot of headaches and we haven't much time left. I don't know how people will cope with working the wrong way around. Having been working happily downwards forever, now we have to start thinking upwards. You would think that someone would have thought of it earlier and not left it to us to sort out at the last minute. There are those predicting that our entire economy will collapse from the confusion, chariots will crash in mid-flight, the aqueducts may fall down, Vesuvius will erupt, the pyramids will implode, and so forth.

I spoke to Cassias the other evening. He was livid that Julius hadn't done something about it when he was sorting out the calendar. He said he could see why Brutus turned nasty. We called in the consulting astrologers, but they simply said that continuing downwards using minus BC won't work. As usual, the consultants charged a fortune for doing nothing useful. As for myself, I just can't see the sand in an hourglass flowing upwards.

We have heard that there are 3 wise guys in the east working on the problem, but unfortunately they won't arrive till it's all over. Some say the world will cease to exist at the moment of transition. Anyway we are continuing to work on this blasted Y zero K problem and I will send you a parchment if anything further develops.

Plutonius

Galileo Buzzes Europa

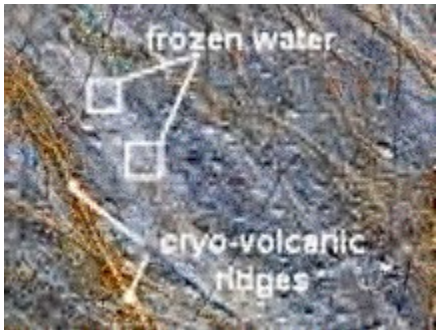
Press release from NASA:
Feb 2, 1999: JPL scientists reported that the Galileo spacecraft executed a close flyby of Europa on Sunday, passing a scant 894 miles above the surface of Jupiter's frozen moon. Early indications are that the maneuver was a success and that all scientific data were stored on the spacecraft's tape recorder for later playback.

Right: Artist Duane Hilton's concept of Galileo as it flies by Europa on Jan. 31, 1999.

This latest flyby is the last of a series that began in late-1997 as part of the extended Galileo-Europa Mission (GEM). Scientists are intrigued by Europa because of mounting evidence that a liquid ocean exists beneath its frozen surface. Although the moon's surface temperature is a chilly -260° F it's possible that warmth from a tidal tug of war with Jupiter and neighboring moons could be keeping large parts of Europa's ocean liquid. Tidal friction from Jupiter is also thought to be responsible for volcanic activity on Europa's neighbor Io.

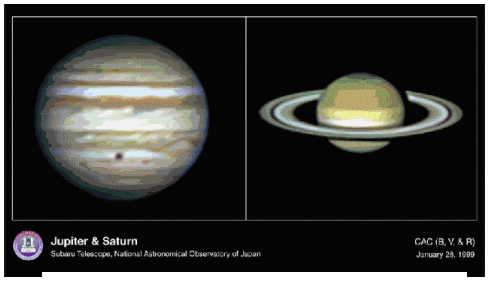
The picture below, right is an image from Europa's southern hemisphere. The brown, linear ridges extending across the scene are thought to be frozen remnants of cryo-volcanic activity. "Cryo-volcanoes" (cold volcanoes) occur when liquid or partially frozen water erupts onto the Europan surface, freezing instantly in the extremely low temperatures so far from our sun.

A geologically older, smoother surface, bluish in tone, underlies the ridge system. The blue surface is composed of almost pure water ice, whereas the composition of the dark, brownish spots and ridges is not certain. One possibility is that they contain mineral salts in a matrix of high water content.

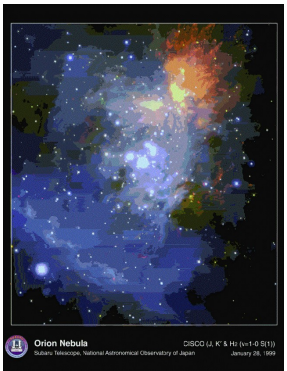


Right: A close up view of the volcanic ridges and areas of blue that scientists believe are frozen water on Europa.

First Light From Subaru



Jupiter and Saturn

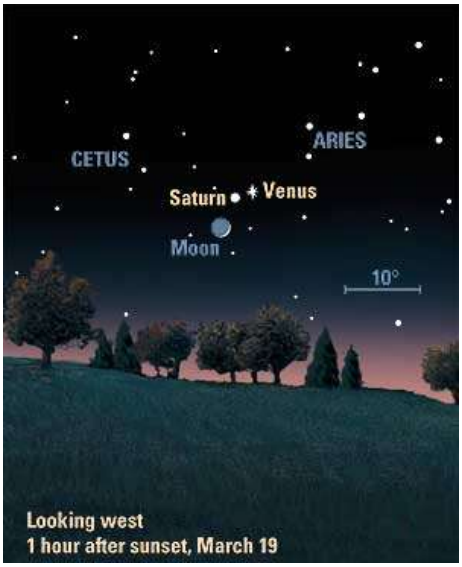


The TOP TEN ways to know you're a Deep Sky person...
10... you consider the moon a major annoyance.
9... you consider Jupiter 'light pollution'.
8... you actually know how to USE setting circles
7... your favorite objects are objects you can barely see.
6... you enjoy looking at faint fuzzies with the smallest possible aperture.
5... you enjoy looking at faint fuzzies with the largest possible aperture.
4... you like to choose objects that are easier to imagine than to see.
3... you frequently disagree with Burnhams, and have seriously considered publishing your **own** "observer's guide"
2...you see absolutely no value in using a Telrad
1... you remove the LED on your drive control panel, because THAT ruins your dark adaptation!

Hic Orion Nebula

March Celestial Events

Day	Time (CST)	
1	4 a.m.	The moon passes 0.2 degree north of Regulus
3	7 a.m.	Mercury is at greatest eastern elongation (18 degrees, evening)
6	8 p.m.	The moon passes 3 degrees north of Mars
13	5 p.m.	The moon passes 1.4 degrees north of Neptune
14	2 p.m.	The moon passes 1.3 degrees north of Uranus
18	5 a.m.	The moon passes 3 degrees south of Jupiter
19	1 p.m.	The moon passes 5 degrees south of Venus
	9 p.m.	The moon passes 3 degrees south of Saturn
20	3 p.m.	Venus passes 3 degrees north of Saturn (evening)
	8 p.m.	Equinox (northern spring/southern autumn begins)
22	Noon	The moon passes 0.6 degree north of Aldebaran
28	10 a.m.	The moon passes 0.3 degree north of Regulus



Planetary Events for March 99

From Astronomy Magazine's Website by Martin Ratcliffe and Alister Ling

March opens with a beautiful line of three planets above the western horizon. Venus is the highest and the most brilliant. Jupiter lies below Venus, while elusive Mercury is to the lower right of Jupiter during the first week of March.

Early March is the best time all year to see Mercury. It can be found roughly 11° above the western horizon 30 minutes after sunset. The planet sets only one and a half hours after the sun, so look for it early in the evening. As a guide use Jupiter, it's only 4° above and to the left (east) of Mercury.

On March 1, Mercury shines at magnitude -0.7. It changes rapidly during the month, dimming by nearly 0.2 magnitude per day. By March 10, it's at magnitude 1.1. This rapid fading is common after Mercury reaches its greatest eastern elongation (18° on March 3). It also makes seeing the planet more difficult.

Although Mercury seems to be near Jupiter, in reality the speedy planet is moving to our side of the solar system. Jupiter is on the far side of the sun -- some 5.9 astronomical units away. Each evening Jupiter sets roughly three minutes earlier than the previous night. By the end of the month, Jupiter is lost in the solar glare.

Magnitude -4.0 Venus is still pulling away from the sun. It rises higher each night as it moves toward a meeting with Saturn on March 20. Watch Venus's nightly progress as it closes in on the ringed planet. The 20° separating the two on March 1 shrinks to only 3° by March 20.
Not only is the distance between Venus and Saturn shrinking, but Venus's phase is getting smaller as well. From March 1 to its meeting with Saturn on March 20, the gibbous phase shrinks by roughly 8 percent. This phase decrease is partially compensated with a gentle growth in the apparent size of the planet's disk -- 13" at month's end. By June, its apparent size will have doubled, and by July it will be triple this size -- evidence that Venus is getting closer to Earth (see "Venus Rising," February 1999, page 80).

The three bright planets are precursors to the eight brightest winter stars -- Aldebaran, Betelgeuse, Rigel, Sirius, Procyon, Castor, Pollux, and Capella. All eleven objects make this late winter sky more interesting.

Reserve the evening of March 19 to take a closer look at Venus and Saturn. On that date, Venus will be less than 3° north of Saturn. A 2-day-old crescent moon also joins the pair. The bright trio shines at magnitude -4.0 for Venus, magnitude 0.5 for Saturn, and a brilliant -10 for the waxing crescent moon. The contrasts will be quite spectacular.

One day later, on March 20, the moon is past the two planets and Venus lies 3° north of Saturn. The ringed planet is a gorgeous sight through a telescope. It's the only object that can surpass the March 19 evening trio. The southern face of the ring system is one of the true wonders of the night sky, and it currently faces Earth. This is the last month that Saturn is visible in a dark sky, so make the most of it. By April, Saturn succumbs to the sun's glow and passes into the morning sky.

Attentions turn toward Mars this month as the season for observing the Red Planet gets underway. For a couple of months before and after its April 24 opposition, Mars presents its most favorable aspect to Earth. From now until mid-July, Mars's disk will be over 10" in diameter. This allows small telescopes to see appreciable surface detail.

Mars rises shortly after 11 p.m. local time on March 1 and two hours earlier by March 31. It competes with the glow of Arcturus to the north and reaches its highest point above the southern horizon a couple of hours before dawn. In the third week of March, its easterly motion slows against the background stars. Mars then begins its retrograde loop. Retrograde motion is similar to watching another car as you pass it. The slower car appears to move backward relative to your car. In the context of the solar system, Earth is beginning to overtake Mars. Eventually the red planet will swing back toward Spica in Virgo.

Shining at a stunning magnitude -1.0 by March 31, Mars is visible for the rest of the night among the stars of Libra. Its apparent diameter has now grown to 13". By April 24, it will increase in apparent size by another 3".

The trick to observing Mars through any size telescope is to catch the brief moments of seeing through our unsteady atmosphere. These moments usually last only seconds, but observers patiently wait for them to see the finest detail on the Red Planet.

The spring Equinox occurs at 8:46 p.m. EST on March 20. On this day, observers at the north and south poles can theoretically see the sun traverse the entire horizon during a 24-hour period. It also marks the beginning of spring in the Northern Hemisphere, and the beginning of autumn in the Southern Hemisphere.

Martin Ratcliffe is Director of Theaters at the Exploration Place in Wichita, Kansas. Alister Ling is a meteorologist working for Environment Canada in Alberta.

Pluto, the 9th Planet

Look! Up in the sky! Is it an Asteroid? Is it a Trans-Neptunian Object? No, it's a Planet (again)!

(Editors Note: Due to the recent discussion of the classification of Pluto, A little background on Pluto seems to be in order)

Text by Bill Arnett

Pluto is the farthest planet from the Sun (usually) and by far the smallest. Pluto is smaller than seven of the solar system's moons (the Moon, Io, Europa, Ganymede, Callisto, Titan and Triton).

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orbit:    5,913,520,000 km (39.5 AU)
diameter: 2274 km
mass:     1.27e22 kg
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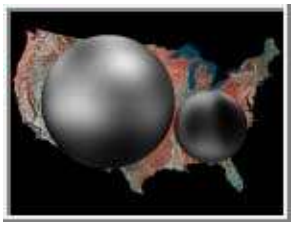
In Roman mythology, Pluto (Greek: Hades) is the god of the underworld. The planet received this name (after many other suggestions) perhaps because it's so far from the Sun that it is in perpetual darkness and perhaps because "PL" are the initials of Percival Lowell.

Pluto was discovered in 1930 by a fortunate accident. Calculations which later turned out to be in error had predicted a planet beyond Neptune, based on the motions of Uranus and Neptune. Not knowing of the error, Clyde W. Tombaugh at Lowell Observatory in Arizona did a very careful sky survey which turned up Pluto anyway.

After the discovery of Pluto, it was quickly determined that Pluto was too small to account for the discrepancies in the orbits of the other planets. The search for Planet X continued but nothing was found. Nor is it likely that it ever will be: the discrepancies vanish if the mass of Neptune determined from the Voyager 2 encounter with Neptune is used. There is no tenth planet.



Pluto is the only planet that has not been visited by a spacecraft.

Pluto and Charon size comparison with the U.S. as a backdrop. (Photo Courtesy: Calvin J. Hamilton used with permission)

Even the Hubble Space Telescope can resolve only the largest features on its surface. Fortunately, Pluto has a satellite, Charon. By good fortune, Charon was discovered (in 1978) just before its orbital plane moved edge-on toward the inner solar system. It was therefore possible to observe many transits of Pluto over Charon and vice versa. By carefully calculating which portions of which body would be covered at what times, and watching brightness curves, astronomers were able to construct a rough map of light and dark areas on both bodies.

Pluto's radius is not well known. JPL's value of 1137 is given with an error of +/-8, almost one percent. Though the sum of the masses of Pluto and Charon is known pretty well (it can be determined from careful measurements of the period and radius of Charon's orbit and Kepler's Third Law), the individual masses of Pluto and Charon are difficult to determine because that requires determining their mutual motions around the center of mass of the system which requires much finer measurements -- they're so small and far away that even HST has difficulty. The ratio of their masses is probably somewhere between 0.084 and 0.157; more observations are underway but we won't get really accurate data until a spacecraft is sent.

Pluto is the second most contrasty body in the Solar System (after Iapetus). Exploring the origin of that contrast is one of the high-priority goals for the proposed Pluto Express mission.

There are some who think Pluto would be better classified as a large asteroid or comet rather than as a planet. Some consider it to be the largest of the Kuiper Belt objects (also known as Trans-Neptunian Objects). There is considerable merit to the later position, but historically Pluto has been classified as a planet and it is likely to remain so. Pluto may actually be included in both categories. This is currently being debated within the IAU.

Pluto's orbit is highly eccentric. At times it is closer to the Sun than Neptune (it has been so since January 1979 and will continue until February 11 1999). Pluto rotates in the opposite direction from most of the other planets.

Pluto is locked in a 3:2 resonance with Neptune; i.e. Pluto's orbital period is exactly 1.5 times longer than Neptune's. Its orbital inclination is also much higher than the other planets'. Thus though it appears that Pluto's orbit crosses Neptune's, it really doesn't and they will never collide. Like Uranus, the plane of Pluto's equator is at almost right angles to the plane of its orbit.

The surface temperature on Pluto is not well known but is probably between 35 and 45 Kelvins (-228 to -238 C). Pluto's composition is unknown, but its density (about 2 gm/cm3) indicates that it is probably a mixture of 70% rock and 30% water ice much like Triton. The bright areas of the surface seem to be covered with ices of nitrogen with smaller amounts of (solid) methane and carbon monoxide. The composition of the darker areas of Pluto's surface is unknown but may be due to primordial organic material or photochemical reactions driven by cosmic rays.

Little is known about Pluto's atmosphere, but it probably consists primarily of nitrogen with some carbon monoxide and methane. It is extremely tenuous the surface pressure being only a few microbars. Pluto's atmosphere may exist as a gas only when Pluto is near its perihelion; for the majority of Pluto's long year, the atmospheric gases are frozen into ice. Near perihelion, it is likely that some of the atmosphere escapes to space perhaps even interacting with Charon. The Pluto Express mission planners want to arrive at Pluto while the atmosphere is unfrozen.

The unusual nature of the orbits of Pluto and of Triton and the similarity of bulk properties between Pluto and Triton suggest some historical connection between them. It was once thought that Pluto may have once been a satellite of Neptune's, but this now seems unlikely. A more popular idea is that Triton, like Pluto, once moved in an independent orbit around the Sun and was later captured by Neptune. Perhaps Triton, Pluto and Charon are the only remaining members of a large class of similar objects the rest of which were ejected into the Oort cloud. Like the Earth's Moon, Charon may be the result of a collision between Pluto and another body.

Pluto can be seen with an amateur telescope but it is not easy. Mike Harvey's planet finder charts show the current position of Pluto (and the other planets) in the sky, but much more detailed charts and careful observations over several months will be required to actually find it. Suitable charts can be created with many planetarium programs such as Starry Night.

For the latest on the Pluto issue, see the following website:
http://www.ss.astro.umd.edu/IAU/div3/pluto.shtml

For more images from Mr. Hamilton, see his website at:
http://www.hawastsoc.org/solar/eng/toc.htm

THE PRAIRIE ASTRONOMY CLUB CALENDAR
For March 1999

Sun	*Mon*	*Tue*	*Wed*	*Thu*	*Fri*	*Sat*
1999 MAHONEY STAR PARTY DATES: **FRIDAY, MAY 21** **FRIDAY, JUNE 18** **FRIDAY, JULY 16** **FRIDAY, SEPT 10** **FRIDAY, OCT 8**	**1**	**2** **FULL MOON** 	**3**	**4**	**5** **OAS Meeting**	**6** **Hyde Observatory open to the public 7-10 PM**
7	**8**	**9**	**10** **3RD QUARTER** 	**11** **NSP Planning Meeting 7:30 PM @ Mahoney State Park Lodge**	**12** **Observing at Olive Creek SRA**	**13** **Hyde Observatory open to the public 7-10 PM**
14	**15**	**16**	**17** **NEW MOON** 	**18**	**19** **Messier Marathon?? Constellation Program @ Pioneers Park**	**20** **Hyde Observatory open to the public 7-10 PM**
21	**22**	**23**	**24** **1ST QUARTER** 	**25**	**26** **UNL Behlen Observatory Spring Open House 7-10 PM**	**27** **Hyde Observatory open to the public 7-10 PM**
28	**29**	**30** **PAC Meeting 7:30 PM Hyde Observatory**	**31** **FULL MOON** 	**April 30-May 1, Iowa.** The Cedar Amateur Astronomers will host the convention of the Astronomical League's North Central Region at the Sheraton Four Points Hotel in Cedar Rapids. Contact Deb Bonser, 1009 Harding, Tama, IA 52339, or call 515-484-5235, or e-mail deb.bonser@usa.net. *Also, the editor apologizes for listing 2 1st quarter moons for the month of February. February 8th should have been a 3rd quarter moon. Just keep in mind that I'm new at this!*		

"Men give ear to an upstart astronomer who tries to show that the Earth revolves, not the Sun and Moon. This fool wishes to reverse the science of astronomy." - Martin Luther (regarding Copernicus)	**"I would find it easier to believe that two Yankee professors would lie, than that stones should fall from the sky." -Thomas Jefferson (regarding two New York astronomer's theories about the origins of meteors)**

DIRECTIONS TO BEHLEN OBSERVATORY

Behlen Observatory is located at the University of Nebraska Agricultural Research and Development Center a few miles southeast of Mead, Nebraska and about 35 miles from either Omaha or Lincoln.

From **LINCOLN**: Take highway 77 North to about 1/2 mile past Swedeburg where you turn east on highway 63. Follow highway 63 for about 7 miles until you reach 10th street (same as spur 78F) where you will see a sign to Mead. Turn left and go one mile North to avenue "H". Turn right on Avenue "H" and continue east about 2 miles until you reach "8th" Street. Turn left on "8th" Street and follow it north about 0.7 miles to the observatory, which will be seen off to the left.

From **OMAHA**: Take highway 92 West until you reach Mead. At Mead turn south on to spur 78F and follow it about 5 miles until you reach Avenue "H". Turn left on Avenue "H" and continue east about 2 miles until you reach "8th" Street. Turn left on "8th" Street and follow it north about 0.7 miles to the observatory, which will be seen off to the left.

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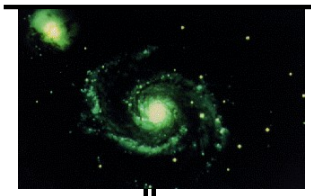

The Prairie Astronomer
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P.O. Box 5585
Lincoln, NE 68505-5585

First Class Mail

Next PAC Meeting
February 23, 1999
7:30 PM
Hyde Observatory

NSP 6 Countdown
Less Than 170 days
August 7-14, 1999
Merritt Reservoir