



THE
WASP

The Winter jewels

NOVEMBER
1975

VOL. VI NO. II



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 through college) Membership, \$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 are held on the third Thursday of every month.

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

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The editors of the W.A.S.P. will exchange copies of this publication with other 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 correspondence, sometimes intermittent, with the following organizations:

THE ADAMS ASTRONOMICAL SOCIETY

THE ASTRONOMICAL LEAGUE

THE DETROIT ASTRONOMICAL SOCIETY

THE DETROIT OBSERVATIONAL AND ASTROPHOTOGRAPHIC ASSOCIATION

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 ASTRONOMICAL SOCIETY

THE SUNSET ASTRONOMICAL SOCIETY

THIS MONTH'S COVER BY: Frank McCullough

THIS MONTH'S STAFF INCLUDES: Ray Bullock, Gary Boyd, Carl L. Noble

OBSERVERS CORNER: "Five o'clock in the morning"

I am beginning to know why the "average" citizen has a warped idea of the astronomer, whether amateur or professional. One morning two weeks ago there was the clang and "WOWS!" of the professional bungling of the "block astronomer". Who else, besides someone in an institution would get up at 4:00 a.m. just to see a cloud of gas in the heavens for the first time? When the neighbors asked me what I was doing out at that unnatural hour I just replied, "Having fun!"

The one thing that struck me most of all and that was the total quiet and peace at that hour of the morning. It was a real pleasant; experience to have that large cup of coffee and a pipe full of tobacco and a good optical instrument - all topped off with just beautiful clear, and dark skies. With the whole morning "planned", I checked my assorted goodies and went to work.

The first thing I wanted to do was to point my 'scope toward Orion and view M42 for the first time. But, I'm one to wait for the "dessert", the best for the last, so I first looked at Saturn. What a neat sight! The whole morning was so steady that I could see some of the markings on the planet with about 120X. Just a comment to those who are just starting in this fantastic hobby - it takes a while to know where things are and how to find them. I have been searching the heavens now for about one year, and it is just starting to come "easy". So, don't give up - it will come.

After some time went by, I pointed my instrument toward the Great Nebulae in Orion. I doubt if words can express what I felt, and I'm sure others can share this feeling. It was just unreal! I could see the expanse of the gas cloud over the whole field of view (50X). It was a beautiful bluish color, and I think it was an excellent view for Warren. It was a morning I will not forget easily.

After that "high" of viewing M42, I tried some "experimental astronomy". What I mean by this is that I have often wondered if astrophotos could be taken in the backyard of my home in Warren. I pointed my 3Smm to certain constellations and took exposures varying from 10 - 20 seconds. When the film came back from Kodak (excuse me, I ran out of chem.) I was truly surprised when I looked on them - they turned out! And beautifully I might add. It is a bit of astronomy that any beginner can become very proficient and very rewarding!

To summarize, I now can realize the meaning of those words from long ago: "Today is the day the Lord has made, I will rejoice and be glad in it!" MARANATHA!

clnoble

Faitus report....

This report is to bring the membership up to date on a recent improvement at our club's observatory.

Faitus Enterprises built and installed a motorized dome control. You will notice on your next visit to Stargate the absence of the pipe handles to rotate the dome. You will also observe a small blue box to the right of the fuse box. It houses two pushbuttons for forward and reverse rotation. To rotate the dome push one of the buttons and to reverse directions push the other. If you encounter any hesitation, especially when the slit is oriented in the southern direction, do not panic, try reversing, then you will be able to rotate the dome to a desired position. The hesitation is caused by an "out of round" condition inherent in the dome structure, and is no fault of the drive.

You can rotate the dome 360 degrees in less than 30 seconds. We would appreciate any comments or suggestions. If you encounter any problems with mechanical failure, please notify your observatory chairman, Lou Faix as soon as possible.

FAITUS ENTERPRISES

comics....

B.C.



By John Hart



By permission of John Hart and Field Enterprises, Inc.

The Wizard of Id



by Parker and Hart

Cranbrook...

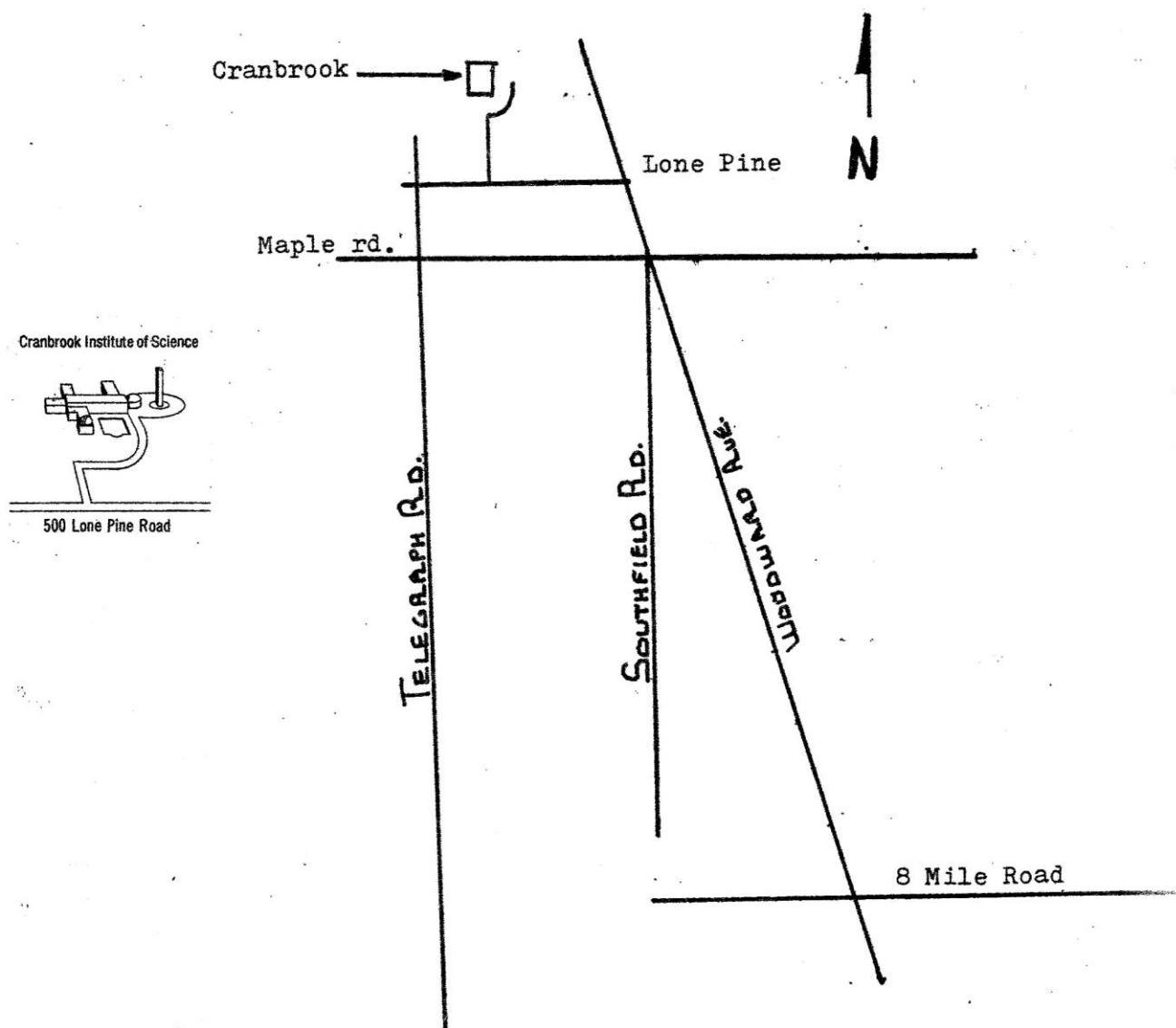
On October 24th, Cranbrook Institute of Science is having a "Members Day." This is an activity for all Institute affiliated members with the science club. Our club (Warren Astronomical Society) has been invited to join them in the evening.

This is a wonderful opportunity to exchange interest on related sciences and to present the true aspects of Amateur Astronomy. So come along and bring your scopes ... For further information call Lou Faix at 781-3338

TIME: at Dusk

DATE: October 24th

PLACE: Cranbrook Institute of Science



“THE SOUNDS IN THE SKY ARE A NATURAL HIGH”

By: Garry Boyd

In recent years many backyard observatories have acquired a new aspect. The circle of cane-bottomed chairs which formerly welcomed the visitor has all but vanished in favor of the relay rack, high-gain amplifier and data recorder. Even the place, where the visitor once put his eye has been usurped by a small black box. The telescope continues to sweep the sky from its central spot beneath the dome, but the whir and click of automatic devices now accompany the stars on their silent march.

Today it is not unusual to find amateur astronomers operating a dozen or more electronic instruments which were all but unknown before World War II. The trend was launched when electric motors developing, a fraction of a horsepower began to displace mechanical clocks for driving small telescopes in right ascension. Then came vacuum tubes, tied together by feedback circuits, to regulate the motors. Amateurs next discovered that the photoelectric cell makes a good substitute for the eye, particularly on fatiguing jobs such as keeping a star centered on crosshairs. The introduction of electronics into amateur astronomy suggested a logical new development: amateur radio astronomy.

Many amateurs have expressed interest in building a radio telescope, but few have actually built one. The chief barrier appears to be the lack of simple design. Perhaps the techniques of Radio Astronomy are too new to have filtered down from professionals to amateurs, or they are too demanding.

Professional radio astronomical investigations have been made, with very costly equipment, with several millions of dollars of grant money at their disposal. However, the recent development of economical circuits completely built up on integrated circuit chips, and the ready availability mass produced and surplus parts and assemblies has brought the cost of radio equipment down to where it is within range of the purse of the hobbyist. The cost of construction of a good radio astronomy receiver and suitable read out equipment need not exceed the expense of a stereo unit with its ancillary tapes and records, or the cost of a good photographic lab.

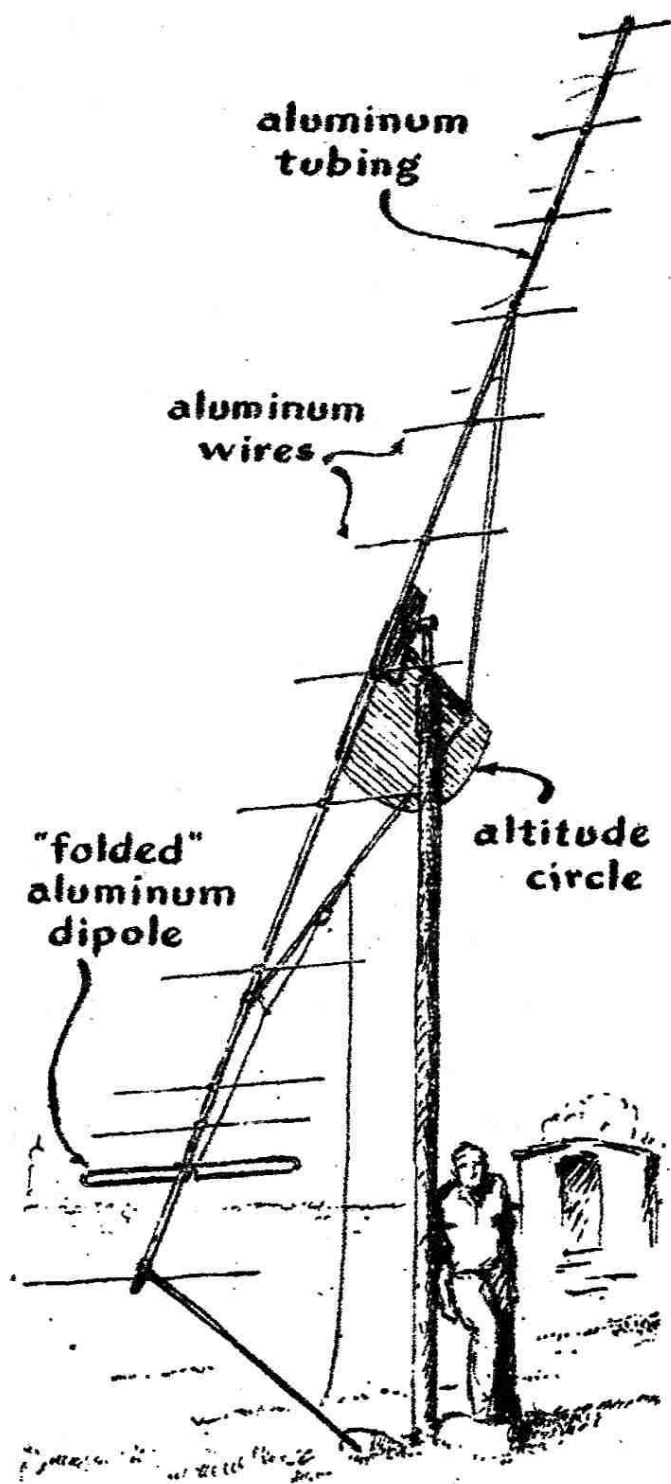
To date, only one project on Radio Astronomy has reached the department of Scientific American: that by Lyndall McFarland.

Bill Schultz, who I convened very much with on the subject, highly recommended Mr. McFarland's design to those amateurs with no previous electronic background. His receiver is quite simple; it employs a F.M. receiver, detector and readout. It operates at a frequency of 108 MHz, which is located at the end of your FM dial.

All this may seem strange and very new to you, but like any new field of Astronomy you involve yourself with, you must learn the language and meaning to complete your criteria. I would bet that mapping the radio sky, could be just as rewarding as

astrophotography. It's not that deep sky photography offers no reward, it's that Radio Astronomy can offer many hours of enjoyment and accomplishment. Detecting a Pulsar on your homemade radio telescope can give one the thrill and excitement that one derives when looking through his home made telescope.

If any amateur has built or considered such an apparatus with the facilities of the average basement workshop, I would like to hear about it:



Yagi antenna of the Kansas telescope

PLANETARIUM GAZING

R. Bullock

The autumn colors are at their peak this month, so now is the time to take a long drive and enjoy them. This month's planetarium tour will require a long drive, all the way across the state to Grand Rapids.

The ROGER B. CHAFFEE PLANETARIUM of the Grand Rapids Public Museum is named after the locally born astronaut who died in the tragic Apollo spacecraft fire in 1967. This planetarium is the strangest looking machine I've ever seen. Instead of the star ball being located at the end of the arms, it is in the center of everything, with the arms extending out.

Now showing, through November 30, is "Voyage Through Space and Time". Quoting from their brochure:

"When you look into the sky at night, you can easily sense its vastness and mystery. Now, "Voyage Through Space and Time" allows you to travel into these regions, conveying through audio-visual stimulation, an impression that is vivid and meaningful.

"You are part of an imaginary journey into deep space where you peer down upon the barren wasteland of the moon and Mercury, see the mysteries of Mars close-up, and stand upon the frozen wasteland of Pluto.

"Light years are crossed in seconds as the incredible voyage continues outward past the known stars, through a nebulous veil, and then on toward the boundaries of the Milky Way galaxy. Suddenly, the realm of stars ends, and you enter upon an endless sea of night, populated by thousands of galactic islands.

"Your unique perspective now allows you to look outward toward the very fringes of the observable universe. You find yourself peering at a ghostly image of the distant past."

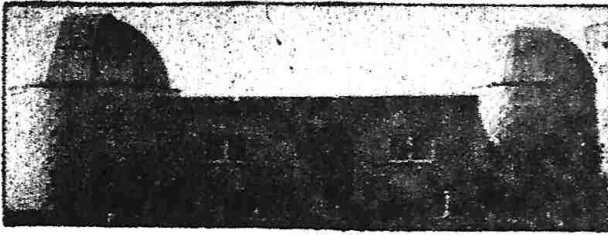
Shows are given Thursdays at 8 pm, Saturdays at 3:15 and 8 pm, Sundays at 2:45 and 4 pm, Informal discussion of the current constellations and the upcoming close approach of Mars follow the Thursday and Saturday night performances.

Also of interest is the Grand Rapids Public Museum, which contains exhibits on geology, animals, Indians, archeology, period furniture, costumes, musical instruments, toys, lumbering, a Gaslight Village, among other things.

Admission to the museum is free; planetarium costs 75¢ for adults, 50¢ for students. Tickets go on sale 30 minutes before each show. Main museum hours: 10 to 5 Monday-Friday, 2 to 5 Saturday, Sunday and Holidays.

The JAMES C. VEEN OBSERVATORY is a multi-faceted astronomical observation and educational center designed and built by the Grand Rapids Amateur Astronomical Association with assistance from the Grand Rapids Public Museum. It took five years to complete, and was financed through donations from numerous charitable sources. It was dedicated and officially opened on June 21, 1970, and is named in honor of the Association's co-founder.

(See picture, next page.)



In addition to two fully equipped telescopes, the observatory houses a lecture room seating 40 people, a library, and photographic darkroom. The facilities are used almost every clear night for activities including individual observation, photographic programs, field trips for

school classes, and public inspection.

The largest telescope possesses a reflecting mirror $12\frac{1}{2}$ inches across. It has a focal length of 72 inches and is well suited for very faint and extended subjects, such as nebula and clusters. The instrument was entirely built by the membership.

The 6 inch refracting telescope in the east dome is the property of James Marron, and is used for photographic study of the moon and planets.

The observatory grounds and building are open for inspection only for groups and during regular visitors' nights. It is open on the second Saturday and last Friday of each month, 8 to 10:30 p.m., from April through October. When the sky is clear, observations are permitted through the $12\frac{1}{2}$ inch telescope, there is an alternate program and inspection of equipment conducted on cloudy nights. Last Visitors' Night this year: October 31. In addition there is an annual "open house" each year on five consecutive evenings in late August.

HOW TO GET THERE: To the Museum

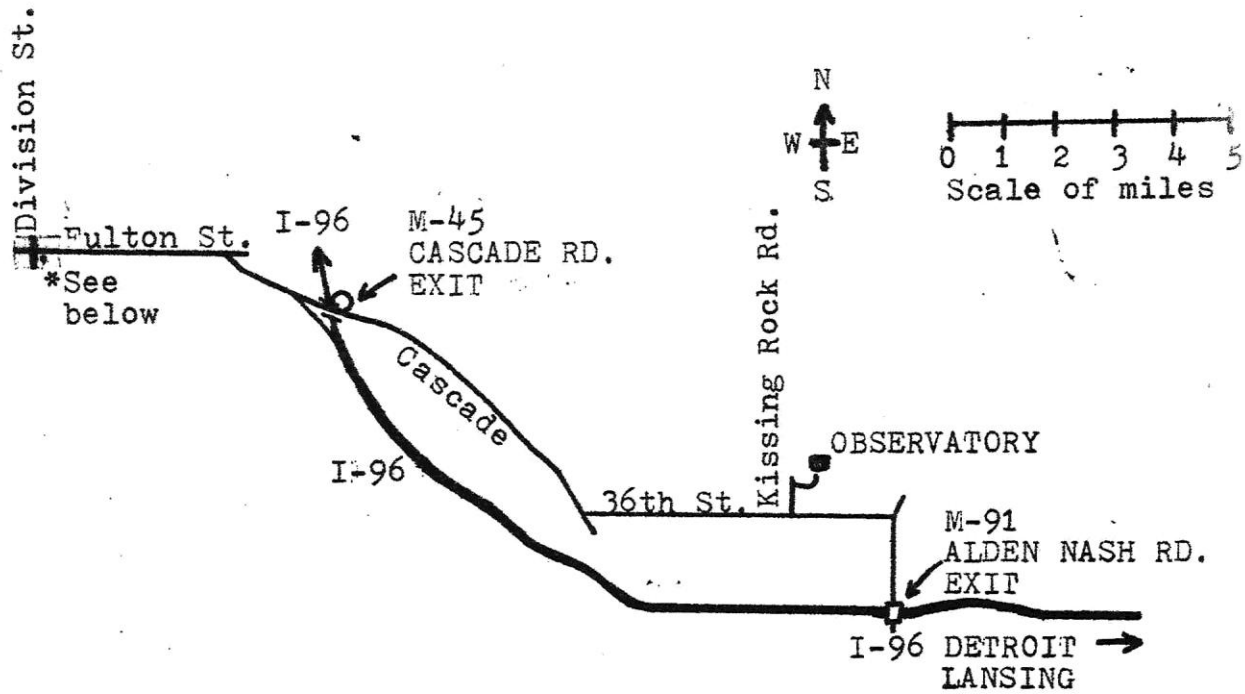
Take I-96 from Detroit to the Cascade Road (Michigan Route 45) Exit. Take Cascade to Fulton Street, turn left. Proceed to Lafayette, turn left, then right at the next block (Washington Street). You can park on Lafayette, Washington or across from the museum, between Washington and State. (See map.)

TO THE OBSERVATORY: From Detroit

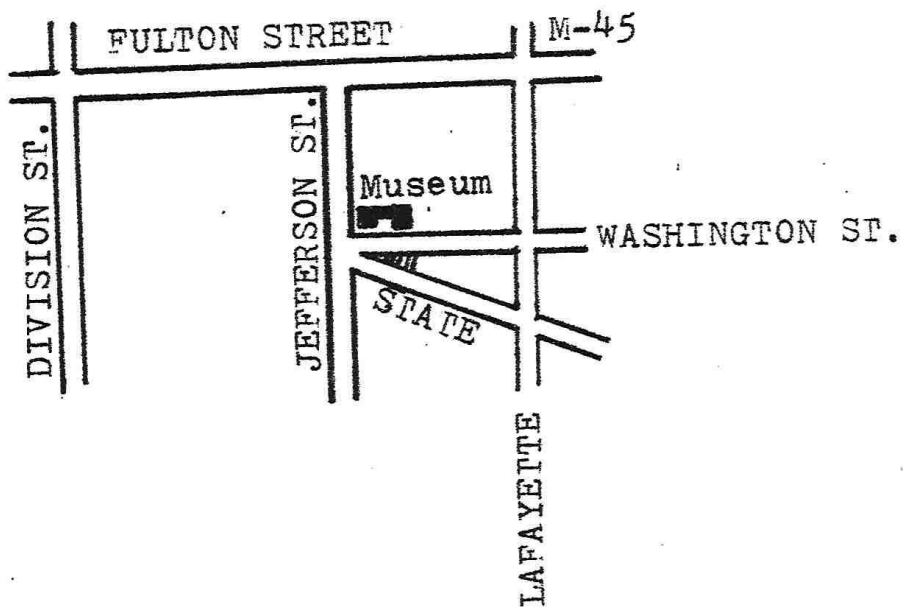
Exit from I-90 at Alden Nash Road (Michigan Route 91). Drive North to 36th Street, turn left. Go two miles to Kissing Rock Rd. and turn right. Observatory entrance will be to the right, about one mile or so up Kissing Rock.

FOR MORE INFORMATION:

Call the Grand Rapids Public Museum at (616) 456-5494 or write Grand Rapids Public Museum, 54 Jefferson S.E., Grand Rapids, MI, 49502. Ask for their free museum, planetarium, and observatory brochures. Unfortunately, it is not possible to see all three attractions on the one trip unless you wait until April 10, 1976 when Visitors' Night will be scheduled on the same day as a planetarium show.



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MESSIER OBJECTS LISTED BY CONSTELLATIONS

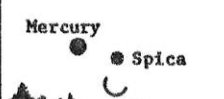
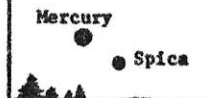
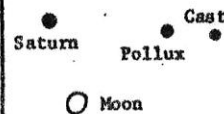
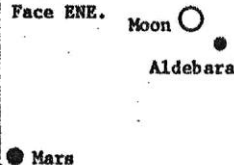
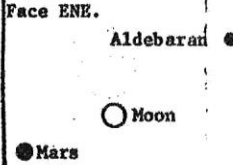


Constel- lation	Messier Number	R. A. h. m.	Dec. ° ' "	Visual Magnitude	Type
And	31	00 40	+41 00	4.8	Spiral Galaxy
And	32	00 40	+40 35	8.7	Spheroidal Galaxy
Aqr	2	21 31	-01 03	6.3	Globular Cluster
Aqr	72	20 51	-12 44	9.8	Globular Cluster
Aqr	73	20 56	-12 50		Open Cluster
Aur	36	05 33	+34 07	6.3	Open Cluster
Aur	37	05 49	+32 33	6.2	Open Cluster
Aur	38	05 25	+35 48	7.4	Open Cluster
Cnc	44	08 37	+20 10	3.7	Open Cluster
Cnc	67	08 48	+12 00	6.1	Open Cluster
CVn	3	13 40	+28 38	6.4	Globular Cluster
CVn	51	13 28	+47 27	8.1	Spiral Galaxy
CVn	63	13 14	+42 18	9.5	Spiral Galaxy
CVn	94	12 49	+41 24	7.9	Spiral Galaxy
CVn	106	12 17	+47 35	8.6	Spiral Galaxy
CMa	41	06 45	-20 41	4.6	Open Cluster
Cap	30	21 38	-23 25	8.4	Globular Cluster
Cas	52	23 22	+61 19	7.3	Open Cluster
Cas	103	01 30	+60 26	7.4	Open Cluster
Cet	77	02 40	-00 13	8.9	Spiral Galaxy
Com	53	13 10	+18 26	7.6	Globular Cluster
Com	64	12 54	+21 57	8.8	Spiral Galaxy
Com	85	12 23	+18 28	9.3	Spiral Galaxy
Com	88	12 30	+14 42	10.2	Spiral Galaxy
Com	91	12 41	+13 33		(Probably a comet)
Com	98	12 11	+15 11	10.7	Spiral Galaxy
Com	99	12 16	+14 42	10.1	Spiral Galaxy
Com	100	12 20	+16 06	10.6	Spiral Galaxy
Cyg	29	20 22	+38 21	7.1	Open Cluster
Cyg	39	21 30	+48 13	5.2	Open Cluster
Dra	102	15 05	+55 57	10.8	Spiral Galaxy
Gem	35	06 06	+24 21	5.3	Open Cluster
Her	13	16 40	+36 33	5.7	Globular Cluster
Her	92	17 16	+43 11	6.2	Globular Cluster

Constel- lation	Messier Number	R. A. h. m.	Dec. ° ' "	Visual Magnitude	Type
Hya	48	08 12	-01 48		Open Cluster
Hya	68	12 37	-26 28		Globular Cluster
Hya	83	13 34	-26 37	10.1	Spiral Galaxy
Leo	65	11 16	+13 22	9.3	Spiral Galaxy
Leo	66	11 18	+13 16	8.4	Spiral Galaxy
Leo	95	10 41	+11 58	10.4	Spiral Galaxy
Leo	96	10 44	+12 05	9.1	Spiral Galaxy
Leo	105	10 45	+12 51	9.2	Spiral Galaxy
Lep	79	05 22	-24 34	7.9	Globular Cluster
Lyr	56	19 15	+30 05	8.2	Globular Cluster
Lyr	57	18 52	+32 58	9.3	Planetary Nebula,
Mon	50	07 00	-08 16	6.3	Open Cluster
Oph	9	17 16	-18 28	7.3	Globular Cluster
Oph	10	16 54	-04 02	6.7	Globular Cluster
Oph	12	16 45	-01 52	6.6	Globular Cluster
Oph	14	17 35	-03 13	7.7	Globular Cluster
Oph	19	17 00	-26 12	6.6	Globular Cluster
Oph	62	16 58	-30 02	6.6	Globular Cluster
Oph	107	16 30	-12 57	9.2	Globular Cluster
Ori	42	05 33	-05 25		Diffuse Nebula
Ori	43	05 33	-05 18		Diffuse Nebula
Ori	78	05 44	+00 02		Diffuse Nebula
Peg	15	21 28	+11 57	6.0	Globular Cluster
Per	34	02 39	+42 34	5.5	Open Cluster
Per	76	01 39	+51 19	12.2	Planetary Nebula
Pup	46	07 40	-14 42	6.0	Open Cluster
Pup	47	07 52	-15 17		Open Cluster
Pup	93	07 42	-23 45	6.0	Open Cluster
Psc	74	01 34	+15 32	10.2	Spiral Galaxy
Sge	71	19 52	+18 39		Globular Cluster
Sgr	8	18 01	-24 23		Diffuse Nebula
Sgr	17	18 18	-16 12		Diffuse Nebula
Sgr	18	18 17	-17 09	7.5	Open Cluster
Sgr	20	17 59	-23 02		Diffuse Nebula
Sgr	21	18 02	-22 30	6.5	Open Cluster
Sgr	22	18 33	-23 57	5.9	Open Cluster
Sgr	23	17 54	-19 01	6.9	Open Cluster
Sgr	24	18 16	-18 27	4.6	Open Cluster
Sgr	25	18 29	-19 17		Open Cluster
Sgr	28	18 22	-24 54	7.3	Globular Cluster
Sgr	54	18 52	-30 32		Globular Cluster
Sgr	55	19 37	-31 04		Globular Cluster
Sgr	69	18 28	-32 23	8.9	Globular Cluster

Constel- lation	Messier Number	R. A. h. m.	Dec. ° ' "	Visual Magnitude	Type
Sgr	70	18 40	-32 21	9.6	Globular Cluster
Sgr	75	20 03	-22 04	8.0	Globular Cluster
Sco	4	16 22	-26 24	6.4	Globular Cluster
Sco	6	17 37	-32 11	5.3	Open Cluster
Sco	7	17 51	-34 48		Open Cluster
Sco	80	16 14	-22 51	7.7	Globular Cluster
Sct	11	18 48	-06 20	6.3	Open Cluster
Sct	26	18 42	-09 26	9.3	Open Cluster
Ser	5	15 16	+02 16	6.2	Globular Cluster
Ser	16	18 16	-13 48	6.4	Open Cluster
Tau	1	05 32	+21 59	8.4	Diffuse Nebula
Tau	45	03 44	+23 57	1.6	Open Cluster
Tri	33	01 31	+30 24	6.7	Spiral Galaxy
UMa	40	12 20	+58 23		2 faint stars thought Neb.
UMa	81	09 52	+69 18	7.9	Spiral Galaxy
UMa	82	09 52	+69 56	8.8	Spiral Galaxy
UMa	97	11 12	+55 18	12.0	Planetary Nebula
UMa	101	14 01	+54 35	9.6	Spiral Galaxy
UMa	108	11 09	+55 57	10.0	Spiral Galaxy
UMa	109	11 55	+53 39	11.0	Spiral Galaxy
Vir	49	12 27	+08 16	8.6	Spheroidal Galaxy
Vir	58	12 35	+12 05	9.2	Spiral Galaxy
Vir	59	12 40	+11 55	9.6	Spheroidal Galaxy
Vir	60	12 41	+11 50	8.9	Spheroidal Galaxy
Vir	61	12 19	+04 45	10.0	Spiral Galaxy
Vir	84	12 23	+13 10	9.3	Spheroidal Galaxy
Vir	86	12 24	+13 13	9.7	Spheroidal Galaxy
Vir	87	12 28	+12 40	9.2	Spheroidal Galaxy
Vir	89	12 33	+12 50	9.5	Spheroidal Galaxy
Vir	90	12 34	+13 26	10.0	Spiral Galaxy
Vir	104	12 37	-11 20	8.7	Spiral Galaxy
Vul	27	19 58	+22 35	7.6	Planetary Nebula

SKY CALENDAR NOVEMBER 1975

Information for helping teachers and students observe the sky

SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
<p>Evening Planets: Jupiter is brilliant in SE at dusk and is high in S later in evening (10 p.m. local time in early Nov and 1/2 hr earlier each week). Jupiter sets in W about 6 hrs after passing due S. Red Mars ranks 2nd in brightness only after Jupiter among all evening objects. Mars rises in NE 3 hr after sunset Nov 1, shifting to only 1 hr after on the 31st. Saturn rises in ENE as Jupiter is due south. Look below Castor and Pollux. Visible rest of night, Saturn is best in morning sky.</p> <p>45 min before sunrise (face ESE): Mercury and Spica appear closest this morning, 4° apart. Moon below Spica.</p>  <p>Mercury ● Spica ●</p>	<p>3</p> <p>New Moon, not visible. It rises and sets with the sun, and its dark side is toward us. Mercury remains visible this week, but gets lower each morning (see Nov 2, 8).</p>	<p>4</p> <p>Tonight the moon, 1 1/2 days past new and 20° upper left of the setting sun, sets 1 hr after sundown. Look for moon half an hour after sunset, 5° above horizon and 30° south of due west.</p>	<p>5</p> <p>Tonight the moon is 33° east (upper left) of setting sun. Setting 2 hrs after sun, the moon is much easier to see than last night. Moon sets one hour later each night next several nights.</p>	<p>6</p> <p>Which star map? When Jupiter is nearly due south, use this month's map. Earlier in evening, use last month's within 1 hr of time listed on map. For additional maps for use at other times, see <i>Star Maps for Beginners</i>.</p>	<p>7</p> <p>Jupiter's 4 bright moons are visible in binoculars and small telescopes. Look for #4 farthest east of planet on Nov 1, 17 and farthest west on Nov 9, 26. Number 3 is eclipsed Nov 9 at 10:17 p.m. EST.</p>	<p>8</p> <p>45 min before sunrise (face ESE): Mercury 10 1/2° lower left of Spica.</p>  <p>Spica ● Mercury ●</p>
<p>9</p> <p>This week and next watch moon move thru the zodiac constellations, near "ecliptic" on star map. Moon in Capricornus tonight. Plot moon's position on star map each night thru Nov 22.</p>	<p>10</p> <p>First Quarter (Evening Half Moon). This afternoon look for moon in daytime, 1/4 circle (90°) to the east of the sun.</p>	<p>11</p> <p>At the full moon one week from tonight, the moon will pass through the earth's shadow. See Nov 16-18. For more details, see the current issue of <i>Sky and Telescope</i> magazine.</p>	<p>12</p> <p>Next few nights moon moves through faint Pisces. Use Square of Pegasus to help you plot moon. Tonight, for example, moon is nearly in line with Square's west side.</p>	<p>13</p> <p>Watch Venus 1 1/2 hrs before sunrise next several mornings. Early next week it will pass close to 3rd magnitude Gamma in Virgo.</p>	<p>14</p> <p>Saturn high in south 2 hrs before sunrise. Note Pollux 12° NW of Saturn, and Beehive 4° east of it. By late March Saturn will retrograde 7°, approaching within 7° of Pollux.</p>	<p>15</p> <p>Brilliant "star" near moon tonight is actually Jupiter. Tomorrow night moon will be just south of the bright stars in Aries. What star cluster will be close to the moon on eclipse night?</p>
<p>23</p> <p>1 hr before sunrise: High in WSW.</p>  <p>Saturn ● Pollux ● Moon ○</p>	<p>24</p> <p>Bright Mars now rises in NE as evening twilight ends. Each evening it rises 5 or 6 minutes earlier. By mid-December it will be up at sunset and visible all night.</p>	<p>18</p> <p>ECLIPSE TIMES Totality begins 5:03pm Mid-eclipse 5:23pm Totality ends 5:44pm Moon leaves umbra 7:08pm All times are EST. Convert to your Time Zone by subtracting 1 hr for CST, 2 hrs for MST, 3 hrs for PST.</p> <p>25</p> <p>Observers with binoculars and a good finder chart or star atlas showing faint stars may be able to spot 7th magnitude Ceres, the largest minor planet or asteroid. It is now 1.7° N of Aldebaran and 1/4° farther W each night.</p>	<p>19</p> <p>2 1/2 hrs after sunset: Face ENE. Moon ○ Aldebaran ●</p>  <p>Mars ● Moon ○ Aldebaran ●</p>	<p>20</p> <p>2 1/2 hrs after sunset: Face ENE. Aldebaran ● Moon ○</p>  <p>Mars ● Moon ○ Aldebaran ●</p>	<p>21</p> <p>1 hr before sunrise: Mars ● Moon ○</p>  <p>Mars ● Moon ○</p>	<p>22</p> <p>Venus' rising 4 hrs before sun this month is the best in 8 years. The interval by which Venus rises before sunup will shrink to 1 hr by March 1976.</p>
<p>30</p>			<p>26</p> <p>Last Quarter (Morning Half Moon). Predawn: Bright star near moon is Regulus. After sunrise moon is easily seen in daytime sky for several hours, 1/4 circle to west of sun.</p>	<p>27</p> <p>Watch Venus and Spica next several mornings one hour before sunrise. Venus, moving eastward 1.1° per day, passes 4.2° north of that star December 1st.</p>	<p>28</p> <p>Mercury at superior conjunction (on far side of sun, and not visible). Late next month Mercury will become visible in SW evening sky after sunset.</p>	<p>29</p> <p>1 hr before sunrise: Look 25°-30° up in southeast.</p>  <p>Venus ● Spica ● Moon ○</p>

Magnitudes of the Planets: Venus -4.0; Jupiter -2.4; Mars -0.8 to -1.4; Mercury -0.8; Saturn +0.3
 Positions of the Planets: Venus 32° eastward in Virgo; Mars (Nov 6-30) 4.3° westward from Gemini
 into Taurus; Jupiter 2.4° westward in Pisces; Saturn stationary in Cancer.

East Lansing Sunrise: Nov 1 7:11 a.m.; Nov 18 7:33 a.m.; Nov 30 7:47 a.m. EST
 Sunset: Nov 1 5:32 p.m.; Nov 18 5:13 p.m.; Nov 30 5:05 p.m. EST
 Moonrise on eclipse day, Nov 18 5:09 p.m. EST