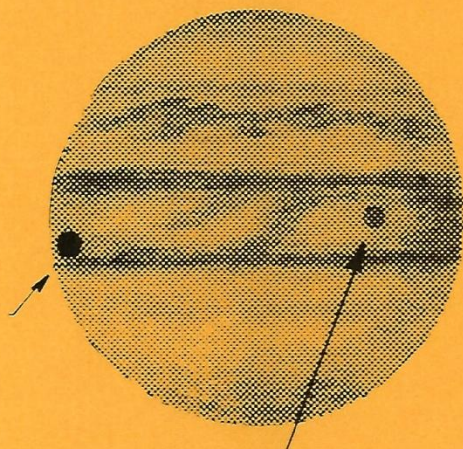


The *Warren* *Astronomical* *Society* *Quarterly*

This Month



Jupiter
Photographers Opportunity
(DRAWING BY)
(LOUIS FAIX)

November
1974

Journal of the Warren Astronomical
Society

NORTHERN LIGHTS ON DISPLAY

by: Frank McCullough

On the morning of October 13, 1974, a beautiful patterned, but not too flashy, northern lights appeared in the Detroit area skies.

At 3:05 a.m. (D.S.T.), Diane and I were driving home (north) when we noticed a huge green arch extending from the setting Cygnus in the northwest. The highest point of the arch reached into Cepheus and then downward to the northeast into the rising Cancer.

After stopping home to pick up my camera, we drive ten miles north to avoid city lights. The arch had fallen back into Ursa Minor when we arrived at our site at 3:42 a.m. It started to break up slightly, but nothing spectacular. At 3:50 a.m. in the northeast, just northeast of the bowl stars in Ursa Major, a small funnel-type system formed, but within five minutes it had disappeared.

At 4:00 a.m. the aurora looked to be regrouping, forming three small arches five degrees high from Leo to the tip of the handle in the Big Dipper, then one large arch extending from the last small arch all the way over to Cygnus.

At 4:12 a.m. the large arch at the farthest northwest point began to break up into rays, which were missing most of the night. Between the times of 4:12 and 4:45 a.m., when I finally left, the sky was filled to the north with cloud-like flashes. At 4:23 a.m., the most spectacular event occurred in the northeast. The three small arches formed one and a large tornado-type structure appeared working its way to the horizon just west of the handle of the Dipper.

By 4:43 a.m., the northerly sky lost my interest as it broke into a soft green glow with many small flares making the sky look like it was on fire. My wife and I packed up and left by 4:50 a.m.

* * * * *

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by Frank McCullough

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STARGATE REPORT

The purpose of this report is to make the W.A.S. membership aware of the club's observatory at Camp Rotary. Our 12½" cassegrain telescope, with clock drive, declination control, and variable frequency oscillator is made available to the boy and girl scouts camping at Camp Rotary. We have lectures given by our lecturers and assistant lecturers there every Friday evening, this being part of our obligation to the Rotarians since 1970 when they built the observatory at no cost to the W.A.S.

Any member of the W.A.S. can make use of the telescope any evening; contact Stargate director or any lecturer to make arrangements.

At the present time we are in need of assistant lecturers. Anyone interested please contact any of the following Stargate personnel: Pete Kwentus***Director

lecturers: Roger Civic	assistant lecturers:
Louis Faix	Tony & Angie Bommarito
Dave Harrington	John Caruso, Jr.
Larry Kalinowski	John Okroy
Donald Misson	Steve Smith
Frank & Diane McCullough	

We also want to mention some of the many people who have helped us during the summer months;

Kim Dyer and Ken Wilson

****THANKS A LOT****

A special thank you is also extended to Garry Boyd who has donated a 60 millimeter Kelner eyepiece for use at the Observatory. THANK YOU!!

LETTERS TO THE W.A.S.P.

I am certain that many readers of the WASP have wondered why we have not published any letters from our vast readership. Well, I can assure you, it was not because we hadn't received any. The postman regularly strains his fingernails bringing in the tons of correspondence. But after you examine the following sample, you will understand why this correspondence has gone unpublished.

Sir:

One of the most noble enterprises of any amateur astronomical organization is the spreading of astronomical information to the public. One of the most effective methods of doing so is via the audio-visual media.

It just so happens that I have an excellent slide/tape program on the solar system prepared. The photography is fantastic, as are the script and soundtrack.

Now I can let the Warren Astronomical Society have the entire package for a very reasonable, dirt cheap price...

R. Civic
Civco Enterprises, Unltd.
Earth, Mars and other
major planets.

(Ed. Note: Don't call us...)

Sir:

Since all other channels have failed, I demand that the WASP publish my observatory report...

P. Kwentus

(Ed. Note: We'll give you a whole column. After all Dear Abby had to start somewhere.)

Sir:

I have just completed installing a newly designed dual exhaust, multi-channel, chromium dioxide, tunnel diode filter to the input source of my sixty-eighth generation chilled emulsion camera. I'm certain I'm on the right track. Frankly, I'm surprised that more amateurs have not attempted to make such a simple instrument as this. I don't know what I would've ever done without mine.

L. Faix

(Ed. Note: If at first you don't succeed, quit!)

Sir:

I have a few jokes and puns to share with your readers. What do you call

CENSORED

CENSORED

CENSORED

F. McCullough

(CONT. NEXT PAGE)

LETTERS CONT.

Sir:

I wish to announce plans for the acquisition of a new telescope. It will be a 24" Newtonian-Cassegrain. This instrument will not be a toy like my former telescope, but, instead, it will be a moderate size instrument whose added light gathering power will finally allow me to prove the libration of the moon.

Dr. Harrington

P.S.: This new instrument will, of course, be a portable one like my 14".

(ED. NOTE: More power (mirror?) to you.)

Sir:

Excuse me, but I'd like to ask a question. I'm just a beginner at this so this may be a dumb question. Now stop me and tell me if I'm wrong. But, what do you think this theory...I came up with it on my own, but I like it better than any of the other theories that I've ever heard... What's the theory? ...Oh, just a minute... Oh yeah, what do you think of a theory that the universe is just a giant Easter egg?

Sincerely,

B. Bock

(ED. NOTE: No Comment.)

Well folks~ that's all there is for now. Keep those cards and letters coming in.

DID YOU KNOW?

*that there's no such thing as "centrifugal" force.

*that planetary nebulae do not originate from novae or supernovae.

*that Stargate Observatory is the first and only observatory in Macomb County.

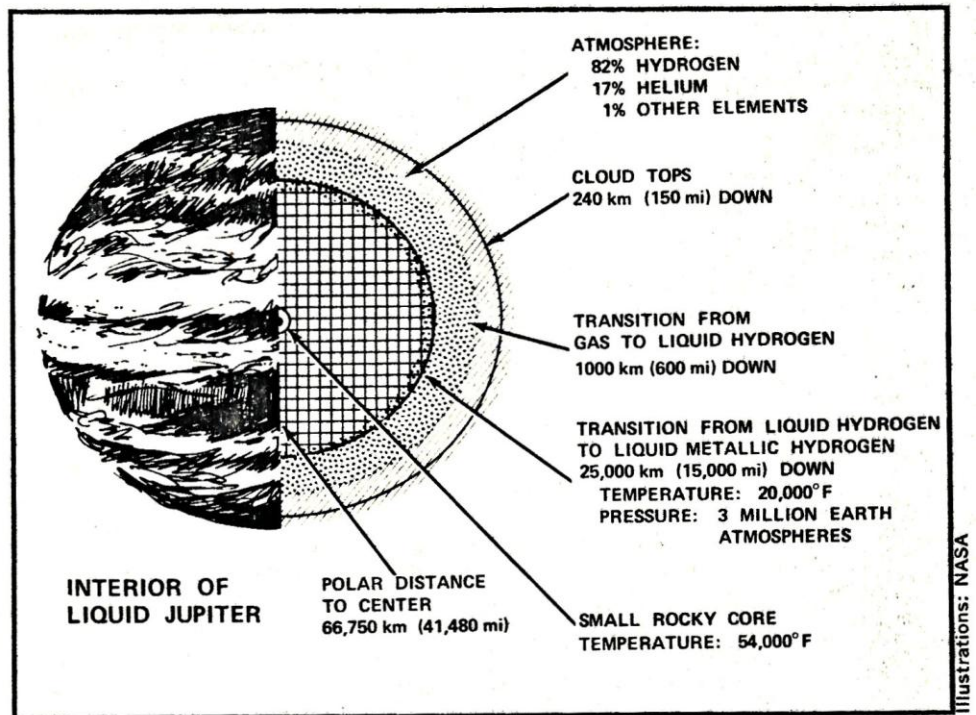
*that Jupiter has a satellite (Ganymede) that is larger than the planet Mercury.

*that some people can see eighteen stars in the Pleiades with their naked eyes.

*that some people can see the four Galilean satellites of Jupiter with their naked eyes.

Jupiter: The Planetless Planet?

Pioneer 10 scientists probe further into the solar system's second biggest ball of hydrogen



What is Jupiter? Its vast size and near-primitive mix of elements almost seem to suggest that it is a former candidate for stardom that failed to ignite, but William Hubbard of the University of Arizona estimates that it never stood a chance—it would have had to be some 80 times larger to be capable of generating a star's self-sustaining reactions. Yet Hubbard and the other scientists analyzing Pioneer 10's flight past Jupiter last December (and awaiting Pioneer 11's repeat later this year) have found that, for all its size, the giant planet may scarcely be a planet either.

If there is a real, rocky world beneath those multicolored clouds, it is a tiny one, squeezed into the bottom few percent of Jupiter's 44,000-mile depth and tortured by 54,000-degree F. temperatures more than six times hotter than the surface of the sun. Everything else is atmosphere, or more precisely, a sort of atmosphere-ocean continuum in which the gas of the uppermost levels is compressed to near liquidity as little as 600 miles down. Barely 35 percent of the way down, at about 15,000 miles, the liquid hydrogen that is most of Jupiter (even the upper atmosphere includes only 17 percent helium, with an additional one percent for "other") starts becoming liquid metallic hydrogen. Not a solid, exactly-solid hydrogen at temperatures of tens of thousands of degrees is difficult to conceive, Hubbard

points out—but at pressures millions of times greater than earth's sea-level atmosphere the definition of a liquid may be largely academic.

And the whole planet seethes. Vast convection currents roam up and down throughout the hydrogen ball, although Hubbard estimates that because of Jupiter's great size and gravitational pull they could take from 10 years to a century to travel from the center to the cloud tops. The long, ponderous scale of changes on Jupiter, says Andrew Ingersoll of the California Institute of Technology, could mean that the famous Great Red Spot, known to earthly observers for centuries, is about as significant on the giant planet as a rather lengthy hurricane of a few weeks duration on earth.

In the upper reaches inhabited for the present by the Red Spot, however, the pace of events is anything but leisurely. The features of Jovian "weather" are driven by a strong Coriolis force opposing a planet rotating at about 22,000 miles an hour, which, says Ingersoll, is probably the major reason for Jupiter's strikingly banded appearance. Features that would be large cloudy regions on earth are pulled out into continuous stripes. Yet even among the stripes, all rotating in the same direction, the differences in speed between slower and faster stripes can produce shear winds as fast as 300 to 400 miles an hour. It is even possible that it is

such a difference that holds the Red Spot in place, like a ball bearing turning between two surfaces moving in opposite directions. Computer simulations of Jovian weather using Pioneer 10's data suggest, in fact, that apparent vortex-type features such as the Red Spot (Pioneer 10 photographed several others) may be able to exist only along such shear lines, where the adjacent faster and slower winds can sustain their spin.

The light and dark bands that girdle the planet are believed to be alternately cooler and warmer, and higher and lower, regions. The wide, white zones, according to Pioneer 10's information, seem to be about 15 degrees cooler and about 12 miles higher in the atmosphere than the darker belts. The light color is probably that of ammonia crystals, while the darker stripes may mark the presence of sulfur in the form of ammonia hydrosulfide crystals. Farther down may be frozen water crystals and possibly even liquid water, the Pioneer researchers suggest, although water has never been observed there.

Above the visible clouds lies Jupiter's invisible outer atmosphere, extending possibly as much as another 150 miles. Guido Munch of the California Institute of Technology believes that this outer layer may contain not only some ammonia, but enough mixed-in methane to absorb the sun's heat and create a temperature inversion, perhaps

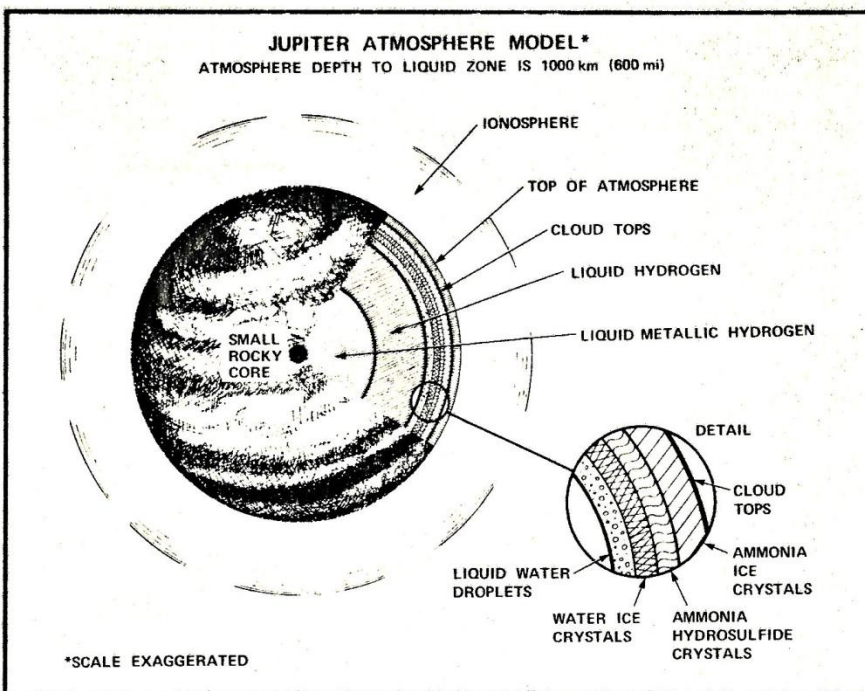
21 miles above the cloud tops. Above that, there may be a layer of aerosol droplets and hydrocarbons such as ethane and acetylene (detected from earth-based infrared measurements) which also add to the heat absorption. These high, invisible, heat-absorbing layers may be the reason that one of Pioneer's experiments, a radio-occultation measurement, showed significant heating in the atmosphere to begin at much higher altitudes than was indicated by Munch's infrared heat-mapping device (SN: 4/13/74, p. 236).

Resolving this discrepancy may be possible with further study of Pioneer 10's data, abetted by that from the identical instruments aboard Pioneer 11, due at Jupiter in early December. But more likely, says Pioneer project scientist John Wolfe of NASA's Ames Research Center in California, is that neither the Pioneers nor the scheduled Mariner Jupiter-Saturn mission to be launched in 1977 will solve the riddle. The answer, he feels, may require sending a probe into the Jovian atmosphere itself. Ironically, says Wolfe, the dust particles that have also been hypothesized in such a heat-trapping layer might well cause a thermal plasma around the probe, which would block radio signals to earth confirming the very phenomenon that censored the message.

Although probeless like its predecessor, Pioneer 11 will have its own contributions to make. Unlike Pioneer 10, it will fly clockwise around the planet, as well as completing a greater arc on its way back across the solar system to a September 1979 rendezvous with Saturn. As a result, it will sweep through 360 degrees of Jupiter's huge magnetic field, at the same time approaching to within little more than half Pioneer 10's closest distance to the planet. Besides refining magnetic, atmospheric, solar wind and other measurements, Pioneer 11 will provide another look at Jupiter's vast-and lethal-radiation belts.

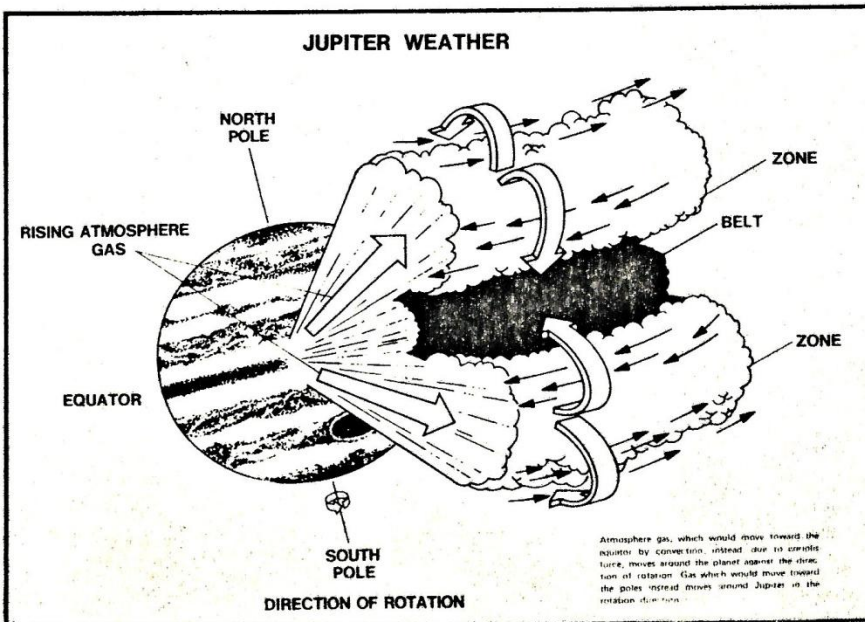
In the few minutes Pioneer 10 spent in the most intense part of the belts, it absorbed 1,000 times the radiation dose required to kill a man. Carefully "hardened," or radiation-proofed probes may someday be able to spend short periods in the intense zones, but human researchers may be limited in the foreseeable future to looking on from the outermost of Jupiter's major satellites, Callisto.

Io, the innermost large moon, has become of particular interest since Pioneer and other data have indicated it to have an atmosphere (possibly including methane snow), an ionosphere (apparently including a sodium cloud extending more than 200,000 miles into space, suggesting to some researchers a surface layer of sodium chloride—table salt) and a mysterious hydrogen cloud reaching a third of the way around its orbit. An international, 10-day "10 week" beginning Nov. 6 will focus observations on that intriguing world.



From invisible top to inaccessible bottom, the Jovian atmosphere (above) is still largely an educated guess.

Photos of banded clouds (right) are combined with meteorology from earth in efforts to understand Jupiter's windy weather.



VISITORS' NIGHTS

CLOUDY OR CLEAR!

THE UNIVERSITY OF MICHIGAN - DEPARTMENT OF ASTRONOMY

Time: Friday Nights, 8:00 p.m.

Place: Auditorium B, Angell Hall

<u>Date</u>	<u>Speaker - Title</u>	<u>Movie (to be shown after the talk)</u>	<u>To Observe</u>
October 18, 1974	Mr. Robert Stencel "Matter - Antimatter Cosmology"	"Skylab: The Second Manned Mission - A Scientific Harvest"	h and χ Persei clusters Pleiades
October 25, 1974	No Visitors Night - Homecoming Weekend		
November 1, 1974	Dr. Hugh Aller "Radio Waves From Jupiter"	"Birth and Death of A Star"	Double Star and Moon, Jupiter
November 8, 1974	Dr. Richard Teske "What is Time?"	"Birth and Death of A Star"	Moon, Saturn, Jupiter

Following the illustrated talks and film the observatory on the fifth floor of Angell Hall will be open until 10:30 p.m. for observations with the telescopes (if the sky is clear) and for an inspection of the telescopes, exhibits, and planetarium (if the sky is cloudy or clear).

CHILDREN WELCOMED, BUT MUST BE ACCOMPANIED BY ADULTS

SKY CALENDAR NOVEMBER 1974

Information for helping teachers and students observe the sky

SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
Brilliant Jupiter passes due S 3 hrs after sunset Nov 1, decreasing to 1½ hrs after by Nov 30. In binoculars, its moons close like faint stars very close to planet. #4 farthest W of Jupiter Nov 4, 5, 21, 22; farthest E Nov 13, 30.	Saturn rises in ENE within 2 hrs after Jupiter passes S. Saturn itself passes high in S 2 hrs before sunrise Nov 1, increasing to 4 hrs by Nov 30. Brighter than Pollux and Castor, Saturn is brightest "star" in Gemini.	Mercury is visible in morning sky all month; binoculars are helpful at beginning and end of month. Faint red Mars becomes visible last half of month. Let Spica help you find Mercury, and Mercury help you find Mars. See date blocks.	45 min before sun- rise: Mercury and Spica getting higher each morning and easier to see. They are now 4.6° apart. ● Spica ● Mercury	Oct 31, 45 min before sunrise (face ESE): Look for Mercury 4° lower left of Spica. Binoculars help. ● Spica	Today, tomorrow, and all next week, Mercury and Spica fit within the field of view of 7-power binoculars. Look very low ESE about 45 min before sunrise. See Nov 2.	To find Spica, first find Big Dipper in NE. Follow the curve of its handle to bright orange Arcturus in ENE, then continue to bluish Spica lower in ESE. "Follow the arc to Arcturus and drive a spike to Spica."
45 min before sun- rise: Mercury, now brighter than Spica, has become an easy naked-eye object. Mercury 4° left of Spica. ● Spica ● Mercury	Look for Jupiter's moons with binoculars and telescope. Tonight #4 nearly 0.2° west of Jupiter, while the other three are crowded in close on the east side of the planet.	Bright "star" close to moon this morning is the planet Saturn. 45 min before sunrise, look for Mercury and Spica, 4.4° apart low ESE.	45 min before sun- rise: Mercury and Spica getting higher each morning and easier to see. They are now 4.6° apart. ● Spica ● Mercury	● Spica	45 min before sunrise: Bright star about 7° from moon is Regulus, the heart of Leo the Lion. Mercury 5½° lower left of Spica.	Mercury now rises 9 about 1½ hrs before sun- rise, but is higher 45 min before sunup. Mercury 6° from Spica. ● Spica ● Mercury
Mercury reaches 10° greatest angular distance from sun, 19°. For several mornings it is 10° above horizon 45 min before sunrise. This week and next are best of year for viewing Mercury with naked eye in morning sky.	45 min before sun- rise: ● Spica ● Mercury	45 min before sun- rise (last chance to see waning moon): ● Spica ● Mercury	New Moon, rising and setting with sun, is not visible. In two nights look low SW 45 min after sunset for thin waxing crescent moon. Moon #4 farthest east of Jupiter tonight.	One month ago 14 today Mars was behind sun, in conjunction. Using binoculars, begin looking for Mars about 45 min before sunrise. Tomorrow Mercury 12° lower left of Spica and Mars 8° lower left of Mercury.	45 min before sunrise: Spica ● Mercury ● Mars	Use star map to become familiar with the constellations along the line marked "ecliptic". They are six of the twelve zodiac constellations, in which the planets, moon, and sun are found.
Beginning tomorrow morning, Mercury and Mars fit within the field of 7-power binoculars for rest of Nov. Use Mercury to locate Mars. On what morning will you first see Mars with naked eye?	Mercury 16° lower left of Spica. Mars 6° below Mercury. ● Mercury ● Mars	Beginning tonight the moon moves through the zodiac constellations shown on star map. Moon in Capricornus tonight. Note moon's position each night thru December 3.	Tomorrow morning Mercury 20° lower left of Spica, and Mars 3½° below Mercury (see diagram). Tomorrow evening moon passes First Quarter phase. Note shape. D →	45 min before sunrise: Spica ● Mars ● Mercury	Tonight thru Nov 29 watch the moon wax thru its gibbous phases as it moves from First Quarter to Full. (Gibbous = more than half and less than full.) Jupiter 7° from moon tonight.	Binoculars and telescopes: Satellite #4, now west of Jupiter, moves closer next two nights. On the 26th it is east of Jupiter and passes thru planet's shadow for 3 hrs beginning 8:51 p.m. EST (9:51 EDT)
45 min before sun- rise: Mercury 25° lower left of Spica. Mars 1.3° to lower right of Mercury.	Mercury and Mars appear closest together this morning, only 1° apart. Look 45 min before sunrise very low ESE, 26° to lower left of Spica.	Saturn, in Gemini, now rises in ENE 3 hrs after sunset. Wait at least an additional hour to see it clearly, and note Castor and Pollux to left of Saturn.	Mercury getting lower each morning, while Mars is getting higher. They are 2° apart this morning. 45 min before sunrise: ● Mercury ● Mars	Tonight Saturn is 4° south of 3½-magnitude star Delta in Gemini. Watch Saturn slowly retrograde to 6.2° west of star by mid-March 1975.	Lunar eclipse visible 29 before sunrise in western half of U.S. Moon enters umbra 5:29 am PST; totality begins 6:35 am PST. Add 1 hr for MST. Add another hr if Daylight Time still in effect. In evening moon rises shortly after sunset.	Can you still see Mercury? It has barely risen 45 min before sunrise. Mars, now a naked eye object, is 4½° upper right of Mercury. ● Mercury ● Mars

Magnitudes of the Planets: Jupiter -2.1; Saturn +0.1; Mars +1.8

Mercury: Oct 31 +1.3; Nov 3 +0.6; Nov 6 +0.1; Nov 9 -0.2; Nov 12 -0.4; last half of Nov -0.6

Planet Motions: Jupiter resumes direct motion in Aquarius Nov 3, has moved 14° east by Nov 30.

Saturn retrogrades (moves west) 0.8°. See Nov 28.

courtesy of Science and Children, reprinted by permission.

Sunrise and Sunset Times, East Lansing -- Sunrise: Nov 1 7:11 a.m.; Nov 16 7:30 a.m.; Nov 30 7:47 a.m. Sunset: Nov 1 5:31 p.m.; Nov 16 5:15 p.m.; Nov 30 5:06 p.m. E.S.T.