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# THE PRAIRIE ASTRONOMER

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March 29, 1977

## THE BIG NEWS OF THE MONTH-- 100 MOONS APPARENTLY CIRCLE URANUS IN A BELT

Two American astronomers have announced that they have discovered a swarm of moons around the planet Uranus. They called it a find of major importance.

Dr. J. L. Elliot of Cornell University and Dr. Robert Millis of Lowell Observatory in Arizona made the announcement.

Uranus was previously thought to have only five moons. Elliot said the swarm could contain up to 100 moons. This means that Uranus, 1.8 billion miles from the sun, has more moons than any other planet.

Elliot made his observations from the U.S. National Aeronautics and Space Administration's C141 flying observatory over the Indian Ocean. Millis spotted the same swarm using the Perth observatory's reflecting telescope at Bickley, Australia.

He said he identified several moons with diameters between 18 and 24 miles. Millis said he identified a moon about 60 miles in diameter.

The observations were made when Uranus occulted star SAO 158687 on March 10, 1977. A secondary occultation was observed, which was reported to be "presumably caused by a small body (not Miranda) in orbit about Uranus." Later reports stated that the secondary occultation was actually "several occultations", observed independently by Elliot aboard the airborne observatory, and Millis and his colleagues at Perth. Both groups in-

dependently concluded that these occultations were caused by "bodies that are apparently part of a satellite belt about 40,000 km distant from the center of Uranus." The diameters of the satellites range from 100 km to much smaller values.

Later computations by Brian G. Marsden of the Smithsonian Astrophysical Observatory show that "the asymmetry in the times of the satellite occultations about the main occultation is consistent with the existence of a circular belt in the plane of Uranus' equator. Allowance for fore-

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## "LONELINESS FACTOR" IS MARCH MEETING PROGRAM HIGHLIGHT

How did life evolve on Earth? Are there intelligent beings elsewhere in the universe? Can we ever communicate with them?

These absorbing questions are explored in a new sky drama, "The Loneliness Factor", which Jack Dunn has acquired from the American Chemical Society for the program at our March 29 meeting. The meeting will be at Olin Hall, Nebraska Wesleyan, at 7:30 p.m.

"The Loneliness Factor" was developed by the Hansen Planetarium, Salt Lake City, Utah, and produced for distribution to other planetariums.

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President's Report

## MARCH FINISHES UP ON A BRISK NOTE AS CLUB ACTIVITIES ACCELERATE

As nice weather returns, we have a number of activities coming up. Our calendar for the next month is crowded with interesting events.

This Friday, March 25, there will be an open house at Behlen Observatory, sort of an amateur astronomer's night. The Prairie Astronomy Club and the Omaha Astronomical Society are invited to bring telescopes as we did last Fall, and there may be several hundred enthusiastic observers there, weather permitting. Last Fall our club brought eight portable scopes, from a Questar to a 12½-inch, and I hope we can top that this time.

Next Tuesday, March 29, is our meeting at Olin Hall of Science on the Nebraska Wesleyan Campus. Jack Dunn has an interesting program for us, and Rick Johnson has offered to bring his videotape of the interview he and I had on Channel 10.

One of KOLN-TV's reporters, Larry Hall, has taken an interest in our club and in the City Observatory, and has run two stories about amateur astronomy during the last month. The first of these was coverage of the arrival and inspection of the Celestron-14 telescope, which is now in Lincoln, waiting for construction of the observatory to be completed.

I have seen the new telescope,

and can report that it seems to be a fine instrument, at least mechanically. We have not yet tested it optically.

Professor Moore says that bids for construction of the observatory will be opened at the end of March, with construction to start fairly soon after that.

On March 30, Jack Dunn would like members of our club to bring telescopes to the planetarium to help students in his Backyard Astronomy class learn more about the sky. We have done this before, and it is all

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URANUS MOON SWARM (From Page 1)

shortening yields the radii of the inner and outer edges of the belt as 44,000 and 51,000 kilometers respectively. An observation at Kavalur, India, suggests occultation by a 100 km-sized body near the outer edge of the belt."

Astronomers have been notified that, at the present opposition, the satellite belt should be located from 3.5 to 4.0 seconds of arc to the east and south of the center of Uranus, and from 2.7 to 3.1 seconds to the east and west. The brightest bodies in it are expected to have a visual magnitude of approximately 19.

THE PRAIRIE ASTRONOMER is published monthly by the Prairie Astronomy Club, and is free to club members. Yearly newsletter subscription without regular membership is \$4. Regular membership (including one-year subscription to Sky & Telescope, club newsletter, and four quarterly issues of the Astronomical League publication, The Reflector) is \$10. Family membership, \$12. Editor, Lee Thomas (489-3855).

## ANOTHER TRY AT CAPTURING THE ELUSIVE NEUTRINO IS PLANNED FOR HAWAIIAN ISLAND

A detection system, involving large numbers of microphones positioned 18,000 feet beneath the surface of the sea northeast of Maui in the Hawaiian islands, has been proposed to "listen" for high-energy subatomic particles coming from outer space. The site was chosen because it offers a large volume of water, which is necessary for the experiment, but is close enough to shore to be reached by underwater electric cables.

The particles being sought are neutrinos, which have no mass and no electrical charge. Because most neutrinos are believed to pass right through the earth without interacting with matter, they are extremely difficult to detect. But the undersea detector, if successful, would be a step toward "neutrino astronomy", the study of bodies in space by means of the neutrinos they emit. Neutrino astronomy could ultimately answer such questions as whether there are galaxies composed of antimatter--a substance composed of atomic particles that are the opposite of those occurring in the sun's galaxy.

Though difficult to detect, neutrinos have been found in the laboratory and in previous neutrino detectors located deep in a gold mine at Lead, S. D. Neutrinos so far found, however, have been of lower energies than the underwater system is designed to study.

The underwater detector would work by actually hearing the shock wave created by a spray of particles released when a high-energy neutrino collides with an atomic nucleus in

the water. By recording the precise arrival time of a sound pulse at several microphones, it would be possible to determine the direction from which the neutrino had come. Possible sources could be the collision of cosmic rays with gas in the earth's atmosphere or in outer space, as well as other galaxies and the original "big bang" with which the universe is thought to have begun.

(--New York Times)

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**NOTE ADDRESS CHANGE FOR THE CLUB:**

The club's Board of Directors has authorized a post office box so the club can have a "permanent home" from which to conduct its business. Our official new address is:

Prairie Astronomy Club  
P.O. Box 80553  
Lincoln, Nebraska 68501

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**MARCH MEETING (From Page 1)**

The show theorizes that in the death of supergiant stars billions of years ago were born the elements of life that are scattered in space, the same elements contained in our bodies. If the theory is correct, the chemicals of Earth were once the insides of these colossal stars.

"The Loneliness Factor" concludes that humanity, with its growing knowledge about the composition of the universe, stands now on the shoreline of a sea of unthinkable immensity, awaiting that first message from the stars--perhaps an answer to our conscious efforts to communicate in recent years, or the avalanche of radio signals we have been unleashing into space for the past 60 years.

# SKY CALENDAR

Information for helping teachers

SUNDAY	MONDAY	TUESDAY	WEDNESDAY
<p>Venus can be seen in both morning and evening skies Mar 28-Apr 6. Thereafter Venus is morning object only. For its location at sunset and sunrise, see diagrams after Mar 31 last month. See also descriptions Apr 1-8 &amp; next two blocks.</p>	<p>Venus near inferior conjunction is thin crescent 1 minute of arc across, which may easily be detected in 7X binoculars. Crescent easiest to see around sunset or sunrise, so location is given then. CAUTION!! Do NOT look at sun with binoculars.</p>	<p>Venus as evening object sets in WSW 3/4 hr before sun Apr 1, 1/2 hr after sun Apr 3, and with sun Apr 6. Venus as morning object rises north of east 1/2 hr before sun Apr 4, 1 hr before sun Apr 14, and 1 1/2 hrs before sun Apr 30.</p>	<p>Jupiter is "star" as usual. One best set Apr 1; Apr 3; Apr 30. On Apr 11 of Pleiades 25. Best Mercury in W of Apr. 14 after sunset.</p>
<p>Venus 8° upper right of sun at sunset tonight and 8° upper left of sun at sunrise tomorrow. Venus 5° above horizon and 6° farther north along horizon both times. At 11:18 pm EST tonight full moon 1/5 covered by earth's shadow. ☉</p>	<p>At sunset tonight, Venus 3° up and 7° right of sun. Moon rises about 1 hr later. Two hrs after sunset, look for Spica 5° upper right of moon. At sunrise tomorrow Venus 5° up and 5° left of sun.</p>	<p>At sunset tonight, Venus is 7° to right (north) of sun and about 2° up. 45 min later in about same direction, look for Mercury 26° lower right of Jupiter. Tomorrow at sunrise, Venus 3° left (north) of sun and 6° up.</p>	<p>Venus at conjunction with earth and of tilt of it appears close to set, 7.5° along horizon tomorrow, of sun &amp; ...</p>
<p>☾ 10 Last Quarter (morning half moon). Mercury at greatest elongation, 19° east of sun in evening sky. 45 min after sunset, look 10° above horizon 15° N of W. Mercury is only 21° lower right of Jupiter.</p>	<p>11 Saturn ends retrograde, begins direct (eastward) motion. Saturn now 3° east of Beehive and 20° west of Regulus. Watch Saturn move slowly eastward next 3 months until it disappears in July.</p>	<p>12 Follow the curve of the Big Dipper's handle to two bright stars, as shown on map, April Evening Skies. "Follow the arc to Arcturus and drive a spike to Spica." Note Spica's relation to sun tomorrow night. Use Spica to tell time.</p>	<p>Spica, in ... is in oppo each year date. Half zodiac fr (in Pisces visible at dusk, well middle of in WSW at</p>
<p>● Jupiter ● Pleiades (45 min after sunset) ● Mercury</p>	<p>18 New Moon, in conjunction with sun, not visible. Mercury is of magnitude 1.5 tonight and will fade to 2nd mag by Apr 21. Use binoculars; look 19° lower right of Jupiter.</p>	<p>19 ● Aldebaran ● Jupiter ● Pleiades (45 min after sunset) ● Mercury ● Moon</p>	<p>19 ● Aldebaran ● Jupiter (45 min after sunset)</p>
<p>☀ One hour after sunset: ● Pollux ● Castor ☾ Moon tomorrow ● Procyon ☾ Moon tonight</p>	<p>25 Tonight Jupiter is midway between Pleiades and Aldebaran, 7° from each. Each clear evening, look for Pleiades, Rigel, Aldebaran, Sirius, Betelgeuse, and Jupiter. Find out last date you can see each object.</p>	<p>26 One hour after sunset: ● Saturn ☾ Moon, just past First Quarter ● Procyon</p>	<p>One hour after sunset: ● Regulus ● Moon</p>

Magnitudes of the Planets: Venus -3.3 to -4.2; Jupiter -1.6 to -1.5; Saturn +0.4 to +0.5; Mars +1.4 to +1.3  
Mercury Apr 1 -0.8; Apr 6 -0.2; Apr 11 +0.5; Apr 16 +1.2; Apr 21 +1.9  
Planets against star background: Jupiter moves 6° eastward in Taurus this month; on Mar 1 it is 4.7° S of the Pleiades cluster, and 11° from Aldebaran. By Apr 30 Jupiter is 6.2° from Aldebaran. Saturn, stationary in Cancer Apr. 11, moves very little this month. Use binoculars to locate the Beehive cluster 3° west of Saturn.

# APRIL 1977

and students observe the sky

WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
<p>brightest twilight after sunset look W 32° WNW 11° up. is 4.7° S. See Apr 15 of <i>Mos</i> is 1st half at 45 min t low WNW.</p>	<p>Saturn as April begins, is high in S at end of evening twilight. It is only bright "star" about midway between Pollux and Regulus. A pair of binoculars directed at Saturn shows Beehive cluster 3° to west. <i>Mars</i>: See Apr 9, 15, 16, 23, 30.</p>	<p>At sunset tonight, Venus 8° above horizon and 6° right of sun. As sky darkens look for Mercury 11° upper left of Venus and 32° lower right of Jupiter. By Apr 14 Mercury closes to within 19° lower right of Jupiter.</p>	<p>Tomorrow night, there will be a partial eclipse of the moon. Moon enters umbra (dark central part of earth's shadow) at 10:30 pm; greatest eclipse 11:18 pm; moon leaves umbra 12:06 am. All times EST. See April 3.</p>
<p>inferior 6, between sun. Because its orbit, 7.5° north us sets very low of sun farther north on. At sunset Venus 2° left up.</p>	<p>One hour before sunrise: Moon, Antares</p>	<p>One hour before sunrise: Moon, Antares, Venus 8° nearly directly above sun at sunrise this morning.</p>	<p>40 min before sunrise: Note Mars 6° above horizon 14° south of east. Watch Venus rise 16° north of east. See April 16, 23, 30 for changing Venus-Mars configuration.</p>
<p>Argo, 13 in vicinity to sun around this day around sun's place, Spica is night. ESE at up in S at light, &amp; low dawn.</p>	<p>Jupiter, setting 3 hrs after sun, is brightest evening object now that Venus has departed. 45 min after sunset look for 1st magnitude Mercury 19° lower right of Jupiter. Mercury gets lower &amp; fades rapidly in coming days.</p>	<p>45 min before sunrise: Venus, Moon, Mars</p>	<p>45 min before sunrise: (Venus-Mars 20° apart)</p>
<p>Aldebaran, Pleiades, Mercury</p>	<p>Aldebaran, Jupiter, Pleiades (45 min after sunset), Mercury</p>	<p>One hour after sunset: Moon, Aldebaran, Jupiter, Pleiades</p>	<p>45 min before sunrise: (13° apart), Venus, Mars</p>
<p>Saturn, Moon</p>	<p>One hour after sunset: Regulus, Moon</p>	<p>Watch Venus and Mars play tag in morning sky in May and June. Venus is nearly at greatest brilliance now. Here's an easy way to see it in daytime: Find it before sunset &amp; just keep track of it until after sunrise.</p>	<p>45 min before sunrise: (7° apart), Venus, Mars</p>

East Lansing Sunrise: April 1 6:21 a.m.; April 16 5:55 a.m. EST; April 30 6:34 a.m. EDT  
 Sunset: April 1 7:06 p.m.; April 16 7:21 p.m. EST; April 30 8:37 p.m. EDT

Observing Chairman's Report

## SKY OBJECTS TO LURE YOU FROM THE HEARTHSTONE ON A BRISK SPRING NIGHT

This month we have a variety of objects to look at. First, in Ursa Major we have a nice easy pair of galaxies, M81 and M82. They are located two degrees west of a faint star, 24 Ursa Majoris, which is about six degrees north of Ursa Majoris and slightly west of that star. M81 is a regular spiral which appears as an egg shaped patch of light in a small telescope, and which shows some slight detail in larger instruments. M82 is an irregular galaxy which appears as a spindle of light. Under good conditions the dark band structure slicing the spindle in two is visible in a 3-inch or larger instrument.

There are two other faint galaxies in the area, NGC 3077 and NGC 2976, both of which appear as faint patches of light. They require at least a 6-inch telescope for clear visibility.

For you galactic cluster lovers, I have M38 and M36, a pair of beautiful clusters near the star Phi Aurigae. M38 is  $1\frac{1}{2}$  degrees north of Phi and M36 is  $1\frac{1}{2}$  degrees east of Phi. For those with larger instruments, there are several clusters rather near these two objects. NGC 1907 is just south of M38 and it should be visible with a six inch instrument with ease. Through a small telescope or richest field telescope, M37 is a large and beautiful cluster located  $3\frac{1}{2}$  degrees east of Chi Aurigae and should be viewed under low power.

In Gemini, the large cluster M35 should also be viewed with low power

and is rather striking when viewed with smaller instruments. It is located about two degrees northwest of Eta Geminorum. Also in Gemini is a faint but interesting planetary nebula, NGC 2392, located one degree south and two degrees east of Delta Geminorum. Appearing as a bluish dot of light with a faint ring around it, the object bears resemblance to an eskimo in a fur parka. It requires a large telescope and fairly high power.

Moving southward, be sure and look at M46 in Puppis, located about 15 degrees east and a little north of Sirius. It is beautiful in a six-inch and has a small planetary nebula, NGC 2438 in it, located at the north end of the cluster.

-- David Knisely

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"FAINTEST STAR" IS PHOTOGRAPHED

Australian and British astronomers say they have photographed a pulsar that is the faintest star ever sighted.

"It is a great feat of optical astronomy," said Dr. Paul Murdin, a member of the Anglo-Australian team. "The light from the pulsar is about one millionth of that of our sun. It is like seeing a candle among lighthouses."

The pulsar, a collapsed star 1,600 light years from earth, was discovered by radio astronomers at Sydney University in 1968 and was named Vela. It was photographed by astron-

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## MORE ON THE ASTRONOMICAL LEAGUE/ALPO/NAA/IOTA/WAA NATIONAL CONVENTION

As announced in our last newsletter, the combined Astronomical League, Association of Lunar and Planetary Observers, International Occultation and Timing Association, and Western Amateur Astronomers convention will be in Boulder, Colorado, August 10-13.

Accommodations will be available at the Kittredge Residence Halls, located across the street from the Sommers-Bausch Observatory and the Fiske planetarium. Room and board for 5

nights' lodging (August 9th through 13th), and meals for 4 days, including the evening cookout and Saturday night awards banquet, will be \$94.15 per person for single occupancy, \$70.87 per person for double occupancy, \$60.35 per child under 13 years of age for single occupancy, and \$48.71 per child for double occupancy. Tickets may be obtained for individual meals at the cafeteria.

Activities were described in last month's newsletter. In addition, a telescope and astrophotography contest will be held outdoors with an afternoon set aside for set-up, viewing and judging the telescopes. To enter your telescope, bring it! No pre-registration for the contest is necessary. Convention pre-registrants will receive entry instructions and application forms for the astrophotography contest. Individuals who cannot attend the convention, but would like to enter the photo contest, may receive entry forms from Paul Thayer, 550 Webster Street, Apt. 13, Denver, CO 80226. The deadline for receiving photographs is August 1, 1977.

The NAA Papers Chairman is Andrew Gassmann, 222 East Yucca Hills Road, Castle Rock, CO 80401. Pre-registrations should be mailed to:

Denise Nye

5604 Bowron Place

Longmont, Colorado 80501

Send your name, address, city,

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## PRESIDENT'S REPORT

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ways a lot of fun.

On March 31, Professor Moore would like some help with a public night at Wesleyan, for several hundred elementary students and their parents. We will need some portable instruments if possible, and also some members without telescopes to man (person?) the scopes on the roof of Olin Hall. I know this makes three evenings in a row for club events, so perhaps we can have some members help Wednesday, and others Thursday.

Did anyone see the Soviet booster re-enter on March 13? Numerous reports of a UFO were received because of the reentry, which appeared as a fireball in the western sky about 10 p.m., according to newspaper reports.

Remember: March 25, 29, 30 and 31. As always, everyone is welcome at any of our events, guests included. See you there...and there...and...

-- Larry Stepp

## NATIONAL CONVENTION--

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state and zip, along with the \$18 registration fee (single and family) postmarked no later than August 1, 1977. After August 1, the registration fee will be \$20.

**DON'T FORGET BEHLEN OBSERVATORY  
OPEN HOUSE THIS FRIDAY NIGHT--**

**MARCH 25. BRING YOUR TELESCOPE  
TO MEAD, AND JOIN THE AREA'S  
AMATEURS AT THE AREA'S MAJOR  
ASTRONOMICAL OBSERVATORY FOR  
THE SEASON'S FIRST NIGHT UNDER  
THE PRAIRIE SKIES!**

**THE PRAIRIE ASTRONOMY CLUB  
P.O. Box 80553  
Lincoln, Nebraska 68501**

"FAINTEST STAR" (From Page 6)  
omers using a 150-inch optical telescope at Siding Spring, 200 miles west of Sydney.

The Vela pulsar flashes on and off 11 times a second. It was photographed by a computer-controlled system that scanned the area in synchronization with the flashes. Numerous flashes, each too faint to be separately observed, were then superimposed electronically.

The Vela pulsar may be one of those rare celestial bodies whose original appearance can be dated in terms of human history. The star may have begun in a supernova explosion that was apparently recorded in that area of the sky about 6,000 years ago by the ancient Sumerians.

**FIRST CLASS MAIL**

**Mr. Earl Moser  
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9/77

