

JUPITER FLYBY -- From Page 7

irmed by earth-based instruments at Mauna Kea Observatory on March 16, using the 224-cm telescope.) The ring extends out 57,000 km and is at least 9,000 km wide, although it may extend all the way to the cloud layer. It appears to be less than 30 km thick. Voyager 2 will be used to confirm measurements and, since the ring's position is now known, will undoubtedly produce much clearer pictures. Of the giant planets, only Neptune remains without a discovered ring.

OBSERVING CHAIRMAN -- From Page 6

For those with larger telescopes, look about 1 degree south and 2 degrees east of Delta Geminorium for

NGC 2392, a beautiful planetary nebula which shows a center spot with a ring around it.

For those who like binary stars, take a good look at Castor (Alpha Geminorum). It is a multiple system with two main 2nd magnitude stars and several fainter members seen best in larger telescopes.

Iota Cancri is also a good pair separated by about 31 arc seconds. One member is orange and the other is deep blue. They are a good pair for the small telescope.

-- David Knisely

WELCOME TO THESE NEW MEMBERS:

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Mary J. Rehm, 2726 E Street

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THE PRAIRIE ASTRONOMER

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A WRAPUP ON THE EXCITING RESULTS OF VOYAGER'S JUPITER FLYBY

The data from Voyager I's flyby of Jupiter has poured in with bewildering volume all month long. So much data has been swamping scientists that major discoveries, like the photograph of active volcanoes on the satellite Io, have waited long past reception of the raw transmissions. In case you missed the highlights, here is a summary:

1. A "torus", or doughnut-shaped belt of hot, electrically-charged sulfur particles was found to be following the moon Io in its orbit. The particles, like a gigantic fluorescent light, were found to be glowing in the ultraviolet. The source of the sulfur particles is uncertain, but thought to be the surface of Io.

2. The atmosphere of Jupiter is not composed of orderly belts in a nice, uniform flow. Instead, the atmosphere rolls and churns in dense clouds. Circulation within the Great Red Spot is particularly violent, except for a very small "eye" at the center which, like that of a hurricane, seems virtually calm. The white, or lighter-colored ovals that are seen in great frequency in Voyager pictures appear to be the equivalent of "high pressure" areas in the earth's atmosphere... more calm, and with atmospheric circulation opposite

that of the "red" spots or storms. In addition, Jupiter's atmosphere circulates like that of the earth: in the northern hemisphere, winds predominantly flow west to east, while the opposite is true in the southern climes. Both planets exhibit strong jet streams in their upper atmospheres. Cirrus clouds were clearly visible high above the main atmospheric cloud-tops of Jupiter. The jetstreams, numbering as many as 20, circle the planet at 350 m.p.h., piling up clouds
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MARCH MEETING FEATURES SOLAR ECLIPSE AND JUPITER TAPES

The March meeting of the Prairie Astronomy Club will be held at Hyde Observatory on Tuesday night, March 27, at 7:30 p.m.

There will be a very short business meeting, because the night is expected to be quite busy with program material. A large number of photographs from the Bowbells Solar Eclipse Expedition will be on show, with explanations by the expedition members. And, Jack Dunn will have special videotape footage of the incoming Jupiter Voyager transmissions as recorded by PBS (but not broadcast locally).

PRESIDENT'S REPORT:

If you weren't at the last meeting, I'm sure you've been lying awake at night thinking, "Gee, I wonder if our president returned safely from his eclipse trip." I'm pleased to answer, "Yes, I'm back and extremely happy that I went." Thanks to tremendous planning by Carroll Moore, the trip was a complete success. He somehow managed to arrange one day of clear weather for Bowbells, and that was all we needed. At this month's meeting (after a short, 10-minute business meeting), we will have a number of guest speakers from the trip who will give you their impressions of the eclipse and show their pictures (and we have some beautiful pictures!)

Along the same lines, Hyde Observatory was swamped the morning of the eclipse. According to Lee, the observatory had over 600 visitors, fielded almost constant telephone calls, and the city police had to be called in to direct traffic. All in all, it was the busiest day the observatory has had since its opening. We all owe a debt of thanks to the volunteers who were out there that day keeping things under control.

National Astronomy Day is Saturday, April 7. Our club is setting up an all-day telescope display in the indoor mall at Gateway that day. If you'd like to show your telescope or help man the display area for an hour or so, please let me know--we can use the help. Everyone is welcome to participate.

Also, we are sponsoring an Astrophotography Contest. (Details are bound into the center of this issue of The Prairie Astronomer.) All entries will be displayed at Gateway. As of right now, we only have four entries, so here's your chance to win a nice prize. Everyone but the judges is eligible to enter, so get your pictures in. (You can give them to me at the meeting instead of mailing them, if you prefer.)

One more plug-- I'm going to be teaching an Amateur Telescope Making class through the Parks & Recreation Department at Hyde Observatory on Monday nights

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THE PRAIRIE ASTRONOMER is published monthly by the Prairie Astronomy Club, and is free to club members. Yearly subscription without club membership is \$4.00. Regular membership (includes one-year subscription to Sky & Telescope, club newsletter, and four quarterly issues of the Astronomical League newsletter), is \$12.00. Family membership (includes all regular privileges, plus one additional vote in club elections) is \$14.00. Newsletter Editor: Lee Thomas (489-3855). Address all correspondence to PRAIRIE ASTRONOMY CLUB, INC., P.O. Box 80553, Lincoln, Nebraska 68501.

BARLOW LENSES (FROM PAGE 5)

ways by Barlow manufacturers. For example, some manufacturers place the lens in a sliding cell in the tube so that the magnification can be varied. I don't like this idea personally because it can result in alignment problems and makes it hard to keep the inside of the tube properly blackened. Another idea is to use the same lens in two different length tubes to provide different magnifications, such as the Meade 2X and 3X Barlows. This works fine, except it requires some refocusing-- the 3X focuses about 3/4 inch farther down than the 2X, so it is not parfocal with the Meade eyepieces.

In the next part of this series I will discuss my own suggestion for getting variable powers out of a single Barlow lens.

JUPITER FLYBY (From Page 1)

in certain places and pulling them from others. The white ovals appear to be directly linked to these upper air currents.

3. The Galilean satellites present a fascinating collection of differences. Ganymede is almost certainly at least half ice--and presents a face scarred by craters. Callisto appears similar to Ganymede, with strong evidence of fault processes as well as impact features. Europa yielded less clear views because of some weather interference during satellite transmissions, but measurements indicated it is almost certainly a

rocky body.

4. Io, aside from its resemblance to a gigantic orange that has been attacked by insects and tree rot, showed strong evidence of erosive forces and radiation effects. One geologist said it looked "cooked and steamed", a surface that had been "heated from the interior and put into solution, water being the vehicle." But most exciting was a photograph taken by Voyager when it was only 13,000 miles away from Io. It showed clearly a puff of volcanic debris close to the limb of the satellite. The volcanic cloud had reached a height of nearly 250 miles. Scientists now speculate that volcanic material is expelled with such force that, while gravity almost certainly returns much of it to the satellite's surface (explaining obliteration of impact features), large amounts escape into space, contributing to the sulfur torus that follows in Io's wake. While Mars has huge volcanos, and some are thought to be still active, no eruptions have been observed on that planet. Thus, Io's volcanos are the first confirmed to be still active in the solar system outside the earth. This is the reason geologists are referring to Io as "young".

5. An eleven - minute exposure taken with the narrow angle camera as Voyager passed through the equatorial plane of Jupiter at a distance of 1,200,000 km produced a blurred image of a ring encircling the planet. (Presence of the ring was confirmed)

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starting April 9 and running for 6 weeks. Participants will learn the principles of telescope making and will actually be building their own telescope (their choice of size and design), during the course of the six weeks. So if you've always been meaning to build your own scope, here's your chance to actually do it. Registration costs \$6.00 and you register by calling the Chet Ager Nature Center--474-6147.

--Ron Veys

MOST MASSIVE SPIRAL GALAXY IDENTIFIED

The most massive spiral galaxy yet known--billions of stars and enormous clouds of dust and gas swirling in a disc containing probably 10 times more matter than the Milky Way--has been identified by three astronomers, the National Science Foundation announced March 8. The Milky Way, the galaxy in which our solar system is located, is thought by most astronomers to contain 100 billion stars and to have a radius of 100,000 light years.

The astronomers made their findings on the galaxy, known as NGC 1961, using an optical telescope at Kitt Peak National Observatory near Tucson, Arizona, and a radio telescope at the National Radio Astronomy Observatory at Green Bank, West Virginia.

NGC 1961 is located in the constellation Camelopardus (the giraffe), about 250 million light years from earth. The galaxy was studied by Dr. Vera Rubin and Dr. W. Kent Ford of the Carnegie Institution of Washington, D.C., and Dr. Morton Roberts, director of the NRAO.

The astronomers reported that

their optical observations suggest NGC 1961 has a total mass of more than two trillion (two thousand billion) suns--more than 10 times the generally accepted mass of our Milky Way galaxy-- and a radius of about 300,000 light years--three times that of the Milky Way.

After analyzing the velocities of various components of NGC 1961, the scientists said the galaxy may have had a tremendous outburst of star formation about 200 million years ago, a recent event in the astronomical time scale. This burst of star formation might have been caused by interaction or merger of NGC 1961 with a less massive galaxy, the scientists said. Such interactions seem to have triggered the birth of stars in other galaxies that have interacted in the same way.

APOLOGIES TO MISSING CLUB MEMBERS

Several club members complained at the last meeting that they had not been listed in the membership roster, despite their renewals in

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APOLOGIES TO MISSING CLUB MEMBERS ... (FROM PAGE 3)

late November and December. A check turned up the fact that, not two, but seven members had been dropped from the roster because of misplaced files. The records were mislaid during your treasurer's change of residences last November. Our apologies--and our request that you note the return of the following members to our official active member roster:

Michael Benes	722 Hill Street	Lincoln, NE 68502	R 12/79	432-9179
Harlan Franey	1734 S. Cotner Blvd.	Lincoln, NE 68506	R 1/80	488-0085
Duane Hutchinson	3445 Touzalin Ave.	Lincoln, NE 68507	R 11/79	466-4988
David Knisely	1616 No. 14th St.	Beatrice, NE 68310	R 12/79	472-0424
John Lammers	1007 8th St.	Fairbury, NE 68352	R 12/79	472-3939
Tom Peterson	6161 So. 70th St.	Lincoln, NE 68516	R 12/79	423-2307
Mark Powell	3310 Cooper St.	Lincoln, NE 68506	R 1/80	489-6114

OBSERVING CHAIRMAN'S REPORT...

As the winter skies fade, we begin to look out of our galaxy and into the distant realm of the galaxies. To start with, look at the fairly easy pair of galaxies M81 and M82. M81 is about 8 degrees west and 7½ degrees north of Alpha Ursa Majoris (Dubhe), or about the distance between Alpha and Gamma Ursa Majoris along the line extending from Gamma through Alpha to M81. This galaxy is a spiral that can be seen with a good pair of binoculars and appears as a faint elliptical patch of light through small telescopes. Interestingly enough, large instruments don't show much more than small telescopes when looking at this object; they just make it easier to see.

M82 is the companion of M81, and is less than a degree north of it. M82 can be placed in the same field as M81 in a small telescope. It is

cigar-shaped and shows definite dark lane structure in a six- or eight-inch telescope. I have seen both galaxies in a pair of 7 x 35 binoculars, and also in a 2.4 inch refractor.

For you cluster fans, look at M67, located a few degrees west of Alpha Cancri. It is an old cluster with a large number of faint stars and looks best in telescopes larger than 4 inches, although it can be seen in smaller instruments.

If you have trouble finding this object, you should try M44, the Beehive cluster, about a degree or so northwest of Delta Cancri. I think this is one of the best objects to point a small telescope at, and it is one of the few objects that looks spectacular through a certain well known richest field telescope!

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THE BARLOW LENS ... (PART ONE) By Larry Stepp

I have thoroughly enjoyed Rick Johnson's excellent series of articles on telescope eyepieces in the Prairie Astronomer, and they have inspired me to put in writing some ideas I have had about Barlow lenses.

The Barlow lens, first used in telescopes by Peter Barlow some time around 1800, is one of the most valuable telescope accessories. As I am sure you know, a Barlow lens is a negative lens placed between the objective and eyepiece of a telescope to increase the effective focal length of the objective, and thereby increase the magnification of the telescope. A negative lens is, of course, a lens with a negative focal length, instead of causing light passing through the lens to converge it causes the light to diverge.

Figure 1 shows the optical configuration of a telescope and Barlow lens and shows the paths of light rays for an on-axis point image (a star in the center of the field.) The dotted lines show what the light path would have been without the Barlow lens. The original focal length of the objective is labeled F , the objective diameter D , the clear aperture of the Barlow is d , the distance between the Barlow and the original focal plane is a , the distance from the Barlow to the new focal plane is b , and the focal length of the Barlow

lens is f .

Now for some useful formulas based on the usual thin lens assumptions. The magnification factor of the Barlow (2X, 3X, etc.) is $m = f / (a + f)$. The distance from the Barlow to the new focal plane is $b = af / (a + f)$. Using simple algebra, $a = (f / m) - f$ and $b = ma$. REMEMBER: f IS ALWAYS A NEGATIVE NUMBER.

As an illustration, commercial Barlow lenses often have a focal length of about -100 mm. For a magnification factor of 2X, $m = 2 = -100 / (a - 100)$ and therefore $a = 50$ mm. Then $b = ma = 2 \times 50 = 100$ mm. Notice b is numerically equal to f for a 2X Barlow. This is true for any Barlow, if $m = 2$, $b = -f$. Notice also if $a =$

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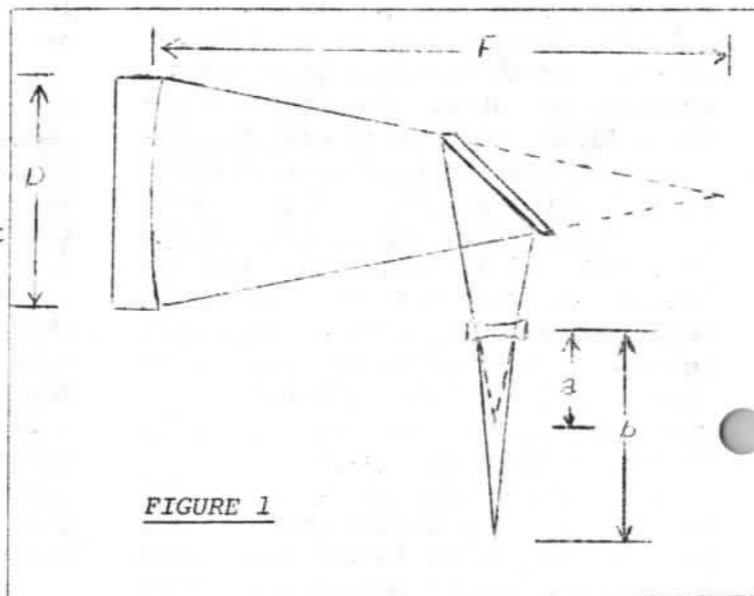


FIGURE 1

THE BARLOW LENS (Continued)

$-f$, b goes to infinity, that is, if you move the Barlow inside of focus a distance equal to its focal length the light never comes to a focus. What you have is a Galilean telescope with a magnification of $M = -F/f$.

This brings me to a point that is a frequent source of misunderstanding. When a Barlow lens is used with different eyepieces, unless they are parfocal, the magnification factor of the Barlow is different. This is because the distance from the Barlow lens to the focal plane of the eyepiece is different. Figure 2 shows a cross section view of two typical eyepieces illustrating this effect.

Generally, a Barlow included with

a parfocal set of eyepieces will yield its advertised magnification factor only when used with eyepieces from that set, i.e. a Dakin 2.4X Barlow is 2.4X only when used with Brandon eyepieces, but may be slightly more or less powerful when used with another brand. This is usually no problem, since it is seldom very important to know the exact power being used. In addition, commercially produced Barlows are fairly forgiving, and can be used over a range of different magnification factors with good results even though they are only properly corrected for one magnification factor. This tolerance for different powers is used in various

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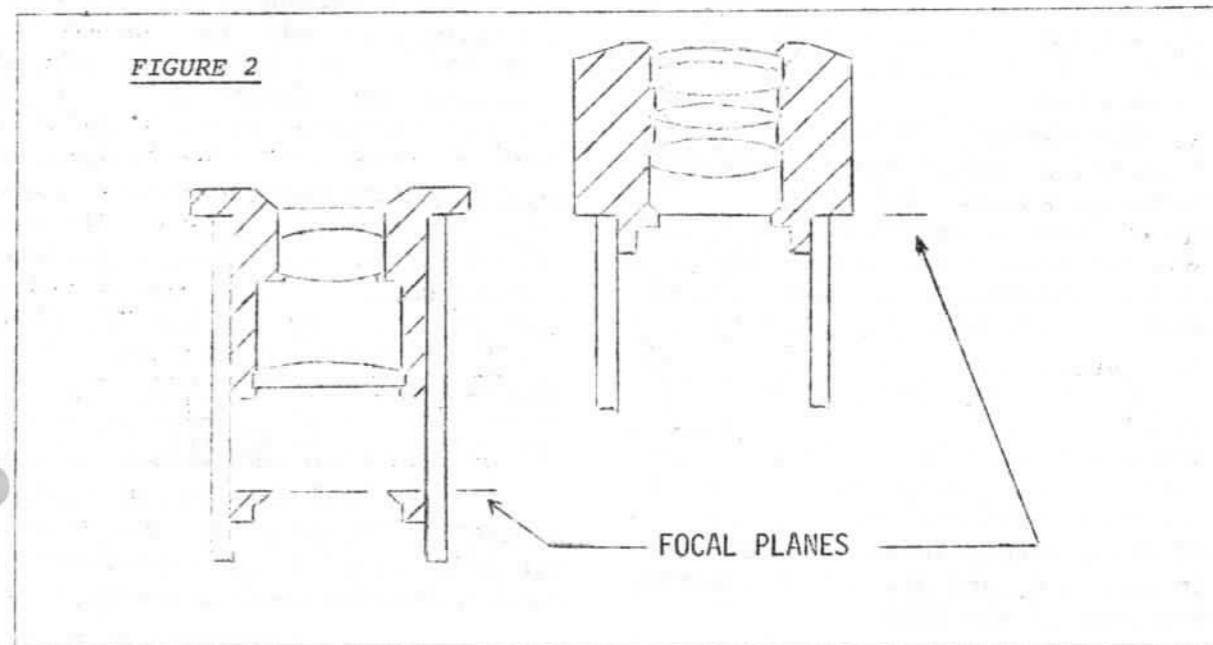


FIGURE 2

ASTRO- PHOTOGRAPHY CONTEST

IN CONNECTION WITH NATIONAL ASTRONOMY DAY (APRIL 7, 1979), LINCOLN'S PRAIRIE ASTRONOMY CLUB IS SPONSORING AN ASTROPHOTOGRAPHY CONTEST, OPEN TO THE PUBLIC !!!

Eligibility: Anyone may enter, regardless of age or experience. Photographs must deal with an astronomical theme (examples: star trails, sunsets, the moon, observatories, planets, constellations, eclipse, star-gazer at work, etc.).

Prizes:

FIRST PRIZE: A \$15.00 gift certificate to Max Miller Camera.

SECOND PRIZE: "Deep Sky Objects: A Photographic Guide for the Amateur", reference book by Jack Newton. (Retail value \$12.50)

THIRD PRIZE: Astro-mural. A giant-sized, full-color poster of a beautiful deep-sky splendor.

PLUS: A limited number of "Honorable Mention" certificates will be awarded.

Deadline: Entries must be received by April 6, 1979. ALL ENTRIES WILL BE DISPLAYED AND WINNERS WILL BE ANNOUNCED AT THE INDOOR GATEWAY MALL ON NATIONAL ASTRONOMY DAY, SATURDAY, APRIL 7.

Address: Mail entries to: ASTROPHOTOGRAPHY CONTEST
PRAIRIE ASTRONOMY CLUB
P.O. BOX 80553
LINCOLN, NE 68501

Write on envelope: "PHOTO ENCLOSED -- DO NOT BEND"

Judging Criteria: Photos will be judged on the basis of originality, technique, image quality, general pleasing appearance of picture. Entrant's age, experience, and equipment used will be considered so that all photos have an equal chance of winning.

Judges:

Rick Johnson - UNL Professor and longtime amateur astrophotographer.
Carroll Moore - Professor of Astronomy at Nebraska Wesleyan University.
Lee Thomas - Program/Station Manager of KLMS Radio and amateur astronomer.

- Rules:
- 1) Entries must be B&W or color prints -- 8x10 or 5x7-inch sizes preferred. (3½x5-inch prints will be accepted, but larger prints are preferred for display.
 - 2) Entrant must write on the back of the photo: Name, Address, Phone No., Age, Title or Subject Matter of Photo (include any interesting details), Equipment Used, and Techniques Used (exposure, film type, etc. (if available)).
 - 3) Photos will be returned if a stamped, self-addressed, large-size envelope is enclosed with entries.
 - 4) A person may enter as many photos as desired, but an individual may win only one prize.
 - 5) Judges will not see names of entrants until judging is completed.
 - 6) The decision of the judges is final.

Orion Trails, a combination star and trail photograph made by allowing the stars to trail for a couple of hours with the camera fixed, closing the shutter for 5 or 10 minutes, and making a final exposure of about a half hour with the camera driven to follow the stars. Panatomic X film.



