



# THE WASP

THE JOURNAL OF THE WARREN ASTRONOMICAL SOCIETY



Diamond Ring effect, Oct. 12, 1977. by Diane McCullough.

---

Diane McCullough captured this dramatic view of the total eclipse just before totality as the sun moved in and out of the light cloud cover. Diane used a 3" f4 refractor, loaded with Ektachrome 200 at 1000th of a second.

---

DECEMBER 1977

JANUARY 1978

*Merry Christmas/Editor*

The Warren Astronomical Society  
P.O. Box 474  
East Detroit, Michigan 48021



The Warren Astronomical Society (W.A.S.) is a local nonprofit organization of amateur astronomers. Membership is open to all interested persons. Annual dues are as follows; Student- 19.00. College- \$11.00, Senior Citizen- \$13.50, Individual- \$16.00, Family- 21.00, the membership fees listed here include a one year subscription to Sky & Telescope Magazine.

Meetings are held on the first Thursday of each month at Cranbrook, and the third Thursday of each month at Macomb County Comm. College, in the student union building.

---

The EDITOR: Roger A. Civic , 26335 Beaconsfield  
Roseville Michigan. 48066- 776-8735

---

Assistant  
to the Editor: Mike Newberry, 623-7284

---

### **OBSERVATORY SCHEDULE**

Lectures for the coming month are listed below.

Dec. 2/3 .....Ray Bullock..... 879-9458	Jan 6/7 .....Lou Faix..... 781-3338
Dec. 9/10 ....Roger Civic ..... 776-8735	Jan 13/14 ..Dave Harrington .. 879-6765
Dec. 16/17 ..Dave Dobrzelewski. 778-9715	Jan 20/21 ..Dennis Jozwik..... 754-2037
Dec. 23/24 ..Merry Christmas .....	
Dec. 39/31 ..Happy New Year.....	

The lecturer may select either the Friday or Saturday. depending on the Weather and their personal schedule.

In the future, some of our younger members will be assisting the senior lecturer. These members are: Bob Dennington, Dave Locke, Doug Holmes, and Joe Tocco.

---

## **•buy- sell- trade•**

WANTED: Used telescopes any size or type. Lou Faix as President has been contacted by many people about such items. Give Lou A call, 781-3338

---

WANTED: A new or used 8" mirror blank or tool to be used as a tool- to grind my mirror with. Call, Chris Edsall at 774-0007 with offer.

---

FOR SALE: 10" Newtonian telescope. Factory mirror, yoke equatorial mount that is portable. 70 power eyepiece. For only \$300.00, also a 40mm Polaris finder scope- 12X, \$25.00. 18mm Kellner eyepiece. \$18.00. All in good condition. Call Doug Tracy- 882-4499.

---

## CLUB NEWS

The Christmas Banquet will be held at the Paradiso Cafe, on the 14<sup>th</sup> of December, 1977. There will be NO December general meeting. Details will be announced at the next two general meetings.

There will be a presentation ceremony for the Annual Merit Award to a most deserving member of the Warren Astronomy Society.

---

In the months to come you all will probably be able to see and hear more about the Eclipse of 1977 than you will be able to stand.

Therefore do not, I say do not miss the Jan. 1978 General meeting, because I understand this is the nite of the BIG EVENT, all the color and excitement, in slides, movies and sound will be exposed to all.

---

The Warren Astronomical Society Newsletter, Vespa has reached another plateau of evolution, by executive decision the name WASP has been reinstated as the official name. Welcome back Wasp...

---

### MORE- BUY SELL TRADE .....

For Sale.... Assorted equipment for a complete dark-room set up. - \$110.00

- 1.- "De Jur" enlarger (diffusion type) with 2- 75mm lens. It will accept 35mm to 3<sup>1</sup>/<sub>4</sub>X4<sup>1</sup>/<sub>4</sub> negs for printing.
  2. Home-made 16"X20" Elect. dryer/w feratype plate--- 8"X10" Elect. dryer.
  3. 60 Second Electric timer for enlarger.
  4. 8"X10" printing easel. 5. Print focuser. 6. 12"X12" Paper cutter.
  7. Three (3) 11"X14" hard rubber chemical trays.
  8. Print washer (faucet type). 9. GAF- roll film developing tank.
  10. Work table, 34" high X 30" wide by 6 feet long, with pipe legs.
- For more information, call Larry Kalinowski - 776-9720.
- 

For Sale... Telescope assembly..... 8" f.6 Coulter mirror in Aluminum cell./ 2.14"Cminor axis) elliptical diagonal, mounted in brass & aluminum 4 vane spider./ 10"dia. aluminum telescope tube, 50" long. Only \$125.00

ALSO--- Heavy duty 10" rings for telescope mount. Cost \$42. Now Only \$25.

PLUS--- 4" O.D.- 24" long, black iron stand is ready to accept 3 legs and an Equatorial head (Pacific) Cost\$25. Now Only \$15.

AND--- A 22<sup>1</sup>/<sub>2</sub> lb. counter weight for a 1" Dia. shaft. Cost \$23. Now Only \$15.

LAST--- Two fine Achromatic lens. These would make great finders. A 2" dia. lens, 8" f.l. f4, mounted in cell. Only \$5.00. A 2.4" dia. Lens (63mm), 13" f.l. (350mm), f-5.5 unmounted. Only \$15.00

For more information Call Roger Civic, 776-8735.

The following are the minutes of the October 20, 1977 meeting of the Warren Astronomical Society:

President Lou Faix opened the meeting of 8:20 p.m. by calling upon Gary Morin to submit his treasurer's report. Members learned that there is a \$382.54 balance in the club's account. Mr. Morin then appealed to the group to subscribe to the \$15 package for the Astronomical League. Nominations for next year's officers of the League should be made to T. Michael Flick.

The name of the club's newspaper will remain the same. Kim Dyer announced that the 24 inch telescope at MSU can now be used by members. Lou spoke of prospective telescope buyers through our club. He would like instruments for sale to be first tested by buyers as an added guarantee to them. Ray Bullock announced that the Cranbrook Institute had a successful Members' Night with the help of Warren Astro volunteers.

Frank McCullough took the floor to disclose plans for the annual Christmas Banquet. To be held on Wednesday December 14 at the Paradiso Cafe, it will also feature awards for outstanding service to the club and prizes for everyone. Price of the dinner is \$8. per person which includes complete dinner plus tip. Dress is optional but not too casual.

Lou Faix, displayed pictures of the October 12 total eclipse which he took on the cruise attended by 17 other Warren Astro amateurs. More pictures are forthcoming and also a possibility of a group photo in Sky & Telescope. More news next month.

The program continued with the Showing of NASA's film entitled "Partnership in Space".

Gary Morin gave a very interesting talk entitled "Three Quarks for Mister Mark". The understanding of the universe by the reduction of matter to its smallest component, or quark, was dramatically brought out by Gary. Dynamic matter, ever changing and relocating and finally coming into physical comprehension by man was explained with keen ability by the speaker.

Weather permitting; there will be a final Messier Contest at Stargate on November 4 and 5. Frank McCullough will manage the affair. A trophy will be awarded for first place.

The meeting was closed at 10:35 by Lou Faix.

Faithfully submitted,

  
Loretta D. Caulley, Secretary

## BOCKS WIN MESSIER CONTEST

The 1977 Messier observing competition was concluded on Friday, November 4th, as members of the Warren Astronomical Society met to match their skills on the grounds of Star Gate Observatory. Mother Nature blessed the outing by providing a cloudless sky with nearly perfect viewing conditions. Under the supervision of Umpire Frank McCullough, the competition got off to a "LeMans" type start at 9:04 P.M. Past champion Lou Faix was first out of the pits and took the early lead with the small spiral galaxy M77 in Cetus. Ray Bullock quickly moved up to tie the pace. The team of Robin and Doug Bock then surged ahead on three galactic clusters in Auriga and never relinquished the lead. They completed the eleven objects in a scant thirty-two minutes to race across the finish line at 9:36 P.M. Doug's 8" F/7 Newtonian telescope featured an improved mounting system and new 50mm x 8 finder scope. Newcomers in Messier competition, Mike and Douglas Smith, put the setting circles on a 8" Celestron to good use and placed second with the very respectable time of forty minutes. The promising rookie team let a chance for victory slip away by getting sidetracked by an unscheduled object, M39 in Cygnus.

Throughout the evening, observers were treated to recurrent glimpses of bright and very fast meteors which streamed out of the northeast. It was felt that they might be forerunners of the Cepheid show which was predicted to reach maxima four days later.

The last of the prize winning positions was taken by Lou Faix as he stumbled across the finish line with his 6" F/5 solar telescope after sixty-one minutes. When asked why his newest telescope didn't have setting circles which were the key to his summer competition victory, Lou gruffly replied that in spite of suggestions to the contrary, he could find the sun in broad daylight without an ephemeris or setting circles.

The competition was rounded out with Ray Bullock, Don Babolla and Mike Grelom, all on the heels of the winners. Umpire McCullough stuck tightly to the rules and required a telescopic view of the Pleiades while rejecting all finger pointing efforts to get one quick, easy score.

After the contest was over and thermoses of coffee had revived chilled spirits, the contestants compared views of Jupiter and relished in the thought of what fun Messier contests were now that Ken Wilson was no longer stomping all competition into the ground. For those who missed the competition but would like to compare their time with the winners, the objects for the final 1977 Messier contest were:

M15	Pegasus	M45	Taurus
M2	Aquarius	M36	Auriga
M33	Triangulum	M37	Auriga
M76	Perseus	M38	Auriga
M74	Pisces	M77	Cetus
M1	Taurus		

## 24" TELESCOPE AVAILABLE FOR AMATEURS

At the November Cranbrook Institute of Science meetings, members of the Warren Astronomical Society were informed of how they might acquire observing time on the Michigan State University 24" telescope. Mr. Russell Carroll indicated that the facility on the Lansing campus would be made available for planned amateur observing programs two nights a month. Time would be allotted for a single night once an applicant's program and plan had been approved by the Observatory Staff. Those wishing to apply for an opportunity should write a detailed description of their project, time and equipment requirements to:

Mr. Russell Carroll  
c/o Oakland University Physics Dept.  
156 Hannah Hall  
Oakland University  
Rochester, Michigan 48063

Spectrographic plates and a photographic laboratory are available at the observatory. All plates will be considered the property of the University and should remain in the Observatory file. In the event of unfavorable weather on the scheduled night, a new application must be processed. All available nights through the end of December 1977 have already been scheduled.

*Chosen the Standard of Excellence*

**LFK**

# DRIVE CORRECTORS

**25  
WATTS**

**... AND SO AFFORDABLE.**

**40-80  
HZ**

**\$ 59.99**  
PRICES  
START  
AT

**TEL. 776-9720**

# THE B.A.O. GUIDE TO EFFICIENT OBSERVING

## Part I -Getting It All Together

- R. Bullock

In the interest of encouraging amateur astronomers to get out and observe, we at the Bullock Astronomical Observatory (B.A.O.) present this multi-part series. It will, it is hoped, show you how to prepare for an observing session which will allow you to take best advantage of the time available. Part I gives you some sources where information you'll need to set up an observing list is available.

The first thing we at the BAO do, is to perform a sacrifice to the Sky Goddess, and hope for the best. Volumes have been written on sacrifices however, and, as it is not in the scope of this series to delve into these matters, we will go on to step two.

You must know what constellations will be in the sky, and then what objects in these constellations you want to observe. Magazines such as Sky and Telescope or Astronomy provide a current sky map each month.

Now, what to look at? Double stars, planets, galaxies, or a little of everything? Wait a second! The primary concern here is the location of the moon. Faint 12th magnitude galaxies are a bit more difficult to locate with a full moon in the way. Any good calendar will give you the moon's phase, so you can plan accordingly.

I highly recommend Olcott's Field Book of the Sky as a reference. Once you determine what constellations are visible, Olcott's book will tell you what interesting objects are to be found there. It goes constellation by constellation for each season, breaking things down into two categories: what's visible to the unaided eye or with binoculars, and what's visible through a telescope. The "Astro-Cards" (available at Stargate) give even more detailed information.

The Field Book and "Astro-Cards" cover double stars, variables, M and NGC objects, -in short, nearly all the major unchanging objects. The sun, moon and planets, however, present problems because they do change their positions, rising and setting at different times, changing each night -a dreadful nuisance! How, then, to plan your session around the planets?

The two previously mentioned magazines have a chart each month showing the locations of the planets. And the Sky Calendar is excellent for alerting you to configurations and conjunctions. The Canadian Observer's Handbook provides this

CONT. →



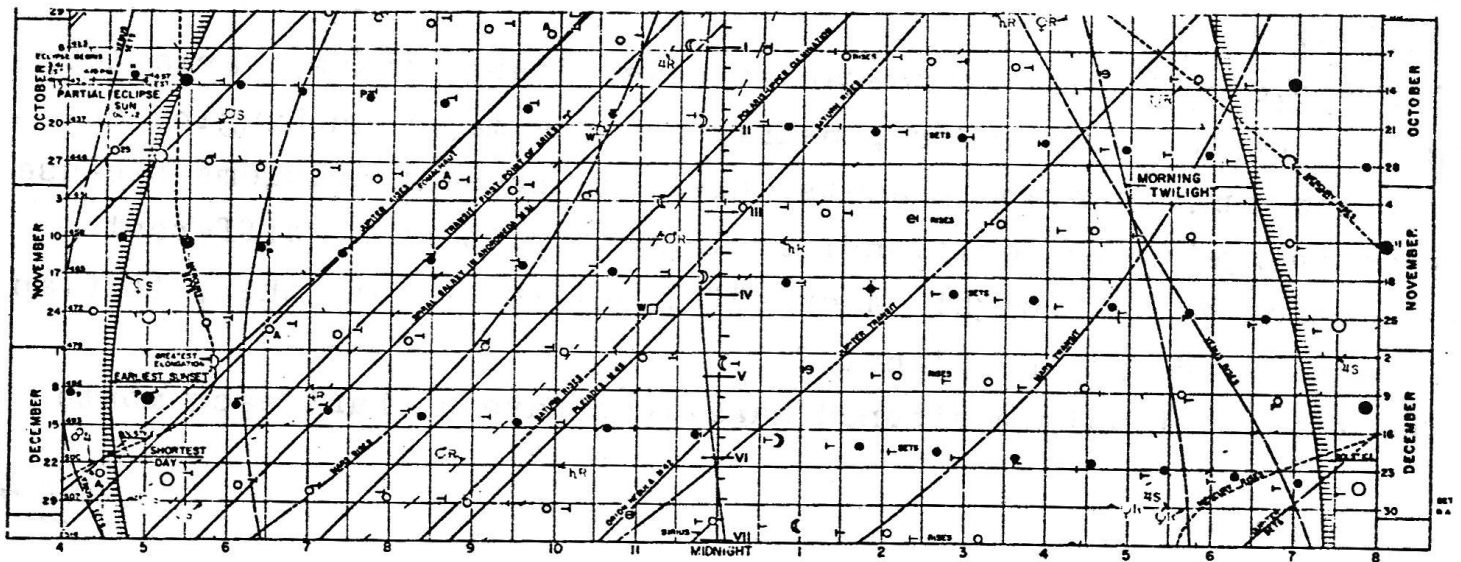
information for the entire year (in a different format). Sky Calendar, of course, is only for a month at a time.

But if you want even more precise information (on November 12 the sun will set at 5:17 PM EST, the one day old moon sets at 6:55 PM, Jupiter rises at 8:02 PM, Mars at 10:26 PM, Saturn at 12:22 AM), then you should invest 75¢ for the Graphic Time Table of the Heavens. (Available from the Maryland Academy of Sciences, 601 Light St., Baltimore, MD, 21230). The time table shows rising and setting times of sun, moon and planets for the entire year. It also gives meridian transit times for many other objects. Don't panic when you see the chart -it's a lot more complicated looking than it is to use (see below).

To really get picky with the planets, the American Ephemeris and Nautical Almanac (available at most libraries) gives the planets' celestial coordinates for the year, as well as configurations of Jupiter's moons (as do Sky & Tel, Astronomy and Handbook) and much more information.

Most important of all; have good star charts. The world's greatest theoretical astronomer can get hopelessly lost behind a telescope. The Skalnate Pleso Atlas is excellent, as are the "Astro-Cards" (both available at Stargate). They'll help you zero in on those hard to find objects. (The staff at the BAO sometimes finds Vega to be a 'hard to find object'. Especially when the sky is overcast).

So you know what you want to look at, when to look and where to find it. But where do you start once you're set up? Next month: how to organize your observing schedule.



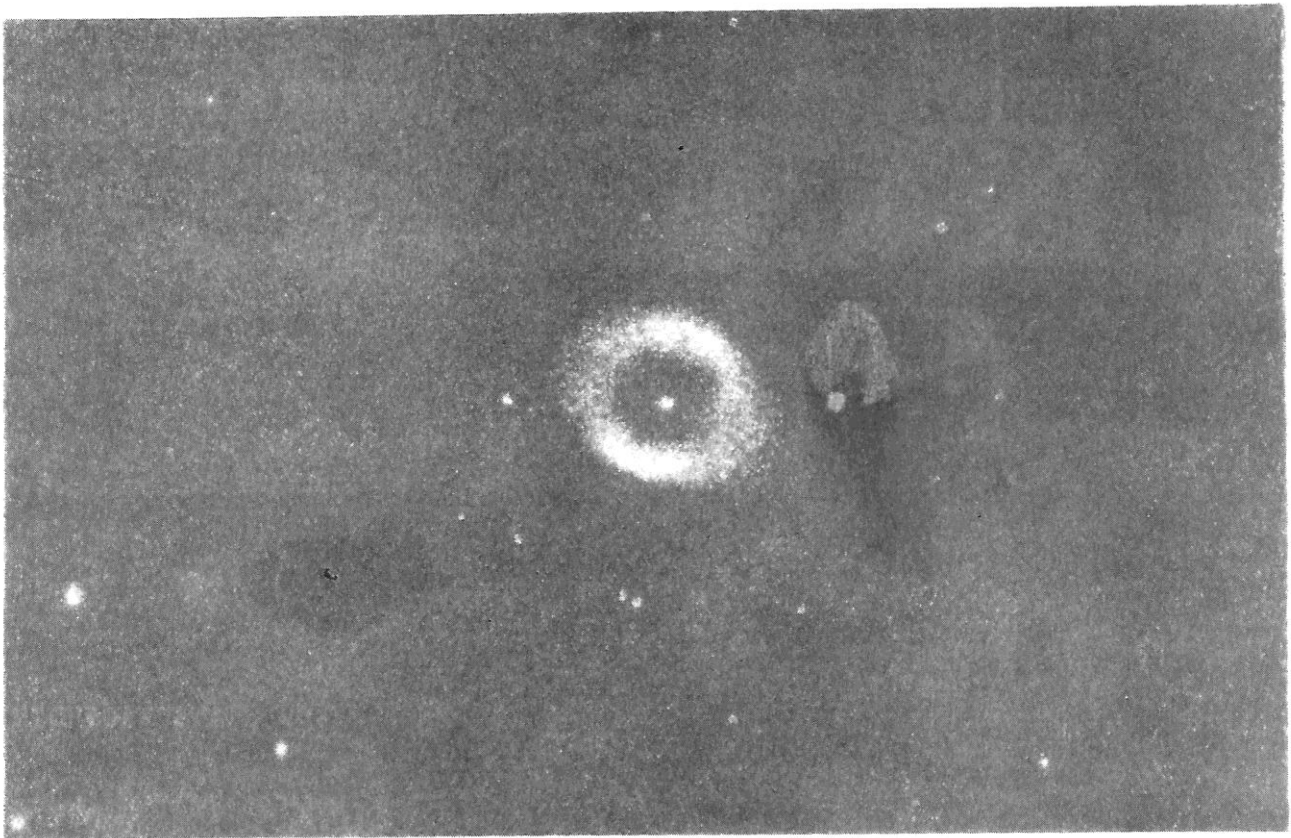
# MICHIGAN STATE UNIVERSITY 24 INCH TELESCOPE.

By BOB DENNINGTON

I would like to express my appreciation and everyone elses (Kim Dyer, Dave Dobrzelewski, Marty Kuntz, Dave Lock, Rick Carter) who went to Michigan State University on the weekend of Oct. 14/15, 1977. I really enjoyed my stay there and would like to thank Russ Carrol who made it possible for us to get an invitation and Dave Dobrzelewski who was our on campus contact man. I would also like to remark on how well the student assistants (Jim Crumucker and Gary Kenney) were in allowing us to have use of the observatory, darkroom, and library.

Everyone had a fine time photographing and developing negatives and prints in the observatory and darkroom. Thanks again for letting us observe through such a fine telescope.

Sincerely,  
Warren Astronomical Society  
and  
Detroit Astronomical Society



Photographed by Bob Dennington with the 24 inch telescope at Michagan State University on Oct. 14 using tri-x sheet film at 12 minutes.

## APPRENTICE ASTRONOMERS NOTEBOOK

### LOUIS FAIX

From the beginning of his ascent from the caves, man has watched the endless, never changing parade of the stars. Seemingly eternal and perpetually fixed, the stars have been used as calendars, signals of when to plant and when to harvest and hunt. Steadfast in their nightly journey, they were fitting custodians of man's history and playground for his heathen gods. Except for a vagrant comet, the waxing and waning of the moon, and the wandering visible planets, the night sky was fixed, immobile, never changing.

Or was it? Even to the ancients there were those few rare exceptions to the dependability of the night. Here and there a random star changed, sometimes slowly, sometimes quickly, and belied the stillness of nature and the timelessness of the universe. The Chinese and Koreans noted the "quest stars" which would suddenly burst into the sky and then silently fade into oblivion, never to be seen again.

Three thousand years ago the astronomers of the Euphrates Valley noted two strange stars in the night sky. As was the Arabic custom, they were given proper names: Miro "The Wonderful", and Algol "The Demon". Today, modern physicists weigh, measure and analyze the structure of these variable stars by the character of their brightening and fading. These two stars are well situated for the fall and evening viewing pleasure of the amateur astronomer.

Algol, at R.A. 3 hours 5 minutes and  $+40.8^\circ$  and also known as Beta Persei, is a double star system (a binary), whose members are very close and hence orbit each other rapidly. Since the plane of their orbit is in line with the Earth, we see a periodic blinking as one star passed behind the other. The period of the orbit is 2 days, 20 hours and 48.9 minutes. A marked decline in brightness from 2.3 to 3.5 magnitudes is evident to even the naked eye observer. Algol takes about five hours to darken and another five hours to return to its normal brightness. Why not try to plot its light curve by observing the eclipse over several nights? The following table lists the times (EST) of the minimum brightness for the rest of 1977.

November 23 - 5:57 A.M.	December 13 - 7:40 A.M.
November 26 - 2:46 A.M.	December 16 - 4:29 A.M.
November 28 - 11:35 P.M.	December 19 - 1:18 A.M.
December 1 - 8:24 P.M.	December 21 - 10:22 P.M.
December 4 - 5:13 P.M.	December 24 - 6:56 P.M.

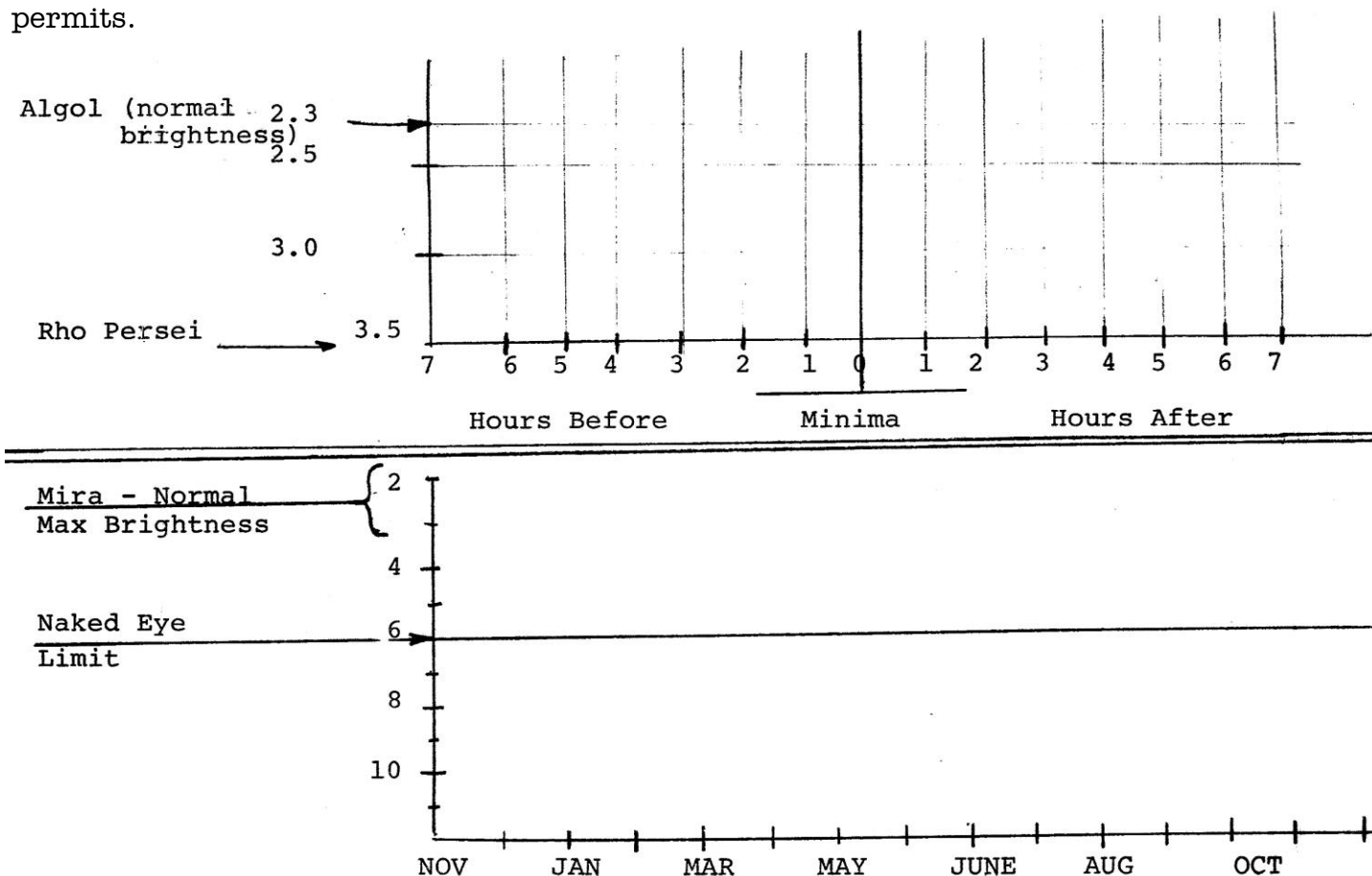
Algol minimums are listed monthly in Sky and Telescope.

Observations made over several nights can be used by simply noting the time of each sighting and figuring the interval before or after that day's minimum brightness time. Some eclipsing binaries have very sharp V shaped light curves while others have flat bottom U shaped curves. The shape of the curve tells us which star is larger and if the eclipse is total or partial. Can you generate a curve for Algol? Compare Algol's brightness to its nearest

companion, Rho Persei. At full eclipse these stars will be nearly the same brightness. The attached chart will make the curve plotting easier.

Mira (R.A. 2 hours 17 minutes,  $-3.2^\circ$ ) was even stranger to the ancients who had no telescopes. It would disappear completely for nearly five months at a time and then flare back to be one of the brighter stars. This pulsating star varies its light output by nearly 1,400 times over a period of nearly eleven months. Its return to maximum brilliance occurs more rapidly than its fading. Even when dimmest, Mira is an easy object for a 4" telescope. One simple way to gauge the change in brightness after the star is no longer visible to the naked eye is to make a series of six cardboard discs to cover the open end of your telescope. Cut a hole in the center of each disc equal to 63, 40, 25, 16, 10 and 6.4% of the diameter of your main lens. On each night you observe, determine which is the smallest lens cover that you can just see the star with. Each cover will reduce the brightness by one magnitude. Plot your observations while Mira is both a naked eye star and a telescopic star on the attached graph and watch for the gradual changes.

These two stars probably represent the extremes in variable star observing; from a matter of hours to a matter of months. They'll both be easy objects all winter and can serve as an introduction to the fascinating study of variable stars. The nice thing about observing these stars is that it can be done at anytime, whenever the time, or the weather or your mood permits.





## Prospects for the February 26, 1979 Total Solar Eclipse

by Jordan Marche

Astronomers will have their last opportunity in this century to view a total solar eclipse from North America on February 26, 1979. However, many factors will combine to make this a not-so-favorable eclipse. The considerable distance of the moon from the earth will limit the maximum duration of totality to approximately two minutes and forty-eight seconds. The time of year (midwinter) will bring hardships on those who set out to travel to the path of totality. The moon's shadow will pass through rugged mountainous country in the U.S. and across much inaccessible territory of the Canadian Provinces. Lastly the sun will never be more than twenty-six degrees above the horizon. With those negative aspects in mind, let's look closer at the circumstances of this cosmic blackout.

From the book Canon of Solar Eclipses by the astronomer Jean Meeus the following central-line data is taken.

Ephemeris Time	Geographic Longitude	Geographic Latitude	Altitude of the sun	Duration	Width of Shadow
16 <sup>h</sup> 09.9 <sup>m</sup>	139.38° W	47.28°N	0.0°	1 <sup>m</sup> 49 <sup>s</sup>	227 km.
16 12	129.04	46.08	7.5	2 05	253
16 24	113.87	46.40	18.4	2 30	295
16 36	105.30	48.10	23.2	2 43	307
16 48	98.29	50.46	25.4	2 48	304
17 00	91.63	53.42	25.5	2 48	292
17 12	84.46	57.11	23.6	2 43	277
17 24	75.40	61.96	19.3	2 32	259
17 36	58.71	69.78	10.0	2 09	240
17 39.8	33.99	71.18	0.0	1 48	227

When one begins to plot a close-up of this path in an atlas one is faced with some difficulty. Ordinary road atlases are not only chopped up by state or province, they are also drawn to DIFFERENT scales, making piecing them together impossible. And complete grids of latitude and longitude are omitted to avoid cluttering the map, adding to the dilemma. The next choice is to visit your nearby library and look at the world atlases in stock, choosing the best. These you will be pleased to discover do not have the above two faults, but no longer have identification of roads. Scales run approximately one centimeter to twenty-five kilometers. A good example is the Times Atlas of the World. Xerox the areas on which the path falls cut and fit them together and you're ready to plot.

For the next discussion refer to the small-scale map at the end of this article.

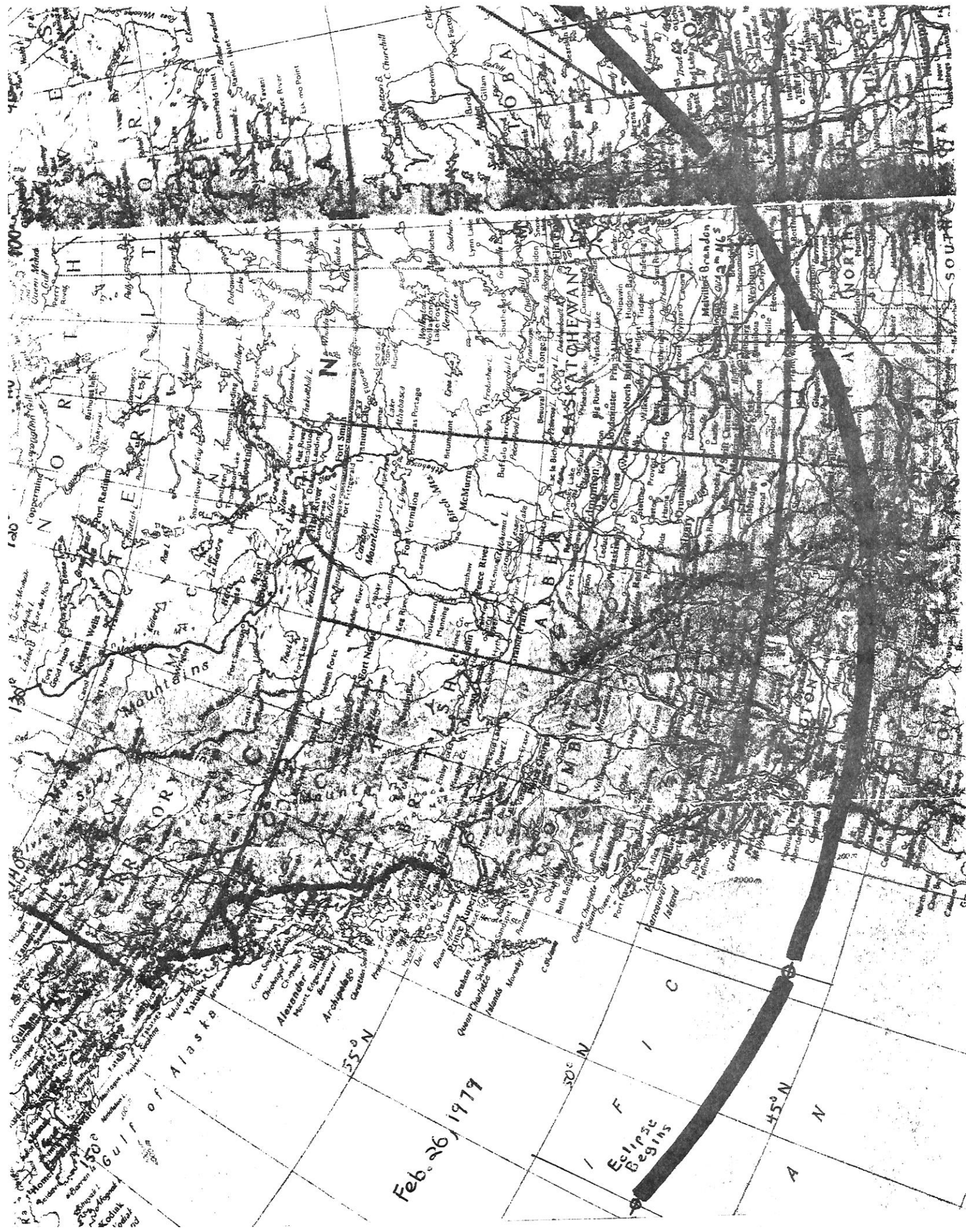
The eclipse begins at sunrise in the northern Pacific Ocean. The moon's shadow starts sweeping eastward and first crosses land at Astoria, Washington. It will travel for nearly a thousand kilometers across the Rocky Mountains while slowly turning northward. Passing into the Canadian Provinces at Northgate, Saskatchewan it continues on to traverse Lake Manitoba at its maximum duration. The town of Winnipeg, Manitoba lies within the limits of totality (though not on the central line) and is the largest city to do so. Thereafter begins the final leg of the shadow's trek to which there are virtually no roads- this includes Hudson's Bay, The Northwest Territories and Greenland, where the shrinking crescent-shaped sun will set enigmatically.

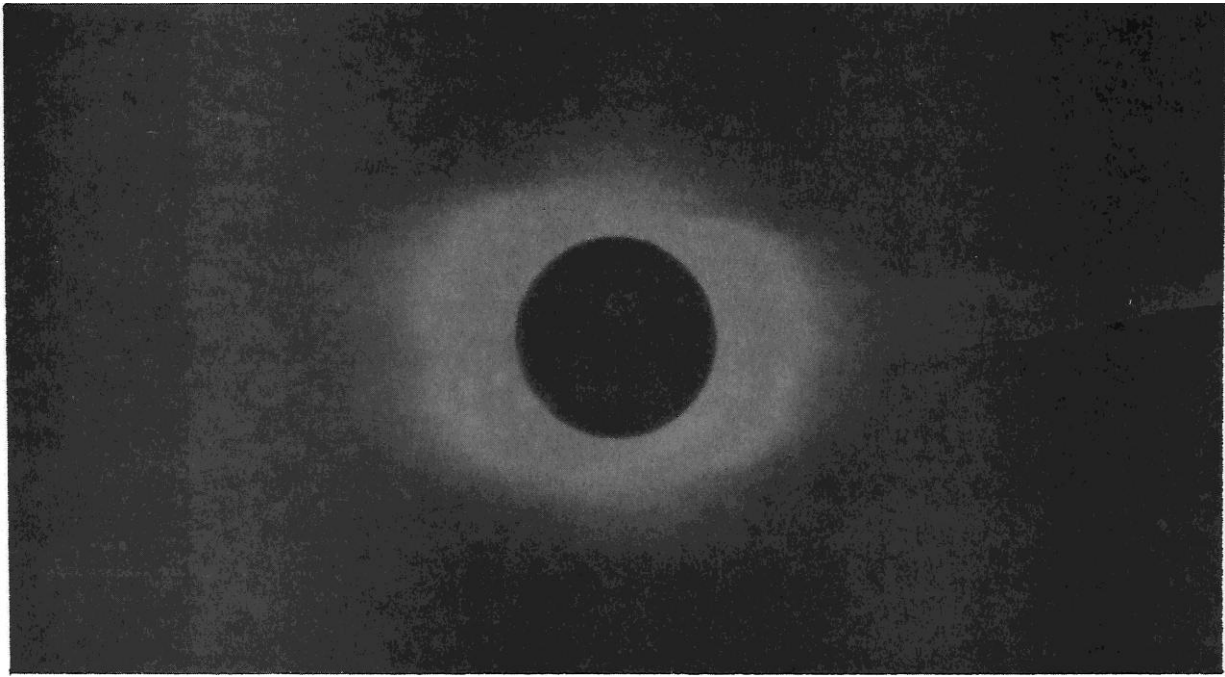
Centering our attention on the best part of the path, I find a town called Brandon, Manitoba to lie directly on the central line, which will endure approximately two minutes and forty-six seconds of totality. I make this my first choice for a site; on Canadian Route 1, 100 km. west of Winnipeg. The location is at the near-eastern end of accessibility, and poor weather would force the eclipse-chaser west and south.

If the astronomer could spare a few more precious seconds of totality (two minutes and forty-three seconds) he/she could view the eclipse from Poplar, Montana (my second choice, also on the central line) and would have a statistically greater chance to move to clear skies, were it necessary- driving could be, either to the east or west; several hundred miles, depending on conditions.

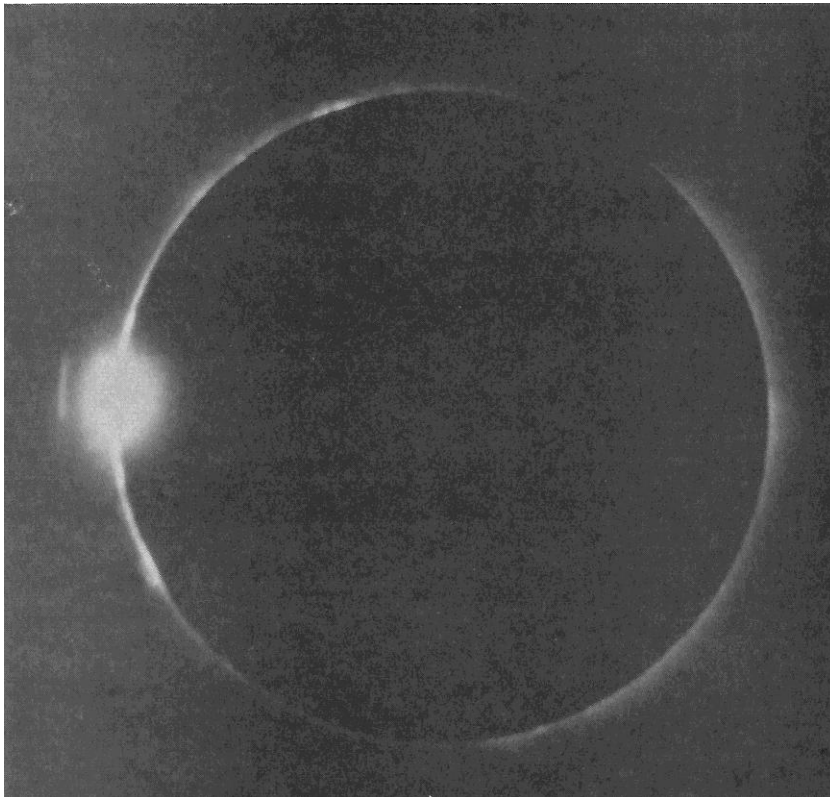
The author plans to write to the cities mentioned above, along with a few others, to inquire about places to stay, and typical weather conditions that might be expected on that date. Being an amateur who has not the means to sail on ocean cruises to eclipses halfway around the world, I must be content and wait until they occur on my own continent. Though it now seems a long way off it is not too early to begin plans for viewing the last total solar eclipse of this century. If you are seriously interested in this adventure I suggest that you contact me.

248-West Owen Hall, MSU  
East Lansing, Michigan 48824





Total Eclipse and the extension of the Solar Corona taken by Diane McCullough. Film, Ektachrome 200,-Instrument, 3" f4 refractor- at  $\frac{1}{4}$  sec. Fast film and a short focal length allowed Diane to capture the fine extensions of the corona encircling the Lunar disk.



The Diamond Ring effect and Solar Prominences. Taken by Frank McCullough. Frank used a 3" f12, 900mm fl refractor loaded with Ektachrome 64, exposed at 1/50th of a second.

This picture, showing the many prominences, inner corona and the last few seconds of a spectacular 10 second Diamond Ring effect. This photo was taken at extreme focal length (1900mm) on the rolling deck of the ship.



# Wright Angles

8-E — THE DETROIT NEWS — Tuesday, November 1, 1977 ••

by Larry Wright



## ECLIPSE WATCHERS GO TO SEA FOR BEST LOOK

• DETROIT FREE PRESS  
Monday, Oct. 10, '77 5-B

# They're Paying to See the Sun Disappear

LOS ANGELES — (AP) — A cruise ship sailed out of Los Angeles this weekend carrying 885 passengers who paid \$765 to \$1,715 each to see a solar eclipse from a spot in the Pacific where the view should be the most spectacular.

"I'm an eclipse freak," said Don Goldstein of Swarthmore, Pa., as he took a swig from his plastic cocktail glass at a bon voyage party aboard the TSS Fairsea.

The Fairsea will rendezvous 1,200 miles out Wednesday with its sister ship, TSS Fairwind, which left from Port Everglades, Fla., Oct. 1. To make sure they are in the correct position, the Sitmar Cruises ships will be receiving weather data from a U.S. satellite center in Redwood City, Calif.

Astronomers at the Hayden Planetarium in New York said the eclipse will be visible in the United States — the farther west the viewpoint the more total the eclipse. The moon will begin to cross the sun's disc at 4:44 p.m. Detroit time Wednesday. It will reach

midpoint at 5:19 p.m., and the eclipse will end at 5:52 p.m.

The forecast for the Detroit area Wednesday calls for partly cloudy skies which should allow viewers here to see the eclipse, about 13 percent, through eye-protecting devices.

Weather permitting, Honolulu viewers will see a 70 percent eclipse, Atlanta 26 percent, Chicago 13 percent, Columbus, Ohio, 13 percent, Denver 24 percent, Flagstaff, Ariz., 38 percent, Los Angeles 47 percent, Minneapolis 10 percent, New York 13 percent, San Francisco 44 percent, and Tampa, Fla., 38 percent.

The Hayden astronomers and eye specialists warned that looking directly at the sun for even a few seconds can cause permanent eye damage. One recommendation is to expose ordinary black and white photographic film to light near a window, not in direct sunlight, and have the film developed. The sun can be viewed through three thicknesses of the film.

THE ECLIPSE will be total in a patch across the Pacific, west of Mexico, reaching the Columbian coast shortly before sunset.

Aboard the Fairsea, standard cruise ship entertainment — shuffleboard, card tournaments and the like — has been augmented with lectures and seminars on astronomy, oceanography, anthropology and other subjects of interest to eclipse watchers.

Some passengers are earning astronomy course credits under a special University of California at Los Angeles extension program. Others have different reasons for taking the cruise.

Terry Holcomb of San Bernardino, a card-reader and dancer, said she and her fiancé, Kit Wilkins, a professional psychic and astrologer, are traveling with about 10 students of the occult.

"An eclipse is a very special opportunity to work with the occult energy of our group," she said.

Mr. and Mrs. J. Clare Holstein of Los Angeles said they planned to buy eclipse photo-

graphs from Sitmar and might not even watch the celestial phenomenon.

"We will be very careful about that," Mrs. Holstein said, referring to possible eye damage. "It's just a fun thing to do."

Paul Laverty, a 17-year-old from Midland, Tex., carried camera equipment, including 30 rolls of film and special filters.

"I did some reading up on it," he said. "I've also brought along a small telescope and I'm going to hook up the camera to it."

In addition to amateur or would-be scientists, a group of professionals are on board the Fairsea to do research.

"We're going to be working very hard," said Jay M. Pasachoff, who has a doctorate in solar astronomy from Harvard and is director of the Hopkins Observatory at Williams College in Williamstown, Mass.

Pasachoff, a veteran of eight eclipses, is traveling with his wife, two small daughters and two tons of equipment that includes a special tracking platform to allow stable viewing on a rocking boat.

# SKY CALENDAR DECEMBER 1977

Information for helping teachers and students observe the sky

SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
<p><i>Evening Planets:</i> Mercury reaches greatest elong, 21° from sun, on Dec 3. Visible first 1/3 of month only, Mercury sets in SW just over an hour after sun. Brilliant Jupiter rises in ENE 1 1/2 hrs after sun Dec 1. See Dec 7, 15, 16, 22, 25. Red Mars, now brighter than any starlike evening object except Jupiter and Sirius, rises 4 1/2 hrs after sun Dec 1 and 2 hrs after on Dec 31. Mars follows Jupiter across sky by 3 hrs. Saturn and Regulus, just over 1° apart, rise 2 hrs after Mars. <i>Morning Planets:</i> Venus rises in ESE 1 hr before sun Dec 1 and is easily seen early in month. After midmonth it gets difficult. An hour before sunrise Jupiter and Mars dominate western sky. A line from Jupiter to Mars, 40° long, extended 20° ends near Saturn and Regulus. Mercury: See 12/31.</p>			<p>Use binoculars to see Ganymede, Jupiter's brightest satellite, nearly 0.1° or 6' east of Jupiter each Saturday night in December. Its orbital period is close to 7 days. Callisto is 10' W of planet Dec 2,3,18,19; 10' E on Dec 10,11,27,28.</p>	<p>One hour before sunrise: 1</p> <p>Saturn  Mars  Regulus  Moon </p>	<p>One hour before sunrise: 2</p> <p>Saturn  Regulus  Moon  Mars </p>	<p>One hour before sunrise: 3</p> <p>Saturn  Regulus  Moon at Last Quarter </p>
<p>One hour before sunrise: 4</p> <p>Saturn  Regulus  Moon </p>	<p>Watch for the rising of Sirius. It rises just before Altair sets. See this month's map. Extend Orion's belt downward to locate Sirius. Note Winter Triangle formed by Betelgeuse, Procyon, and Sirius.</p> <p>5</p>	<p>One hour before sunrise: 6</p> <p>Moon this morning  Spica  Moon tomorrow morning </p>	<p>Brilliant Jupiter rises north of east one hour after sunset. When Jupiter gets higher, look for Eta in Gemini (Castor's toe) 0.6° S of Jupiter. Watch Jupiter move 2.4° farther west by Christmas. See Dec 25.</p> <p>7</p>	<p>1 hr before sunrise: The 3rd mag star 2° right of moon is Alpha Librae. With binoculars look 4' (minutes of arc) above Alpha for its 5th mag companion. 6th mag Uranus is 0.6° upper right of this double star. See Dec 18-20.</p> <p>8</p>	<p>30 min before sunrise: Look 30° south of east to see Venus under very old moon. </p> <p>9</p>	<p>New Moon, in conjunction with sun today, is not visible. Tomorrow evening the moon will set at end of twilight and will be easy to see. Look for earthshine early next week. </p> <p>10</p>
<p>45 min after sunset: Moon tomorrow night  Moon tonight  Mercury </p>	<p>Saturn and Regulus, 1.4° apart, rise 5 1/2 hrs after sunset and pass high in S 2 1/2 hrs before sunup. Now beginning retrograde, Saturn will move 7° westward by Apr 25, passing 1° N of Regulus on Jan 14.</p> <p>12</p>	<p>Geminid meteor shower reaches maximum activity tonight. Highest meteor count (50 per hr) is between 11 p.m. and 5 a.m. local time. Meteors may appear anywhere in sky, but seem to radiate from Castor.</p> <p>13</p>	<p>Mars now rises in ENE 3 1/2 hrs after sunset and passes high in S 3 3/4 hrs before sunrise. Also beginning to retrograde, Mars will move 19° west by Mar 2. It will pass 2.6° N of Beehive Jan 7 and 2.6° S of Pollux Feb 17.</p> <p>14</p>	<p>Jupiter rises about 25 min after sunset tonight. Station yourself at a place with an unobstructed view toward NE to ENE and watch for its rising. Jupiter rises 5 min earlier each night.</p> <p>15</p>	<p>Next week the sun will make its lowest arc thru the sky all year. It will rise in ESE and set in WSW. Since Jupiter will be at opposition, its path thru sky resembles the sun's in June. See Dec 22.</p> <p>16</p>	<p>Moon, just past First Quarter (evening half moon phase) is slightly gibbous tonight. Can you detect curvature of the terminator? Binoculars show Apennine Mts 1/3 of way down from top. </p> <p>17</p>
<p>Uranus easy to locate 1 1/2 hrs before sunup. Find 3rd mag Alpha Librae low in SE 21° lower left of Spica. Binoculars show Alpha's 5th mag companion 4' above it. 6th mag Uranus is 2.4' above the companion.</p> <p>18</p>	<p>This morning 1 1/2 hrs before sunup, both Uranus and the companion to Alpha Librae are 4' above Alpha. Uranus is the faintest of the three and is 1.7' left of the companion.</p> <p>19</p>	<p>Uranus is currently shifting position by 3' per day. With binoculars, look at Alpha Librae 1 1/2 hrs before sunup. Its 5th mag companion is 4' above it, and 6th mag Uranus is 3' to its upper left.</p> <p>20</p>	<p>Winter Solstice. One hr after sunset: Pleiades  Moon  tonight  tomorrow night  Aldebaran </p> <p>21</p>	<p>Jupiter at opposition, 180° from sun and visible all night. Jupiter is low in ENE at dusk, high in S at midnight, and low in WNW at dawn. Next month Mars will be at opposition; in Feb Saturn will be.</p> <p>22</p>	<p>One hour after sunset: Aldebaran  Jupiter  Moon tonight, Dec 23  Moon tomorrow night  Betelgeuse </p>	<p>Jupiter  Moon tonight  Betelgeuse  Moon tomorrow night </p>
<p>Look at Jupiter with binoculars or telescope. The 4th-magnitude "moon" just 4' N of it tonight is actually the star I Geminorum. Moon III is 3' E, and IV 7' E of planet. In coming nights, watch Jupiter go W of star.  Full</p> <p>25</p>	<p>Castor  Pollux  Moon  3 1/2 hrs after sunset: Procyon  Mars  Moon  Mars (10° up in ENE) </p> <p>26</p>	<p>Castor  Pollux  Moon  3 1/2 hrs after sunset: Procyon  Mars  Moon </p> <p>27</p>	<p>5 hours after sunset: Regulus  Saturn  Moon </p> <p>28</p>	<p>5 hours after sunset: Regulus  Saturn  Moon </p> <p>29</p>	<p>One hour before sunrise: Moon tomorrow morning  Saturn  Regulus  Moon this morning </p> <p>30</p>	<p>One hour before sunrise: Locate Antares low in SE and Mercury 14° to its lower left. Mercury will brighten in coming days. Antares  Mercury </p> <p>31</p>

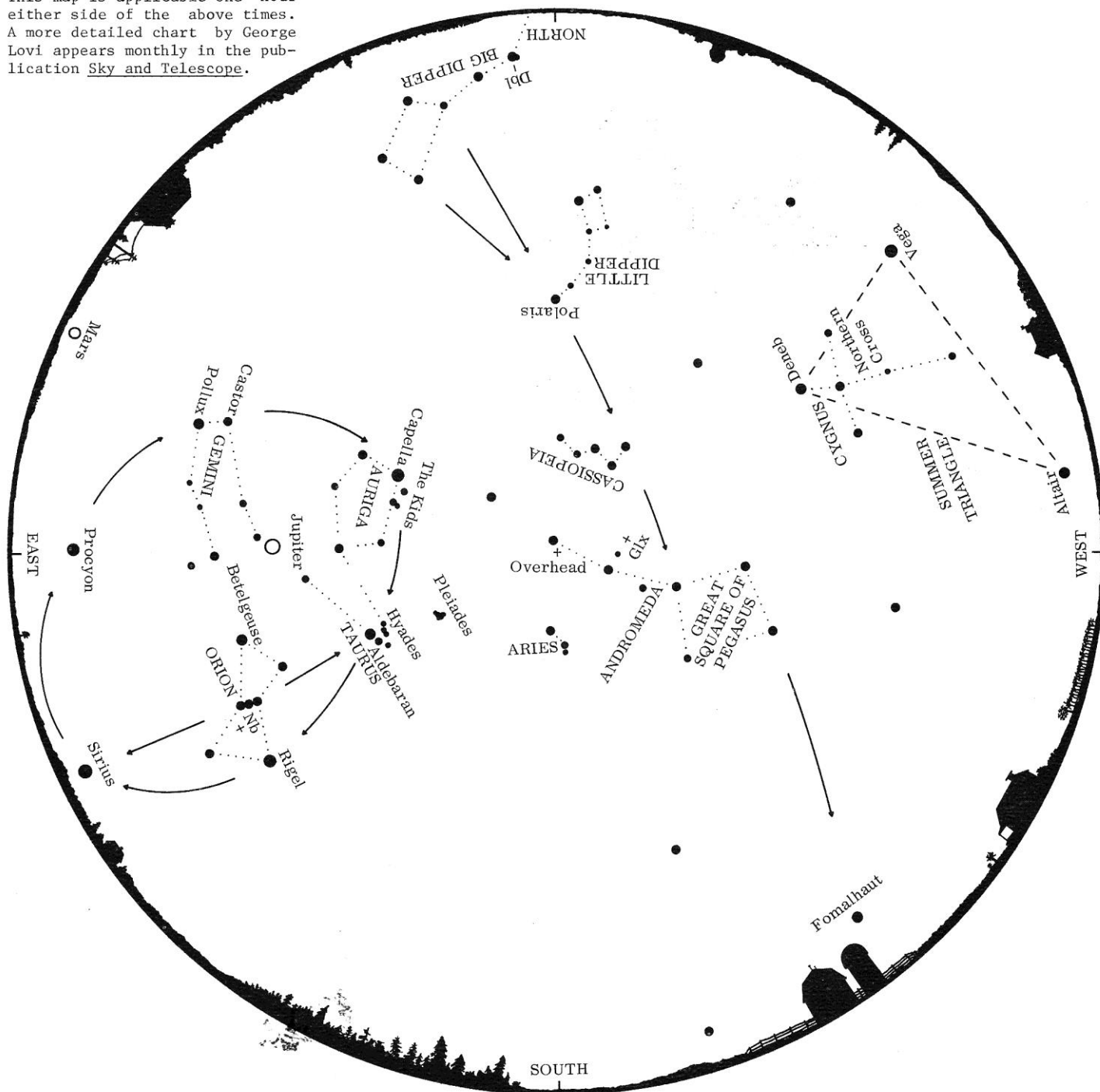
# December Evening Skies

This chart is drawn for Latitude 40° north, but should be useful to stargazers throughout the continental United States. It represents the sky at the following local standard times:

Late November	10 p.m.
Early December	9 p.m.
Late December	8 p.m.
Early January	7 p.m.
Late January	6 p.m.

This map is applicable one hour either side of the above times. A more detailed chart by George Lovi appears monthly in the publication Sky and Telescope.

Abrams Planetarium  
Michigan State University  
East Lansing, Michigan



The planets Jupiter and Mars are plotted for mid-December, 1977. At chart time 13 objects of first magnitude or brighter are visible. In order of brightness they are: Jupiter, Sirius, Mars, Vega, Capella, Rigel, Procyon, Betelgeuse, Altair, Aldebaran, Pollux, Fomalhaut, and Deneb. In addition to stars, other ob-

jects that should be visible to the unaided eye are labeled on the map. The double star (Dbl) at the bend of the handle of the Big Dipper should be detectable above the treetops in the north. The famous Orion Nebula, a cloud

of gas and dust out of which stars are forming, is marked (Nb) in that constellation. The position of an external star system, called the Andromeda Galaxy after the constellation in which it appears, is also indicated (Glx). Try to observe these objects with unaided eye and binoculars.

--D. David Batch

# SKY CALENDAR JANUARY 1978

Information for helping teachers and students observe the sky

SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
<p>1</p> <p>Each night, carefully note the position of Mars in relation to the stars. This Saturday, Jan 7, Mars will pass 2 1/2 degrees north of Beehive Cluster and 1 degree north of 4.7-mag Gamma in Cancer. Use binoculars.</p>	<p>2</p> <p>One hour before sunrise:</p> <p>Moon at Last Quarter</p> <p>(morning half moon)</p> <p>★ Spica</p>	<p>3</p> <p>One hour before sunrise:</p> <p>Moon</p> <p>★ Spica</p>	<p>4</p> <p>New Moon will occur on January 8 at 11 p.m. EST (8 p.m. PST). It may be possible to see old moon before sunrise on the 8th, and it should be easy to see young moon after sunset on the 9th. In both cases, moon is within 24 hr of New.</p>	<p>5</p> <p>Please send reports of your Jan 8 or 9 sightings of the moon to R. Victor c/o Sky Calendar. Include date, time, instrument used, description of moon, and your location. See <i>Sky and Telescope</i>: 8/71 p.78; 2/72 p.95; 6/77 p.440.</p>	<p>6</p> <p>One hour before sunrise:</p> <p>Mercury and Antares</p> <p>★ Moon 15° apart.</p> <p>★ Antares</p> <p>★ Mercury</p>	<p>7</p> <p>One hour before sunrise:</p> <p>Antares</p> <p>★ Moon</p> <p>★ Mercury</p>
<p>8</p> <p>45 min before sunrise: Face SE. Note Mercury 17° lower left of Antares. With binoculars look for very old crescent moon 15° lower left of Mercury and barely above horizon. You'll need perfectly clear sky &amp; unobstructed horizon 25° S of E.</p>	<p>9</p> <p>Conditions are very favorable for seeing very young moon tonight. 30 min after sunset it is 5° up and 25° S of W. Moon sets about 1 hr after sunset. Use binoculars to see if visible crescent extends for 180° of moon's limb.</p>	<p>10</p> <p>As evening sky darkens, note bluish light on dark side of moon. It's called <i>earthshine</i> or <i>the old moon in the new moon's arms</i>. On what night will you last see it?</p>	<p>11</p> <p>Mercury at greatest elongation (maximum angular distance W of sun, 23°). Look 19° lower left of Antares.</p> <p>★ Mercury</p>	<p>12</p> <p>This month's map shows positions of three bright planets for mid-January. Since earth is passing them (Jupiter last month, Mars this month, and Saturn in Feb), all 3 are retrograding. Watch them carefully.</p>	<p>13</p> <p>Note the pretty "double star" very low north of east 3 1/2 hrs after sunset (see map). The brighter more northerly one is yellow Saturn; blue Regulus is 1° south of it. They are closest tonight. 1 hr before sunup look 35° up in W.</p>	<p>14</p> <p>One hour before sunrise: Mercury 22° lower left of Antares.</p> <p>★ Antares</p> <p>★ Mercury</p>
<p>15</p> <p>First Quarter. At midday today, look for moon low in east. Note its half moon shape, and note it is 90° (1/4 circle) east of the sun. Follow moon's progress thru sky in afternoon and evening.</p> <p>☾ east west</p>	<p>16</p> <p>Earth passes Mars at intervals of 25 to 27 months. After this week's close approach, succeeding ones will occur in Feb 1980, Mar 1982, May 1984, July 1986, Sept 1988, Nov 1990, and Jan 1993. See Jan 17 and 21.</p>	<p>17</p> <p>Tomorrow night Mars, at a distance of 98 million km (61 million mi), is nearer earth than it will be again until March, 1982. Of all "stars" in evening sky, Mars ranks in brilliance after only Jupiter and Sirius.</p>	<p>18</p> <p>One hour after sunset:</p> <p>★ Pleiades</p> <p>☾ Moon</p> <p>★ Aldebaran</p>	<p>19</p> <p>One hour after sunset:</p> <p>★ Pleiades</p> <p>★ Aldebaran</p> <p>☾ Moon</p>	<p>20</p> <p>One hour after sunset:</p> <p>★ Jupiter</p> <p>☾ Moon tonight</p> <p>★ Moon tomorrow</p> <p>★ Betelgeuse</p>	<p>21</p> <p>Current view from above solar system:</p> <p>Mars</p> <p>Earth</p> <p>Venus</p> <p>Sun</p> <p>Mars at opposition--visible all night. Venus at superior conjunction--not visible.</p>
<p>22</p> <p>One hour after sunset:</p> <p>★ Castor</p> <p>★ Pollux</p> <p>☾ Moon</p> <p>★ Mars</p> <p>★ Procyon</p>	<p>23</p> <p>One hour after sunset:</p> <p>★ Castor</p> <p>★ Pollux</p> <p>★ Mars</p> <p>☾ Full Moon</p> <p>★ Procyon</p>	<p>24</p> <p>According to astrologers, the sun entered the sign of Aquarius on Jan 20. But the sun is actually within the boundaries of the constellation Capricornus Jan 19-Feb 15. Happy Birthday, Capricornus!</p>	<p>25</p> <p>3 hours after sunset:</p> <p>★ Saturn</p> <p>★ Regulus</p> <p>☾ Moon tonight</p> <p>☾ Moon tomorrow</p>	<p>26</p> <p>One hour before sunrise:</p> <p>☾ Moon tomorrow</p> <p>★ Regulus</p> <p>☾ Moon this morning</p>	<p>27</p> <p>Tonight the moon rises late enough (3 1/2 hrs after sunset) to allow an interval of dark sky. Use this month's map about 2 1/4 hours after sunset and explore the sky.</p>	<p>28</p> <p>Among the prettiest objects for binoculars this evening are: The Pleiades, the Beehive, the Orion Nebula, and the Andromeda Galaxy. All are shown on this month's map.</p>
<p>29</p> <p>Using binoculars, and holding them as steady as you can, look carefully at Jupiter. You may see 4 nearby "stars", one of them to the west of the planet and 3 to the east. These are actually satellites of Jupiter.</p>	<p>30</p> <p>One hour before sunrise:</p> <p>☾ Moon</p> <p>★ Spica</p>	<p>31</p> <p>One hour before sunrise:</p> <p>☾ Moon</p> <p>approaching Last Quarter</p> <p>★ Spica</p>	<p>PLANETS VISIBLE DURING EVENING HOURS: The brightest "star" currently visible is actually the planet <i>Jupiter</i>. In the east at dusk, Jupiter passes high due south around 11 p.m. local time in early Jan and around 9 p.m. at month's end. Bright reddish <i>Mars</i> rises north of east 2 hrs after sunset as Jan opens. By Jan 14 it rises only 1/2 hr after sunset, and for a few days around Jan 21 is visible all night. <i>Saturn</i>, near Regulus, rises 4 hrs after sunset on Jan 1, &amp; about 1 1/4 hrs after sunset Jan 31.</p>		<p>31</p> <p>In the evening, after Saturn has risen, a line from Jupiter to Saturn roughly indicates the ecliptic. Mars is 2/3 to 1/2 way from Jupiter to Saturn and 4° N of ecliptic. <i>Mercury</i> is easily seen low in SE morning sky 1st 3 weeks of Jan.</p>	<p>Recommended for planet-watchers: <i>The Graphic Time Table of the Heavens 1978</i>, 75¢ from Maryland Academy of Sciences, 601 Light Street, Baltimore, MD 21230. Large wall chart of Time Table, 40" by 27", \$3.00.</p>

Sunrise/Sunset East Lansing: Jan 1 8:09 a.m./5:14 p.m.; Jan 16 8:06 a.m./5:30 p.m.; Jan 31 7:54 a.m./5:49 p.m. EST.



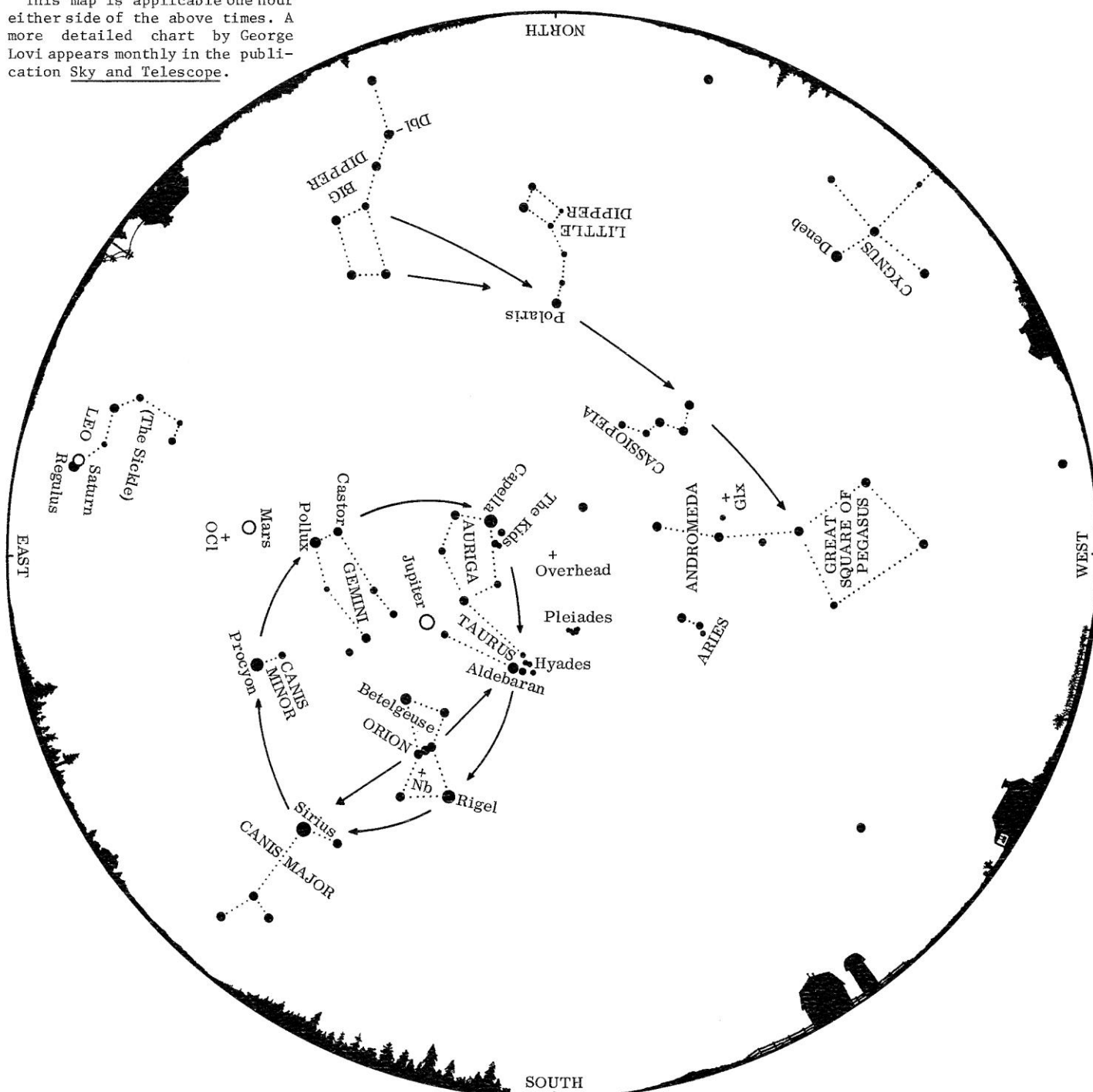
# January Evening Skies

This chart is drawn for Latitude 40° North, but should be useful to stargazers throughout the continental United States. It represents the sky at the following local standard times:

Late December	10 p.m.
Early January	9 p.m.
Late January	8 p.m.
Early February	7 p.m.

This map is applicable one hour either side of the above times. A more detailed chart by George Lovi appears monthly in the publication Sky and Telescope.

Abrams Planetarium  
Michigan State University  
East Lansing, Michigan



The planets Jupiter, Mars, and Saturn are plotted for mid-January, 1978. At chart time 12 objects of first magnitude or brighter are visible. In order of brightness they are: Jupiter, Sirius, Mars, Capella, Rigel, Procyon, Saturn, Betelgeuse, Aldebaran, Pollux, Deneb, and Regulus.

In addition to stars, other ob-

jects that should be visible to the unaided eye are labeled on the map. The double star (Dbl) at the bend of the handle of the Big Dipper is easily detected. The famous Orion Nebula, a cloud of gas and dust out of which stars are forming, is marked (Nb) in that constellation. The open or

galactic star cluster (OC1) known as the "Beehive" can be located between the Gemini twins and Leo. The position of an external star system, called the Andromeda Galaxy after the constellation in which it appears, is also indicated (Glx). Try to observe these objects with unaided eye and binoculars.

--D. David Batch