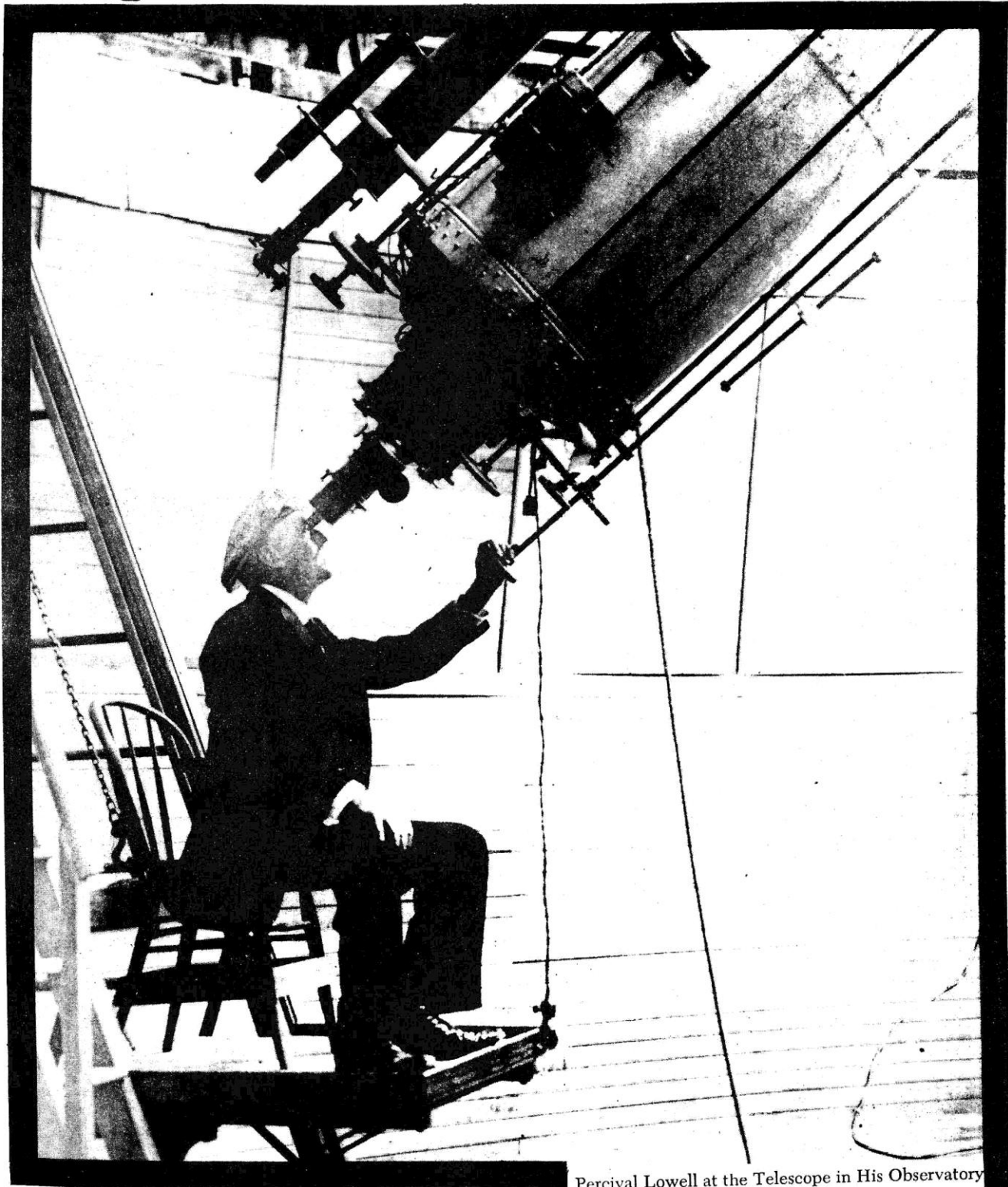


# Warren Astronomical Society Paper



Percival Lowell at the Telescope in His Observatory

## January 1976

The Warren Astronomical Society is a local, nonprofit organization of amateur astronomers. Membership is open to all interested persons. Annual dues are as follows: \$2.00 for Student (K - college), \$4.00 for General Membership, and \$5.00 for a Family Membership. Add \$6.00 for a one year subscription to Sky and Telescope magazine. General meetings of the Warren Astronomical Society are held on the first Wednesday and third Thursday of every month.

The Warren Astronomical Society Paper (W.A.S.P.) is published monthly, by and for the membership of the Warren Astronomical Society. Subscriptions and advertisements are free of charge to all members. Non-member subscriptions and advertisements are available upon arrangement with the editors of the W.A.S.P. Contributions, literary or otherwise, are always welcome and should be submitted to either of the editors listed below.

EDITORS:	Garry Boyd	Raymond Bullock
	15850 State Fair	2991 Charnwood
	Detroit, 48205	Troy, 48084
	839-0973	879-9458

The editors of the W.A.S.P. will exchange copies of this publication for other astronomy club publications on an even exchange basis. If your club would like to participate in such an exchange, please contact one of the above listed editors. The Warren Astronomical Society maintains contact, sometimes intermittent, with the following organizations:

THE ADAMS ASTRONOMICAL SOCIETY

THE ASTRONOMICAL LEAGUE

THE DETROIT ASTRONOMICAL SOCIETY

THE DETROIT OBSERVATION AND ASTROPHOTOGRAPHIC Assoc.

THE FORT WAYNE ASTRONOMICAL SOCIETY

THE GRAND RAPIDS AMATEUR ASTRONOMICAL ASSOCIATION

THE KALAMAZOO ASTRONOMICAL SOCIETY

THE MIAMI VALLEY ASTRONOMICAL SOCIETY

THE OLGELTHORPE ASTRONOMICAL SOCIETY

THE ORANGE COUNTY ASTRONOMERS

THE SUNSET ASTRONOMICAL SOCIETY

## Saturn Returns !!!

SATURN DOES INDEED return, to the early evening skies. Saturn was last visible in the evening sky in the month of June. Although it began rising before midnight in early November, it was not well placed for observing, transiting after 5 a. m.

Now, in late December, Saturn rises at 19:18(7:18 p.m.) and transits at 02:30. It will be in opposition on January 20, rising as the sun sets. The light from Saturn will reach us in only 60 minutes.

The editors of the W. A. S. P. wish to thank all the members who have given the newsletter articles, by giving all the members something in return. This postcard of Saturn can be removed by CAREFULLY lifting it off the page. The adhesive on the back can be rubbed off with your finger.



POETIC PULSARS  
Submitted by Wayne Brasure

PULSARS IN POETRY  
Jay M. Pasachoff (1969)

Twinkle, twinkle, pulsing star  
Newest puzzle from afar.  
Beeping on and on you sing-  
Are you saying anything?  
Twinkle, twinkle more, pulsar,  
How I wonder what you are.

THE PULSAR'S PINDAR  
D. E. Thomsen & J. Eberhart (1968)

Rhythmically pulsating radio source,  
Can you not tell us what terrible force  
Renders your density all so immense  
To account for your signal so sharp and intense?

Are you so dense that no matter you own;  
Not atoms nor protons, save neutrons alone?  
And do you then fluctuate once every second  
So fixed that by you all our clocks might be reckoned?

Or are you two stars bound together in action  
That spin like a lighthouse beam gone to distraction?  
What in the world can account for your course  
O rhythmically pulsating radio source?

And perhaps there is more than your radio beam'  
Perhaps visible light in a radiant stream?  
And what if the cause of your wall-metered twitch  
Is a strange but intelligent hand at the switch?

A world of astronomers ponder, a-pacing,  
The cause of your infernal, rock-steady spacing,  
To see your pulse vary, they valiantly strive,  
From 1.3373795.

But the biggest of mysteries plaguing our earth  
Is, how of your kind can there be such a dearth?  
In infinite apace one should find even more;  
Can it be that your number indeed is but four?

# Cosmic Calendar....

January 1976 Configurations Of Sun,. Moon, Planets

DAY: HOUR\:

01	15	NEW MOON
03	06	Mercury 7° South of Moon
03		Jeremiah Horrocks died, 1641, First man to witness transit of Venus across sun.
04	11	Earth at Perihelion
07		Warren Astronomical Society meeting at Cranbrook. 8pm E.S.T. Call Carl Noble for details. (573-0937)
08	12	Venus 7° North of Antares. ( Galileo died, 1642 )
09	12	Jupiter 4° South of Moon.
12	04	Venus north of Moon.
13		Galileo discovered 4th satellite of Jupiter; 1618
14	03	Mars 50 north of Moon.
14		Edmund Halley died 1742.
15		Warren Astronomical Society general meeting, Macomb college, room K-306 at 8pm Call Carl for details 573-0937.
17	05	FULL MOON
17	13	Saturn 5° north of Moon
20	11	Saturn at opposition.
20	13	Moon at perigee
20	20	Mars is stationary.
21		Pluto discovered 1930 by Clyde Tombaugh, amateur astronomer.
23	23	Last Quarter of Moon
28	08	Venus 2° South of Moon
31	06	New Moon.



By permission of John Hart and Field Enterprises, Inc.

# Club News.....

The Messier and Astrophotography meeting at the Cranbrook Institute of Science was a great success. About 50% of the attendants were of the W.A.S., with a grand total of 57 people "WOW"! Lou Faix and Ken Wilson hosted the evening with excellent talks. So we'll see you January 7th, same time, same place.

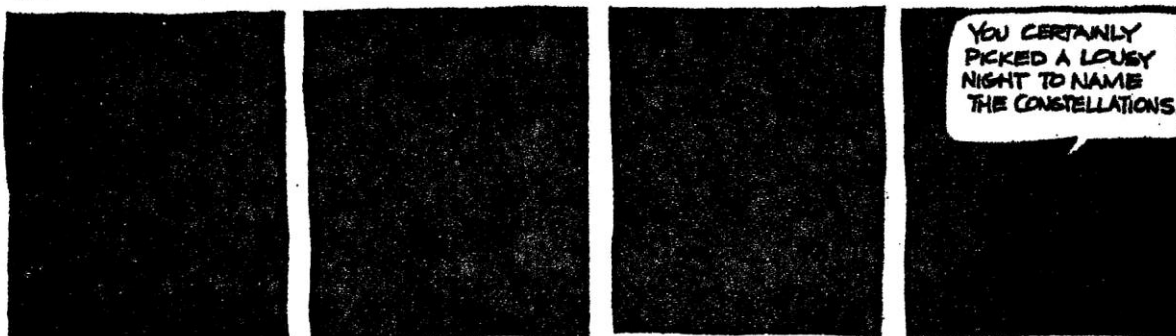
The oscillator for the Star Gate Observatory has been re-installed, apparently something short-circuited. Special thanks to Jerry Parsha of DOAA Enterprises for repairing the unit.

Unfortunately there will be no extra W.A.S.P. this month due to our printing cost, we have only enough available to the normal demand. Sorry, the Editors.

DOUG LANIER just became another proud owner of a Celestron 6 inch telescope, "Is it true you're passing out cigars Doug"?

B.C.

By John Hart



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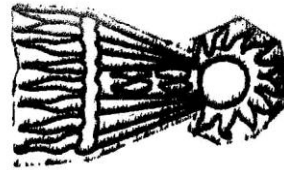
B.C.

By John Hart



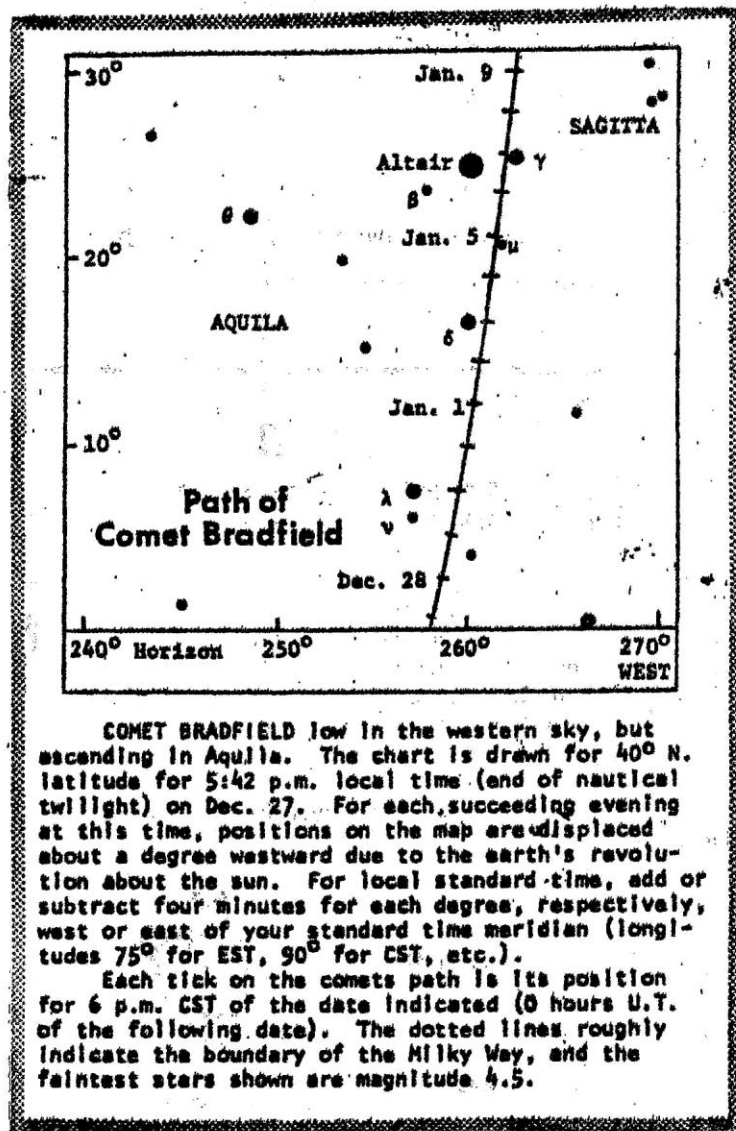
By permission of John Hart and Field Enterprises, Inc.

# New Year's Comet



Comet Bradfield (1975p), discovered on November 11 by an Australian amateur astronomer, appears headed for a brief period of naked eye visibility at the turn of the year for observers in the northern hemisphere.

It is the fourth comet discovery in five years for William A. Bradfield, an engineer living in Adelaide, South Australia. All four bear his name alone; in no case was there a co-discoverer. His last comet was 1975d, a ninth magnitude southern hemisphere object. He has been comet hunting since late 1970 and has used an alt-azimuth six-inch richest field refractor.



Comet Bradfield, currently deep in southern skies, is headed toward a perihelion (closest solar approach) at 04 hours U.T. on December 21 at a distance of .218 A.U. (which is about 12,600,000 miles). Owing to its high orbital inclination (70°), the comet sweeps rapidly north of the ecliptic plane.

## ORBIT OF COMET BRADFIELD 1975p

$$T = 1975 \text{ Dec. } 21.169$$

$$\omega = 358^\circ.140$$

$$\Omega = 270^\circ.632$$

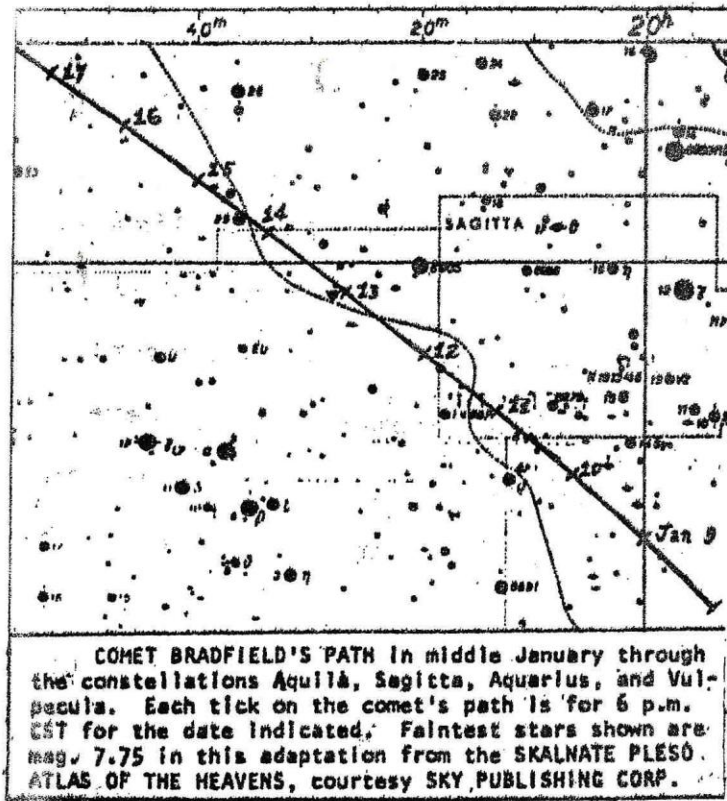
$$i = 70^\circ.642$$

$$q = .21833 \text{ A.U.}$$

(over)



# Bradfield 1975p



It should be about 3<sup>rd</sup> magnitude on December 27, 4th mag. on Dec. 30, 5<sup>th</sup> mag. on Jan. 1, and about 8th mag. on Jan. 23. It might become visible to the naked eye about Jan. 1, as it moves above the evening horizon as twilight ends.

The waxing, first quarter moon will interfere with observations for a week beginning around Jan. 8. The comet's tail would be pointing away from the horizon, toward the north.

(Information from Comet News Service, McDonnell Planetarium, St. Louis, November 23, 1975)

## CRANBROOK INSTITUTE OF SCIENCE

500 Lone Pine Road PO Box 807, Bloomfield Hills, Michigan 48013

### ADULT CLASSES

#### WINTER 1976

#### STAR TREK, THE COMPUTER AND ASTRONOMY

Thursdays, February 5-March 11; 7:30-9:30 p.m.  
(6 weeks) Fee: \$24.00 (Members, \$21.60)

Star Trek – fact or fiction? Or a combination of both? These and other fascinating questions will be explored in this intriguing course on the newest frontier of astronomy, in which participants will consider laboratory experiments with the computer as well as ideas from the popular television show, Star Trek.

Instructor: Dominic Morinelli, Chairman, Science Department Cranbrook School.

#### A PRACTICAL APPROACH TO LUNAR SCIENCE

Tuesdays, March 2-23, 7:30-9:30 p.m. (4 weeks) Fee: \$16.00 (Members \$14.40)

Earth's nearest neighbor, the moon, will be carefully scrutinized in this course which will include such topics as selenography and eclipse monitoring. Students will gain practical experience in how to observe, study, measure and sketch the 'moon as well as how to select and use equipment for lunar work.

Instructor: R. B. Trombley, member, Royal Canadian Astronomical Society.

For more information

Please call 645-3210.





# *Who listens to M82?*

BY: Garry-Boyd

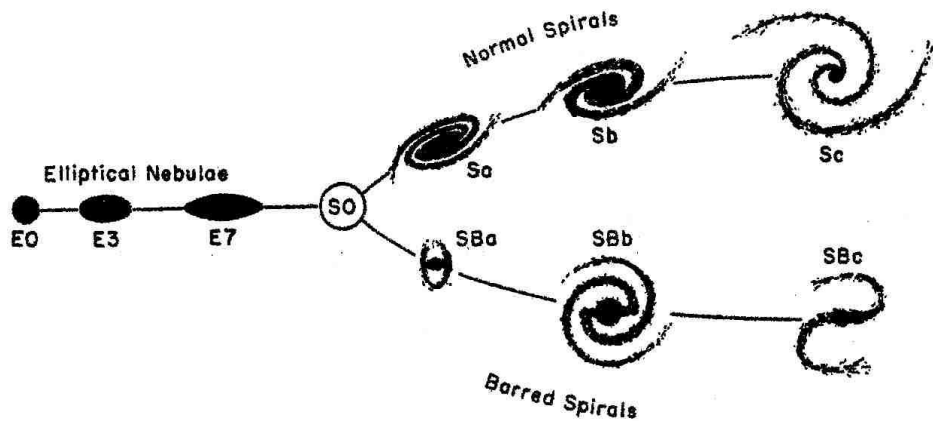
M 82 we know is located in Ursa Major. It is an irregular galaxy close to M 81. Under low power you can observe both of these galaxies in one field. I found that 40 or 60 power is ideal. You must use a large scope to observe the irregular form. Under ideal conditions you should be able to see the dark band running through it. A three inch telescope will resolve the two objects, however a six inch or larger is preferable. M82 has recently attracted an astronomical amount of attention; they think it's an exploding galaxy.

As everything' else, galaxies too have their own classification. We know that M82 is an SC,p type galaxy. The P stands for peculiar. E. Hubble, the person who devised the classification of galaxies stated, "In future research, I hope Radio Astronomers can bring together that image of knowledge, the optical astronomers could not."

When monitoring galaxies most radio observatories use the 21 cm wavelength 1420mc/s. They use this frequency because it responds to the  $H^2$  molecule the best. They call it the neutral hydrogen emission line. M 82 presents two problems to the radio astronomer. The neutral atomic hydrogen appears to have a rather wide spread distribution instead of being confined to the equatorial plane. Second, the object appears to be viewed rather face-on and its orientation to the plane of the sky is hard to determine with any precision. Because the object has a wide spread distribution of radiation and isn't confined to the equatorial plane they concluded that it must have a very primitive spiral structure. What are the spiral arms made of? What can we learn from observing these hydrogen emissions? Well  $H^2$  is the most abundant element in the interstellar matter, studying its distribution is of fundamental importance since this distribution is the basis of star formation, and thus of galactic structure. The simplest model which explains the partial distribution of the gas, is that of a large number of small clouds. (2 to 10pc in diameter) These small clouds are concentrated in larger cloud complexes. The intensity received in the wide antenna beam is the sum of the intensities of large number of clouds. These clouds each have their own density, peculiar radial velocity, kinetic temperature, and internal radial velocity. The temperature of the gas, although not entering directly into determination of the density, if optical depth is not too high, is so poorly known that density estimates might be wrong by factors of two on the account. What they did is measure the temperature of a large number of low density clouds around the sun, and determined values of about 125 degrees K. Where cool clouds appear in front of high intensity regions is the only time it's possible to determine the

temperature of the individual clouds. Clouds as low as 50 degrees Kelvin have been discovered, however one problem still exists. If many of the neutral  $H^2$  clouds are cooling off after a collision with other clouds, then depending on the speed with which they do, so due to molecular  $H^2$  or electron ion cooling mean, temperatures are calculated to be 200K to 500K. We would expect to measure these temperatures in some places, however the maximum temperatures they record is 125 degrees K. This might be caused by an ineffective heating mechanism, (its sun), or the cooling process, or the  $H^2$  is dropping off more rapidly than assumed. Well the only conclusion we can say about the temperature is that it varies from cloud to cloud and has a considerable range.

The more symmetrical and regular a galaxy appears to be from direct photographs, the better determined will be its mass distribution and total mass.



# SOME INTERESTING ASPECTS OF OBSERVING DEEP-SKY OBJECTS FROM URBAN AREAS

by

David L. Harrington

Most deep sky objects are best observed from locations where skies are dark, and the Milky Way clearly seen. However, there are some objects which, as a consequence of their spectral emissivities, are best observed from urban areas. A little known fact is that certain of these objects are in spectral classes Y-IC and Y-LOCK and can be best seen and photographed from the downtown area! Since many members of the Warren Astronomical Society live in close proximity to Detroit, this article should provide valuable information and help to expand the members' observing programs.

The first of these objects that will be discussed is M-97 the famous Groesbeck Nebula. This nebula was discovered by L. Kalinowski in 1964 using a 6" reflector. In an article in "Popular Spectroscopy", Mr. Kalinowski points out that the spectrum of this object was found, in 1966, to contain the distinct line of doubly-ionized neon. This marked the first time that this forbidden spectral line had been observed in nature, other than in the Clock Restaurant sign. Another interesting object is M-53, the Van-Dyke Nebula. This bright nebula was first observed by K. Wilson in 1969, and is described by him as "... an elongated patch of light oriented in the north-south direction, with the southernmost end of the nebula being noticeably brighter, unless you are looking through an inverting telescope, in which case the northernmost end is brighter." The spectrum of this object is quite interesting, containing the forbidden lined of double and triple-ionized mercury, as well as traces of ionized neon.

One object that urban observers should definitely search for is the elusive "Moon" Nebula (M-OON). This object, which is thought to be in our own galaxy, was discovered by R. Snodgrass at Times Square, New York on New Year's Eve, 1957. In his log, Snodgrass wrote "... it appeared as a large dim object, approximately 30' of arc across, and nearly round. It is very diffuse, and appeared to have a large proper motion." Unfortunately, Snodgrass passed away before he could accurately determine the object's position, and it was not observed again until 1966. At that time, P. Kwentus rediscovered this faint nebula and obtained its spectrum. Amazingly, this object was found to have a spectrum almost identical to that of the sun, a fact that still puzzles astronomers today. Kwentus reported in the October, 1966 issue of the "Warren Journal of Theoretical Nebulosity" that the nebula was crescent shaped instead of round, but that it indeed has a large proper motion at nearly 0.5 degrees per hour, exceeding that of even Barnard's star! As a result of this excellent research work, a resolution was introduced at the 1967 annual meeting of the International Astronomical Union that this object be designated as the "Kwentus Nebula", but Mr. Kwentus respectfully declined, saying "To \_\_\_\_\_ with it."

The brightest of all these objects, and the easiest for the novice to locate, is I-94, the "Chicago Nebula". This is one of the finest in the urban sky, and extends from horizon to horizon in an east-west direction. Its brightness has even led observers to refer to it as "the second Milky Way". This object was

known even to the ancients, and Julius Caesar is reported to have said of this object, "... Il Certainus Quo Carborundum." Loosely translated, this means "It really grinds me." The I-94 Nebula ("I" designating inter-galactic), is actually a large nearby galaxy, and contains many hues of red, yellow and green. It is best seen in binoculars or with an RFT, and on good evenings can even be seen with the eyes closed. The spectrum contains many bright lines, including six-times-ionized sodium, mercury, and tungsten. The spectrum of the western edge contains forbidden lines of iron, sulphur dioxide and hydrogen sulfide. Very little oxygen seems to be present. It was stated by R. Civic in the "Roseville Journal of Neutrino Science" that I-94 is actually a variable nebula, with a peak-to-peak magnitude variation of 2.3. Mr. Civic reported that, after painstaking research, he has determined the period as 7,000 days. Amazingly, a sharp brightness maximum for this nebula seems to occur on Sunday Evenings.

Another fine object for urban observing is the famous double nebula in Scorpius. This object is comprised of two nebulae: M-24, the Telegraph Nebula, and its companion, M-10, the Woodward Nebula. The double nebula was first observed in 1943 by two draft-dodgers Simon Telegraph and Carl Woodward, through a chink in the attic roof where they were hiding. Due to obvious circumstances, they were unable to publish their findings immediately. However, when their paper was finally presented at the 1946 meeting of the Flat-Earth Society, it was instantly acclaimed as a landmark discovery. The notoriety they received brought the FBI and they were promptly arrested.

In this same area of the sky is I-96, an unnamed object which is one of the fainter inter-galactic nebulae. This object was discovered photographically in 1972 by L. Faix, while searching for M-59, the "Pontiac" Nebula. After developing a two-hour guided exposure of M-59, and finding that it was out of the field of view, Mr. Faix was about to discard the negative when he noticed something very strange. He had forgotten to use any stop bath! However, even after soaking the negative in a stop-bath solution. A faint streak remained in the upper left hand corner of the negative. After spending weeks inspecting all available sky atlases, and noting that nothing was shown in that position, not even in the Comprehensive Flamsteed Catalogue, (which includes nebulae down to the 4<sup>th</sup> magnitude), Mr. Faix became convinced that he had discovered a dark nebulae. When W.A.S. astronomers at Mount Stargate passed the light from this nebula through their infra-red spectro-photometric analyzer, they were astounded to find that the red-shift indicated a recession velocity of 1.5 times the speed of light. It was then theorized by F. McCullough that this would account for the darkness of the nebula. Then D. Mission pointed out that the red light in the observatory had been left on. When the light was shut off, a residual red-shift remained, indicating that I-96 is indeed receding from us. There is some evidence that the absolute luminosity of I-96 has been increasing; however, it is still a faint object, requiring at least a 3" telescope.

An intergalactic nebula with a photographic magnitude between those of I-96 and I-94 is I-75, the "Flint Nebula". This object, which is actually a galaxy, was discovered by T Skonieczny, using radio astronomy. On September 7, 1974, Mr. Skonieczny was routinely listening to radio emissions at 800 KHz (CKLW) when he noticed an abnormal amount of interference (which is not an easy thing to detect at that wavelength). By changing the orientation of his

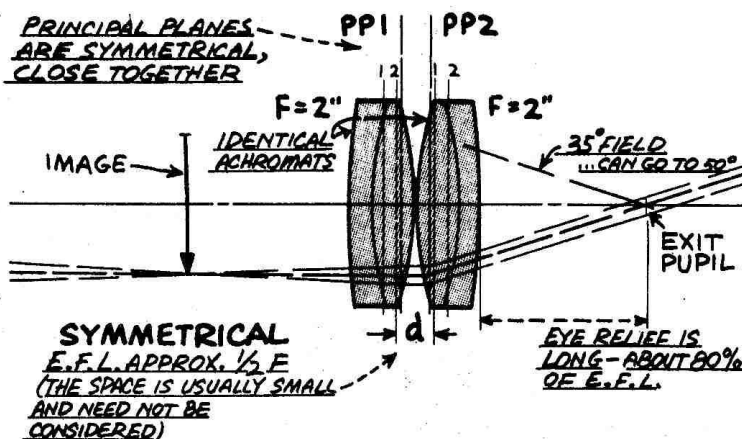
transistor radio, he narrowed the source to a region near the bright galaxy, I-94. He sensed a great discovery, and immediately returned from Michigan State University, even though he was involved in an important astronomical research project: "Is the volume of the Big Dipper changing?" He had already established that the Big Dipper currently holds 8.2 billion cubic parsecs, but, due to proper motion of its stars, will hold only 6.7 billion cubic parsecs by the year 2100. Mr. Skonieczny stated upon his return to Warren, "What will happen to the other 1.5 billion cubic parsecs as it overflows is anyone's guess. It may pose a grave danger to the Earth." He then utilized sophisticated radio equipment (Radio Shack 5-Band) to determine that the radio emissions were being generated by an unseen galaxy colliding with the I-94 galaxy. The fainter galaxy was later detected visually (using a Tuthill Star-Trap) by C. Noble, who named it the "Flint Nebula". He was going to name it the "Skonieczny Nebula", but decided not to.

There are other fine objects observable from urban locations such as M-25, the Gratiot Nebula, and M-14, the Plymouth Nebula, but those already discussed should serve to kindle the interest of the membership. You may not make a monumental discovery such as those mentioned above, but the number of urban-observing projects is endless.

# A.T.M. for the Frantic Fringe!

ACHROMATIC DUPLETS: By Garry Boyd

The most popular and practical homemade eyepiece adopted by most amateurs, has the general concept of employing two achromats. Its construction is usually symmetrical, and the two lenses are in close contact. For visual work, most eyepieces are corrected for the "F, C" lines, the F-line in the blue part of the spectrum and the C-line in the red. These two lines bracket that portion of the spectrum to which the eye is most sensitive. In this symmetrical eyepiece there is a residual of uncorrected color, both between and beyond the "F, C" lines. This secondary color presents a hairline of purple light around a bright star. This color fringe is the only problem with this eyepiece. In any case, the lenses used should be of good, quality, conventional achromats, i.e., duplets designed for incident parallel light and corrected for spherical aberration. Remember, most Edmund war surplus achromats comply with these basic specifications.



# PLANETARIUM GUIDE

JAN.

1976

INTRODUCING a monthly guide to what program is at which planetarium.

R. Bullock



McMath, Cranbrook. Celestial Preview for 1976. What astronomical events are likely to occur in 1976: This program will illustrate many of the predicted, as well as unpredictable, events that you should watch the sky for.

DEMONSTRATIONS: Sunday 2, 3, 4 p.m. Wednesday 4 p.m.; Saturday 2, 3, 4, 7:30 p. m. Additional shows scheduled when needed. Observatory opens for inspection after Sat. evening planetarium demonstration. OBSERVING SESSIONS resume in April. See December 1975 W.A.S.P. for details.



LONGWAY, Flint. Cosmic Dimensions (Starts Jan. 9). Man's attempts to measure distances to the planets and stars are illustrated. The program concentrates on the various methods used to determine cosmic dimensions and concludes with a journey back to the time of the creation of our Universe.

DEMONSTRATIONS: Friday 7:30 p. m.; Saturday and Sunday at 1, 2:30 and 4 p.m. See September W.A.S.P. for details.



ABRAMS, East Lansing. The History of Science Fiction (Begins Jan. 9). Details were not available before our deadline; however don't let lack of information stop you. I've never been disappointed by an Abrams show. Details will be in Feb. W.A.S.P., or call Abrams at 355-4672. Demonstrations Friday and Saturday at 8 p.m.; Sunday at 2:30 and 4 p.m. See October 1975 W.A.S.P. for details.



CHAFFEE, Grand Rapids. Star of Life. This is a program on Earth's most important star. You'll observe the formation of the Sun and planets from a whirling cloud of gas and dust billions of years ago. The latest ideas about the Sun's interior are explained. Sunspots, prominences and flares, are viewed, as well as the aurora the sun produces here on Earth. DEMONSTRATIONS: Thursday 8 p. m.; Saturday 3:15 and 8 p.m.; Sunday 2:45 and 4 p.m. See November 1975 W.A.S.P. for details.



## OBSERVATIONS OF THE TOTAL LUNAR ECLIPSE OF NOVEMBER 18, 1975

David L. Harrington

After five beautifully clear moonrises in a row, could a sixth be expected for lunar eclipse night? After all, even though it felt like September, this was mid-November, which historically has been the "month of cloud cover". Also, a winter storm had been making its way across the northern U.S. toward us. As I talked to Frank McCullough about five hours before eclipse time, the sun was shining brightly, and not a cloud was in sight. This struck fear in our hearts because we had seen conditions like this before (too much good weather too soon). Like in Cap Chat, Quebec for the 1972 total eclipse of the sun. Four beautiful days and nights were enjoyed prior to the eclipse. Even the morning of the eclipse was beautiful. Then, during the partial phases of the eclipse, a front moved in rapidly and blotted out totality.

Preparations for the lunar eclipse continued, with my foremost task being to move the 14 $\frac{1}{4}$ " scope from my backyard to the front yard. With the help of my son, David, and Frank McCullough, this two-hour job was completed about 4:00 in the afternoon on eclipse day. Since the moon rose at 5:03 EST for Detroit observers, and since totality began at 5:03 EST, the moon would rise totally eclipsed. Thus, the event would occur low in the northeast sky, one of the few areas that cannot be viewed from my backyard observatory.

Bill and Sandy Whitney arrived about 4:30, and Bill began to set up his newly constructed 3" refractor. Frank had just about completed the set-up of his 8" reflector, and it was now becoming obvious that we would indeed see this eclipse. The sun was setting, the temperature was about 60° F, and there was not a cloud in the sky. Diane McCullough then arrived, as tripods began to spring up in the front yard, each one topped off with a camera and telephoto lens. As the sun set, film was loaded, lenses set, and shutter speeds checked. It was now 5:03, and we all knew that totality was starting. However, our most optimistic guess as to when we might detect the eclipsed moon was 5:24, with totality half over and the moon at an altitude of only 5°. As it turned out, this was indeed optimistic, as the moon was first observed at 5:35, at an altitude of 7.5°, and with only 9 minutes of totality remaining. By this time, many interested neighbors had been attracted to the observing site, and many cries of, "where? I don't see it", could be heard.

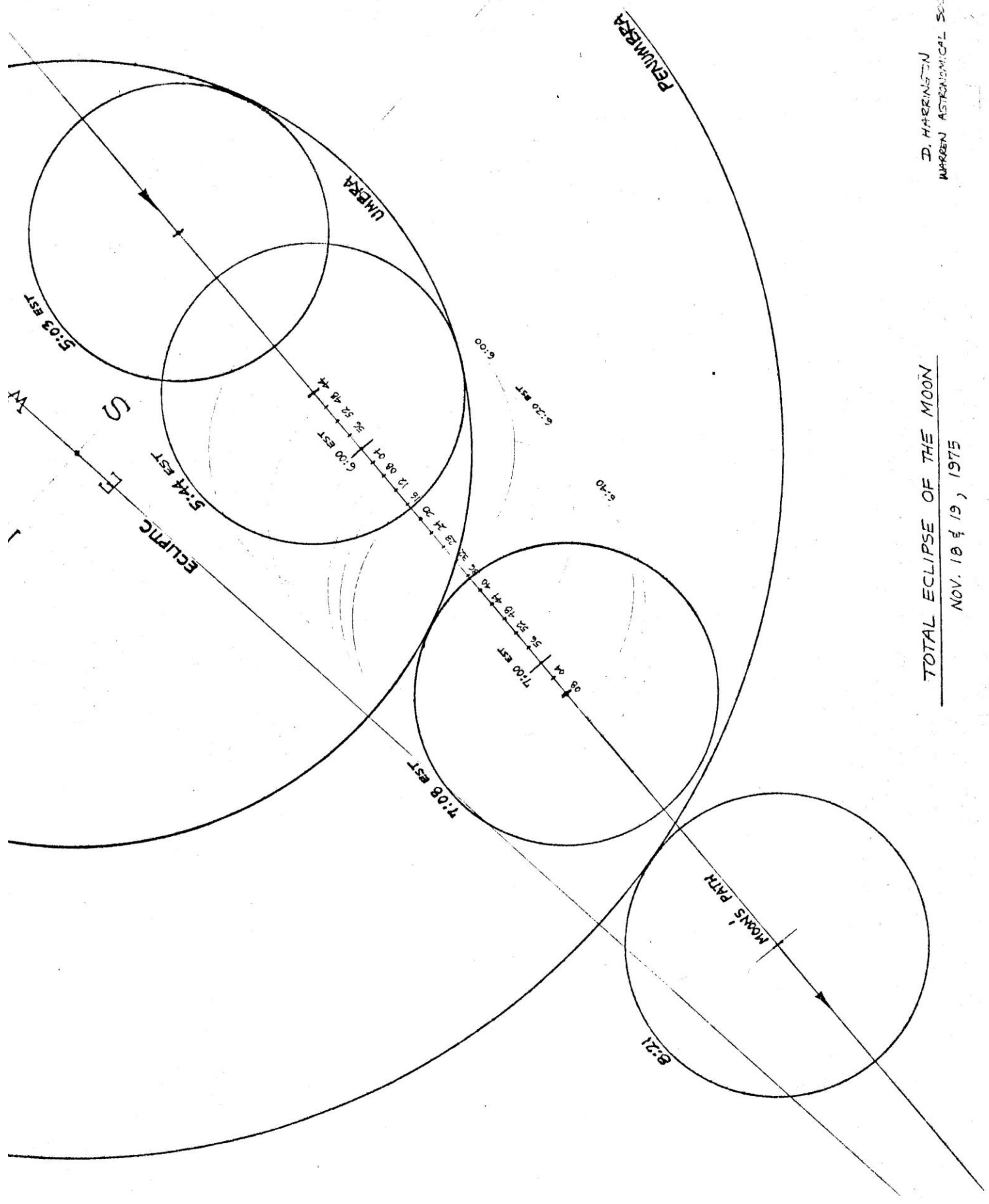
The telescopes were quickly pointed at the eclipsed moon, and it was apparent that only the lower fourth of the moon's disk (toward the horizon) could be seen, and that it was definitely a reddish color. Camera shutters began clicking all around the area, especially after a few minutes had passed and the entire disk of the eclipsed moon could be seen. As the end of totality approached (5:44 EST), the reddish disk of the moon made a beautiful low power sight against the dark blue sky and backdrop of trees. The moon was brightening rapidly, due to the combination of increasing altitude and movement toward the edge of the Earth's umbral shadow. When the lower, left hand portion of the moon emerged from the umbra,

with the moon at an altitude of  $10^\circ$ , it could be easily detected by everyone present. Cameras continued to click as the crater Tycho emerged from the umbra. High-speed color films were quickly exchanged for high-contrast black-and-white films as the moon's disk continued to move out of the umbra and dazzle the eye. Finally, at about 7:00 EST, Mare Crisium, the last portion of the moon in the umbra, began to emerge. By 7:08 EST, the entire disk had emerged, although the area near Mare Crisium remained noticeably darker than the rest of the moon for at least 15 minutes.

As the moon took another one hour and thirteen minutes to move out of the penumbral shadow, the group took a much needed break to devour two extra-large pizzas. After that, the group reconvened to observe a transit of the shadow of Io across the disk of Jupiter, and to contemplate a moon that had now become thousands of times brighter. All in all, a fine evening and a fine eclipse, not to be repeated until at least 1979.

D. HARRINGTON  
WARREN ASTRONOMICAL SOCIETY

TOTAL ECLIPSE OF THE MOON  
NOV. 18 & 19, 1975



# SKY CALENDAR JANUARY 1976

Information for helping teachers and students observe the sky

Magnitudes of planets at midnight: Venus -3.5; Jupiter -2.0; Saturn -0.1; Mars fades nearly a magnitude during January, from -1.1 to -0.2; Magnitudes of Mercury: Jan 2 -0.5; Jan 7 -0.3; Jan 12 +0.3; Jan 17 +1.4. Positions of planets against star background: Venus 3° eastward, from Libra through Scorpius and Ophiuchus, into Sagittarius; Jupiter 3.6° eastward in Pisces; Mars 2.6° westward in Taurus Jan 1-20, then begins slow east; Saturn retrogrades (moves west) 2.5° in Cancer, approaching boundary with Gemini.

SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
<p><b>Evening Planets:</b> 3 of the 4 brightest "stars" in sky as twilight ends are actually planets. Their positions among stars are shown as open circles on this month's star map. <b>Jupiter</b>, the brightest, is high in S at dusk and sets in W near midnight. Binoculars show up to 4 satellites very close to Jupiter. <b>Mars</b>, next in brightness after Jupiter and Sirius, is easily recognized by its orange color. Well up in E at dusk, Mars passes due S (overhead in S Florida and S Texas) at 10:15 p.m. local time Jan 1, and 2 hrs earlier Jan 31. <b>Saturn</b> on Jan 1 rises as twilight ends. It rises 4-5 min earlier each night; see Jan 20, 22, 24. <b>Mercury</b> is visible first half of Jan, but sets before twilight ends. Fading rapidly, it is best early in month; see Jan 2,3,6,8,15.</p> <p>1 hr after sunset this week, use George Lovi's <i>Stars for Nov-Dec</i> (with Nov Sky Calendar). 2 hrs after sunset, use <i>Batch's map, December Evening Skies</i>. This week <i>Jan Eve Skies</i> shows sky 4 hrs after sunset.</p> <p>1 hr before sunrise (face SE):</p> <p>Venus Antares (again 7° apart)</p> <p>The moon rises more than 2 hrs after sunset tonight, and an additional hour later each night. Look for the moon in morning sky before &amp; after sunrise for rest of month.</p> <p>Use this month's map, <i>January Evening Skies</i>, 2 1/2 hrs after sunset. Look for the Beehive Cluster 8° lower left of Saturn. Use binoculars.</p>	<p>About 2 1/4 hrs after sunset tonight, 11 stars of first magnitude or brighter are visible, the maximum number possible from lat 40° N. Also, 3 bright planets, Mars, Jupiter, and Saturn are up. See <i>December Evening Skies</i>.</p> <p>The Pleiades (The Seven Sisters) pass high in the south about 3 hrs after sunset in mid-January each year. Tonight the moon is close by, making that cluster difficult to see.</p> <p>1 hr before sunrise (face west):</p> <p>Regulus Moon</p> <p>Jan 26, 1 hr before sunrise (face SE):</p> <p>Venus Antares</p>	<p>Mercury reaches greatest elongation (maximum angular distance from sun), 19°. For several evenings around this date, Mercury is about 7° above horizon in SW to WSW 45 min after sunset.</p> <p>1 hr after sunset (look high in east):</p> <p>Mars Aldebaran Moon</p> <p>Saturn at opposition (appears 180° from sun). A planet at opposition is visible all night—it rises in eastern sky at sunset, is highest in S in middle of night, and sets in western sky at sunrise. See Jan 16-17.</p> <p>1 hr before sunrise:</p> <p>Antares Moon Venus</p>	<p><b>Morning Planets:</b> <b>Venus</b> is brilliant "morning star" in SE. It rises about 3 hrs before sunrise Jan 1, and 2 hrs before on Jan 31. <b>Saturn</b> is low in W to WNW 1 hr before sunrise. For its location relative to stars in morning sky, see Jan 17.</p> <p>1 hr before sunrise (face SE):</p> <p>Venus Antares (7° apart)</p> <p>Tonight, look for the 11 bright stars and 3 bright planets about 1 1/2 hrs after sunset (see Jan 5). From Gulf Coast, Florida, and southern Texas, the first mag star Achernar can also be seen, very low in south.</p> <p>Mars, now 10° from Aldebaran, has been retrograding since Nov. 6. Now it resumes eastward motion until Dec '77. Watch Mars pass Pollux, Saturn, and Regulus in next 6 months.</p> <p>1 hr before sunrise (face ESE):</p> <p>Moon Venus</p>	<p>New Moon today, can't be seen. This month, watch moon go thru its cycle of phases, waxing to full and waning to new. Watch moon pass 5 planets and 5 bright stars as it moves thru zodiac.</p> <p>Until Mercury disappears next week, 4 planets can be seen simultaneously in sky just before Mercury sets. Locations tonight 1°10' after sunset: Mercury 3° up, WSW Jupiter near moon Mars 42° up in E Saturn 3° up, ENE</p> <p>Mercury, having begun its swing between earth and sun, is now difficult to see. It has faded to first mag and sets barely an hour after sun. It will reappear in Feb morning sky.</p> <p>Saturn is the third planet to reach opposition since Oct '75. Note the motion of a planet near opposition is always retrograde. Watch Saturn carefully next 2 months. Can you detect its motion?</p> <p>1 hr before sunrise (face ESE):</p> <p>Last date to see waning crescent moon.</p> <p>Next week, begin looking for Mercury in ESE morning sky. Sunday Feb 1 it is 16° lower left of Venus. By Feb 7 it is much easier to see, 9° lower left of Venus. See Feb Sky Calendar.</p>	<p>45 min after sunset (face SW):</p> <p>Mercury Moon</p> <p>Venus closest to Antares this morning. Face SE 1 hr before sunset and find reddish Antares 6 1/2° lower right of brilliant planet...Moon at First Quarter (half moon in evening).</p> <p>1 hr after sunset (Face ENE):</p> <p>Castor Pollux Full Moon Saturn</p> <p>1 hr before sunrise (face SSW):</p> <p>Spica Moon at Last Quarter (morning half moon)</p>	<p>45 min after sunset (face SW):</p> <p>Moon Mercury</p> <p>The next time Venus passes Antares will be in late October, but that event will be very low in the evening sky and not as easily seen as the current conjunction.</p> <p>1 hr before sunrise (face WNW):</p> <p>Saturn Castor Pollux Moon</p> <p>To see Saturn's motion, note its place relative to Castor and Pollux. Those stars are 4 1/2° apart, and tonight Saturn is 9° from Pollux. Also tonight Saturn is 1° S of 5.4 magnitude star in Cancer. Use binoculars.</p> <p>New Moon. Once again, as on Jan 1, the moon is in conjunction with the sun and can't be seen. Tomorrow night look low W 45 min after sunset.</p>

East Lansing Sunrise: Jan 1 8:09 a.m.; Jan 16 8:06 a.m.; Jan 31 7:55 a.m. EST.  
Sunset: Jan 1 5:14 p.m.; Jan 16 5:29 p.m.; Jan 31 5:49 p.m. EST.