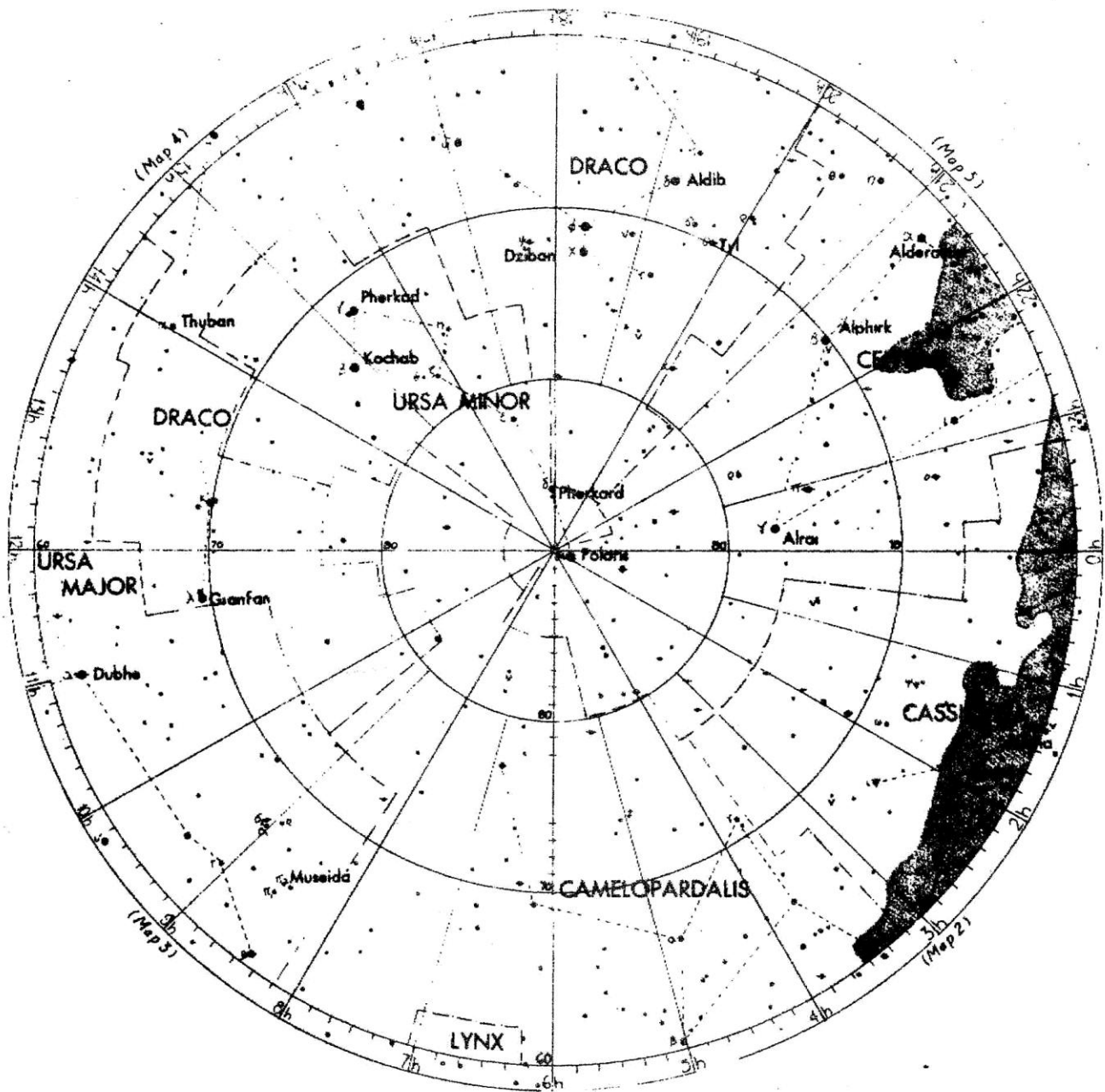


# the WAST\*

\* THE MONTHLY JOURNAL OF THE WARREN ASTRONOMICAL SOCIETY



MAP 1

“...we stand on the shoulders  
of giants...”

## APRIL 1975

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 for Student (K through college) Membership, \$4 for General Membership, and \$5 for a Family Membership. Add \$5 for a one year subscription to Sky & Telescope Magazine. General meetings are held on the third Thursday of every month at Macomb County Community College in room 311 of "B" building, at 8 p.m.

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 the editors. Contributions, literary or otherwise, are always welcome. Contributions to the W.A.S.P. should be submitted to either of the editors listed below.

EDITORS:	Kenneth Wilson	Frank McCullough
	11157 Grenada	34136 Clinton Plaza Dr.
	Sterling Heights,	Frazer,
	Michigan, 48077	Michigan, 48026
	268-9337	791-8752

The editors of the W.A.S.P. will exchange copies of this publication with other club publications on an even exchange basis. The Warren Astronomical Society maintains correspondence, sometimes intermittent, with the following organizations:

THE ASTRO-GATOR ASTRONOMY CLUB

THE ASTRONOMICAL LEAGUE

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 OLYMPIC ASTRONOMICAL SOCIETY

THE ORANGE COUNTY ASTRONOMICAL SOCIETY

THE DETROIT ASTRONOMICAL SOCIETY

THE DETROIT OBSERVATIONAL AND ASTROPHOTOGRAPHIC ASSOCIATION

Other organizations are invited to join this list.

.....Cosmic Calendar by Ken Wilson .....

APR	EVENT
1	Free lecture by Jim Loudon on "Why You Can't Go Faster Than Light" 8 p.m., East Quad, Ann Arbor. First true weather satellite, Tiros I, launched by the U.S.A. in 1960.
3	Messier Club Meeting 8 p.m., contact Frank McCullough (791-8752) for details. Last Quarter Moon.
8	Free Astronomical Film Festival including: APOLLO 13: "HOUSTON, WE'VE GOT A PROBLEM" and "QUESTIONS OF TIME", 8 p.m., Aug. 3, Mod. Lang. Bldg., Univ. of Mich. Largest Recorded Sunspot (7,000 million sq. miles), 1947.
10	Astrophotography Meeting 8 p.m.; Contact Larry Kalinowski (776-9720) for details.
11	New Moon
12	Russian cosmonaut Yuri Gagarin, in Vostok I, becomes the first man to orbit the earth in 1961.
14	Dutch scientist Christaan Huygens born in 1629 (developed wave nature of light and Huygenian eyepiece).
15	Leonardo da Vinci born in 1452
16	Royal Society (of London) founded in 1662 to promote scientific discussion.
17	Warren Astronomical Society General meeting, 8 p.m., room B311 at Macomb County Community College, ELECTIONS!
19	First Quarter Moon.
23	German physicist Max Planck born in 1858 (developed the quantum theory of energy).
25	Free Astronomy class meets. 8 p.m. at St. Paul's United Church of Christ, 31654 Mound Rd. in Warren. For more details contact Louis Faix (781-3338). Full Moon.
28	Isaac Newton published the first volume of his Principia in 1686
30	Astronomer Karl Friedrich Gauss born in 1777

\*\*\*\*\*

### Club News

by

Kenneth Wilson

THIS MONTH'S COVER is by a new W.A.S. member, Carl Noble. Carl joins the staff of the W.A.S.P. as an assistant editor. We feel that his future contributions to the W.A.S.P. will be of great benefit to the club. But this doesn't mean that you people who've been holding off on writing articles can relax now, No Way! It just means that there will be one more person to nag you about them now!

NOTICE! Elections for 1975-76 W.A.S. officers will be held at the April meeting. The offices that will be open are: President, First Vice President, Second Vice President, Treasurer, Recording Secretary and Corresponding Secretary, All members in good standing of the W.A.S. are eligible to vote. Make every effort to be present at the elections. The future depends on the people that you vote into office.

Frank McCullough has been appointed chairman of the nominating committee of the Astronomical League. Congratulations Frank! If you have suggestions for '75-'76 officers, let him know.

- EDITORIAL -

*ASTRONOMY - From a Beginners Perspective -  
Carl L. Noble*

At Present I feel somewhat like a small child in a fire station who dreams of the day he can become a fireman. All around him are men who work in this profession, and the small child wishes he could know and do the things these firemen accomplish.

This is what the W.A.S. is to me. I dream of someday being able to have the knowledge some of my "teachers" have. Before I joined the W.A.S. the only telescope I was acquainted with was a 2 1/4 inch Sears refractor. I would point the 'scope to the moon and Jupiter. I didn't know where any of the other planets were. Also, I knew there were galaxies and nebulae, etc., but thought only the Hale 200 inch could ever see these elusive sky objects. After seeing telescopes with motor drives, setting circles, etc. from the members of W.A.S., I started to see that a telescope could be more than just a "big eye" for viewing the heavens. I wondered if I would ever have an instrument like that. I also did not realize the vast amount of unbelievable items to view. The knowledge the members of the W.A.S. just astound me, and I hope that someday I may be able to know what they do. I firmly believe that to have a cognitive knowledge in your hobby makes it more enjoyable.

I started asking questions of my friends at the W.A.S. about telescopes. After many months and even more mistakes, my wife started to see a very strange "tube-like-creature" form in our basement. Today the once-ugly "Frankenstein" has become a beautiful-green-ornate 8" f/7 Newtonian ("her" name is Little-Jo).

I am convinced none of this would have ever come about if it were not for the fantastic members of the W.A.S. I sometimes feel embarrassed for asking so many questions, but I figure that I will never learn anything if I don't. I have also found that the members of W.A.S. never mind the many calls, or questions thrown at them. My many thanks to all of you at the W.A.S.! I wish all those who are beginners like me could tap the unending resources found in this Society.

+ + + +

As an addition to this article, let me address some of the beginners who might be reading this. I have found some of the following text books extremely helpful to me:

*1.) All about Telescopes - by Sam Brown - Sky Publishers*

This book is written for both the beginner and the advanced. It is written in very easy verbiage, and is easy to understand. I highly recommend it! The cost of this book is \$3.50 and can be ordered from the Edmund Scientific Co. of New Jersey. In it are included all of the information one needs for the hobby/science of amateur astronomy.

*2.) The Telescope Handbook and Star Atlas - by Neale E. Howard - Crowell Publ.*

I received this text for Christmas from my sister – thanks sis! I have found this also to be written with the beginner amateur in mind. The charts in the back are extremely helpful in finding galaxies, nebulae, star clusters and the like. I'm not sure of the cost, but it is worth its weight in gold. I again highly recommend it.

*5.) Making Your Own Telescope - by Allyn J. Thompson - Sky Pub.*

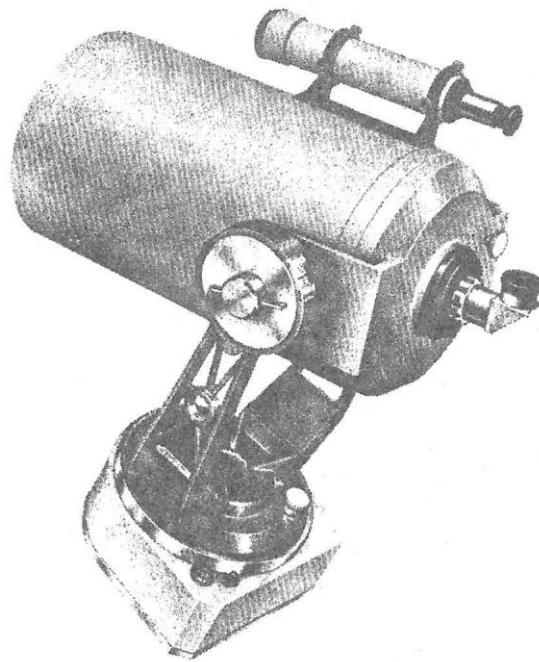
If you wish to make your own telescope from scratch and are good at machining parts, this is an excellent text. It is a bit deep in context for me, but I still have used it. It seems this text was written for the more advanced amateur. The cost is \$5.00.

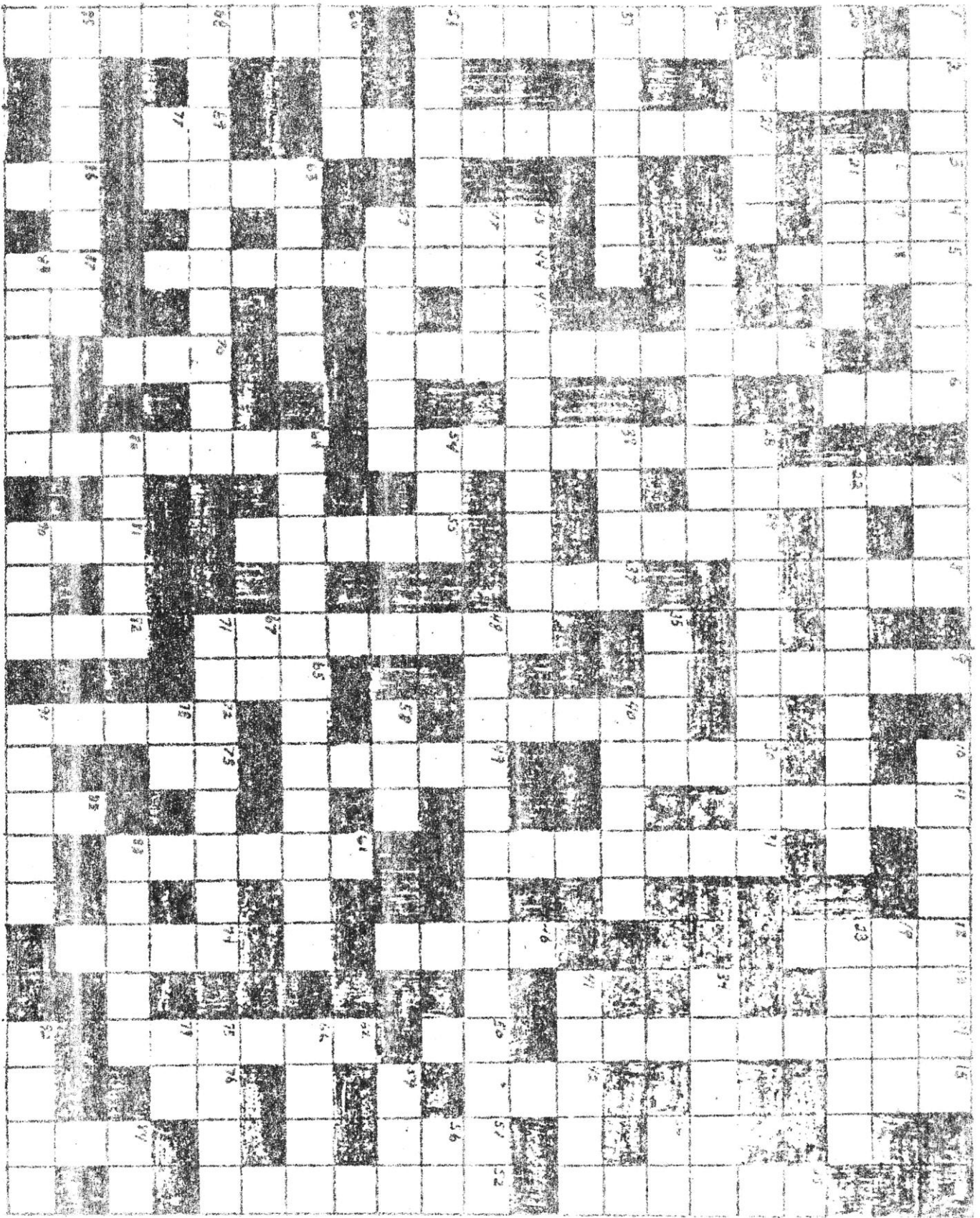
4.) *Exploration of the Universe - George Abell - Holt, Rinehart, & Winston Publ.*

I became acquainted with this particular textbook when I took a college course - Astronomy 201. I have since then used it many times for a handy reference. While it is a "college text" it is really rather simple in its context and writing. I wouldn't know how to obtain it, or even if it is in print yet. The cost in 1967 was \$10.25. .

5.) *Astronomy Made Simple - "Made Simple Book series"*

This text is truly "simple". It would be perfect for someone who knows nothing about the subject of Astronomy. It is very simple, but yet very good as far as a text goes. The cost is only \$1.25 at any bookstore.





## Across

1. Science that studies celestial objects
7. a little dog
10. the total of material and space
16. There \_\_\_\_ 12 constellations in the Zodiac
19. one revolution of earth about the sun
20. granddad
21. one complete journey around the sun
22. what astronomers eat and drink, sleep and think
23. enough and then some
26. without an engine our boat must \_\_\_\_\_
28. The brightest star in Orion
33. it balances inertia of a planet
34. Merrily we roll \_\_\_\_\_
35. where the Lao people live
36. opposite of off
37. a comet in our solar system
38. per day is per \_\_\_\_\_ in Latin
40. largest kind of telescope
41. Sea Monster constellation
43. earth's blanket
47. Western Exchange Tracking Internationale
48. area of sky or group of stars
53. sign or notation or mark
54. what radio telescopes are for astronomers
56. second tone of musical scale
57. not greater
58. shows all the stars
59. to recede, as the tide
60.  $4/5 \text{ N}_2$ ,  $1/5 \text{ O}_2$
63. prefix for  $10^{-6}$
64. instrument for determining spectral lines
66. egg shaped elliptical
67. first Galilean moon of Jupiter
68. reflecting layer of atmosphere
71. variable stars
75. Cygnus the Swan
77. ORION – ORI =
78. HYDRA – YDA =
79. ECLIPTIC – CLIPIC =
80. Dispels the darkness of the void
83. cold luminous objects with tails
84. PYXIS – PYX =
85. fire-breathers
89. not inner
90. gep spelled backwards
91. home planet
92. light waves

Down

2. bodies that undergo fusion and produce light
3. a light streak emanating from a crater on the moon
4. rock samples that contain valuable minerals
5. opposite of far
6. opposite of me
7. Our sun had nine we've named.
8. If canis Major came down we'd tame him as a \_\_\_\_\_
9. opposite of right
11. what we call each other
12. Aldebaran is one of these for Taurus
13. king (Latin)
14. man-made or natural orbiters
15. err a human mistake
24. asteroids
25. The Swan
27. One who studies astronomy.
28. Our most famous constellation.
29. If you can't write legibly, learn to \_\_\_\_\_.
30. Bear
31. cut off light from
32. Meteors in Lyra
39. deface the surface
42. three parts (prefix)
43. absent without leave
44. the big eye
45. Piton is one
46. The beginning of something new.
49. Untold billions of these in the universe.
50. two, too, and \_\_\_\_\_.
51. the moon is fixed in its \_\_\_\_\_
52. gaseous clouds that glow
55. Beta in Orion
60. how high
61. eight degrees either side of ecliptic
62. how we research the upper atmosphere
63. our natural satellite
64. pertaining to stars
65. fish eggs
69. not yes
70. to go astay
72. a stage of the moon
73. Hertzsprung-Russell
74. not different
76. neuter pronoun
81. open space between mountains
82. to touch or label
84. International Geophysical Year
86. Government Issue
87. Abbreviation for North
88. Abbreviation for Oregon



THE  
ASTROPHOTOGRAPHER'S CORNER  
By  
Larry Kalinowski  
CALCULATING YOUR IMAGE SIZE

More often than not, the budding astro-photographer will make an attempt to capture his (or her) first celestial object on film and not even consider how big the object will appear. In the case of the Moon, it's usually too big, but if any portion of the Moon appears in the picture, it's considered a success. As the new photographer improves his photo technique, he moves on to other frontiers, such as the planets. Here he will become sadly disappointed. The first attempt at shooting Jupiter or Saturn reveals an image so small that any decent image size seems impossible. It would be nice to know just how big your image would be before the pictures are developed. Your image size can be computed if you know the effective focal length (EFL) of your camera and telescope combination.

Since most beginners will try the easier methods first, this article will deal with the afocal method (camera and lens shooting through the telescope eyepiece) only. The effective focal length is easy to compute, it's simply:

$$\text{EFL} = \text{telescope magnification} \times 2$$

How's that for simplicity? Just double your telescope power. I must point out, however, that doubling is only valid for those who are using a thirty-five millimeter camera with its normal lens. The answer is in inches. Once the EFL is calculated, multiply it by the angular diameter of your subject (in degrees) then divide by 57.3. I know, I can just hear you saying, "angular what?"

Just to make it easier for everyone, I made a list of most of the common observable objects with their angular diameters in degrees. All you have to do is pick your subject and follow the mathematical instructions above. Your answers will be your image size in inches.

For those who are mathematically inclined, the formula looks like this:

$$S = \frac{A \times \text{EFL}}{57.3}$$

Future issues of the WASP will cover the afocal method with other cameras and lens focal lengths, as well as the positive projection method.

# ANGULAR DIAMETER OF THE MOST COMMON

## OBSERVABLE OBJECTS

(All diameters are given in degrees)

### THE PLANETS

SUN	0.5333	MARS	0.0022	URANUS	0.0010
MERCURY	0.0019	JUPITER	0.0111	NEPTUNE	0.0006
VENUS	0.0055	SATURN	0.0116	PLUTO	0.00007
		MOON	0.5116		

### THE MESSIER OBJECTS

M1	0.100	M27	0.133	M56	0.083	M83	0.116
M2	0.020	M28	0.250	M57	0.166	M84	0.116
M3	0.316	M29	0.116	M58	0.066	M85	0.006
M4	0.383	M30	0.150	M59	0.050	M86	0.066
M5	0.333	M31	2.666	M60	0.060	M87	0.050
M6	0.433	M32	0.050	M61	0.100	M88	0.100
M7	0.833	M33	1.000	M62	0.100	M89	0.033
M8	1.500	M34	0.500	M63	0.133	M90	0.100
M9	0.100	M35	0.483	M64	0.133	M92	0.200
M10	0.020	M36	0.266	M65	0.133	M93	0.300
M11	0.020	M37	0.400	M66	0.133	M94	0.083
M12	0.020	M38	0.300	M67	0.300	M95	0.050
M13	0.383	M39	0.533	M68	0.150	M96	0.116
M14	0.116	M41	0.533	M69	0.066	M97	0.050
M15	0.200	M42	1.100	M70	0.066	M98	0.133
M16	0.133	M43	0.275	M71	0.100	M99	0.066
M17	0.766	M44	1.500	M72	0.083	M100	0.083
M18	0.116	M45	2.000	M74	0.133	M101	0.366
M19	0.083	M46	0.450	M75	0.083	M103	0.100
M20	0.483	M49	0.666	M76	0.333	M104	0.116
M21	0.200	M50	0.266	M77	0.333	M105	0.033
M22	0.283	M51	0.200	M78	0.133	M106	0.333
M23	0.450	M52	0.216	M79	0.133	M107	0.133
M24	0.066	M53	0.233	M80	0.083	M108	0.133
M25	0.583	M54	0.100	M81	0.266	M109	0.116
M26	0.150	M55	0.250	M82	0.116		

### NOTE:

- 1) These values may be used directly for calculating your film image size in the formula on the preceding page.
- 2) To change any of the above values to arc minutes, multiply by 60.
- 3) To change any of the above values to arc seconds, multiply by 3600.

WHY?

Have you received a quizzical look when an old friend discovers you're an amateur astronomer? Perhaps a quietly indulging stare when you admit you spent all night at -20° wind chill, jogging an obscure light beam between dull red cross hairs with finger controls long since numbed by the heat thief, night? Did they wonder why you bypassed the big game to do hours of research in musty narrow library alleys?

Why?

Why am I an amateur astronomer?

Do I search for novas to advance the cause of science? No I lack the dedication for the endless barren hours that discovery demands.

Do I seek new comets that my name might be held honored in posterity? No – I have endured too much of mortal life to value frail fame and meaningless epitaphs.

Do I seek the clues of new physical principles that will lift mankind from the dregs to the cosmos? No -- I know I am just a common man with little more than market place intelligence. Such matters are beyond my ken.

Do I chase the rapture of nature's beauty in Saturn's symmetry or a nebula's faint wisps? No -- Nature's beauty and wonder can be beheld in the blush of the first rose, mantled with dew and cradled in the warmth of sunlight. The appreciation of beauty does not oblige the chilling of the marrow and the meeting of our daily chores with a weary mind and a tired back.

Why then? Why indeed am I an amateur astronomer? There may be as many answers as there are six inch f/8 parabolas. I seem driven by a search; a quest that seeks more than a comprehension of helium fusion, gravitational collapse and quantum physics. A quest to belong; to be part of, to become one with space and time. A quest to find my own immortality.

How big is infinity? How long is an eternity? What commands the orderliness? Am I but a morsel of a mechanistic array bound to ashes and dust?

Through the tube my senses have slipped the bonds of mortality, my mind has breached the chasms of purpose; my heart has found its home and my spirit perceives its destiny

Polar Coordinates:	6 hours, 39 minutes, plus 9.91 degrees
Galactic Position:	202.97° longitude, 2.23° latitude
Universal Time:	One hour, sixteen minutes
Sky Transparency:	8/8
Object:	Tonight I saw the face of GOD-- - and he bid me Welcome ----- to eternity ----- to infinity.

Anonymous

## "Star Light - Star Bright"

### But How Bright is the Star Light?

by Lou Faix

Variable star observer, asteroid hunter, astrophotographer, or (heaven forbid) nova searcher. If you're anyone of these, you've probably asked yourself, "How bright is that object?" Through the courtesy of Mr. William Schultz of the Cranbrook Observatory, we now have a simple method of determining stellar brightness. It's a direct method and requires no previous skill at visual estimating. The method was published in issue No. 23, Sept/Oct 1973 of the Planetarium Director's Handbook. All that's required is a camera, an accurate decimal ruler, a piece of graph paper and a star atlas.

We begin by taking an astrophoto of the object in question using a large enough field angle to include a number of stars listed in an available star atlas. I'd strongly suggest a slide photo. A fine grain black and white film is preferred, but color film is acceptable if it's of a variety which does not experience a color shift during a long exposure. Kodak Plus X makes an excellent black on white negative. In color film, Fujichrome is superior to High Speed Ektachrome which experiences a pronounced red shift.

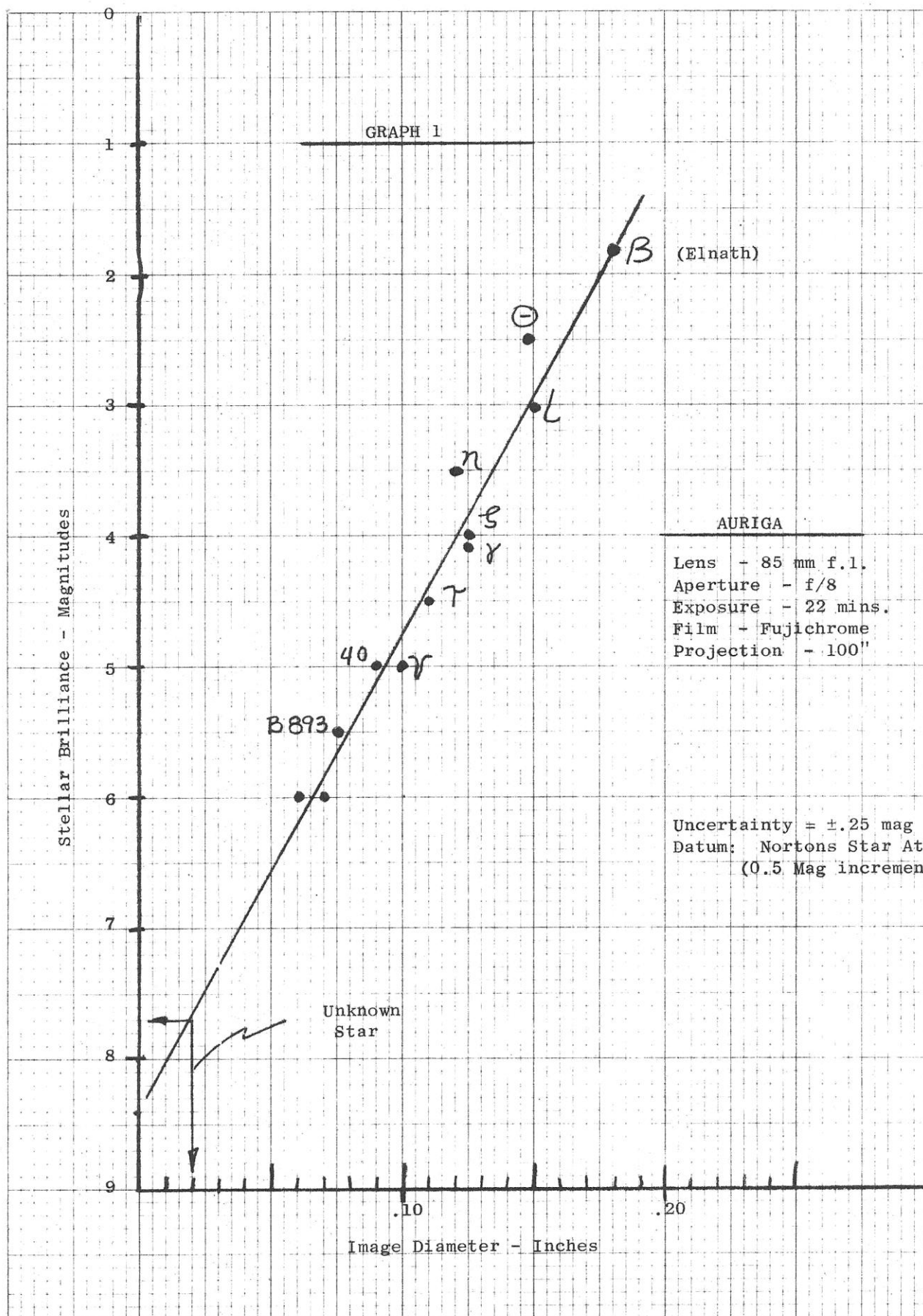
Project the slide onto a smooth white wall or a sheet of paper. A glass beaded screen is too coarse to make measurements on. A total picture size of at least three feet is recommended. The larger the image is, the more accurate the measurements will be. Measure the diameter of the light dots for stars in the picture of known magnitude. Ignore any stars exhibiting coma distortion. Pictures with guiding errors are nearly useless. A magnifying glass and a draftsmen decimal scale are excellent tools at this point. Diameters should be measured to an accuracy of .01". A minimum of six stars spread over several magnitudes should be measured. The accuracy will improve with more data points. An example of the plotted data is shown on the following page. Twelve stars shown in Norton's Star Atlas were used. Draw a single straight line through the points. Not all the points will fall right on the line but try to draw a line which fits the best. For those not afraid to try a little math, there is a method of computing the exact best fit line, known as the "least mean squares."

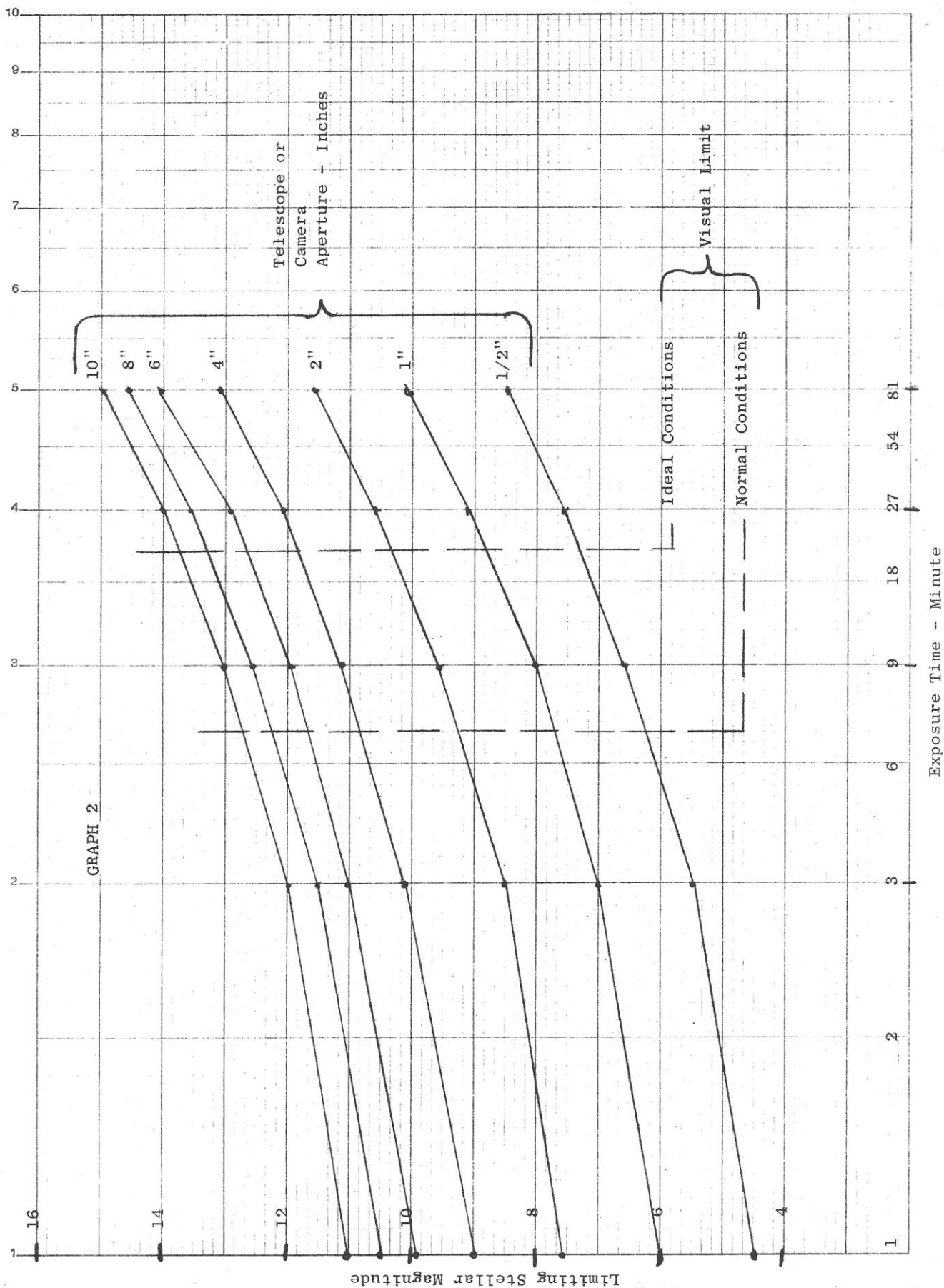
The photographic magnitude of any unknown star can now be determined by measuring its diameter and seeing where that size intersects the line. The graph on the following page indicates the faintest star seen on the photo should be 8.4 magnitudes (zero diameter). The photo used in this plot was made using an 85 mm focal length achromatic camera lens stopped down to f/8 and exposed for twenty-two minutes.

Data from Sam Brown's book "Photography with Your Telescope" correlating aperture size and exposure time with photographic magnitudes is charted on graph two. Checking old photos, I find Mr. Brown's data acceptably accurate for such films as Plus X, Tri X, and High Speed Ektachrome. Fujichrome and the 103a series films exceed the chart by one to two magnitudes.

Just a few comments in using this method to determine stellar magnitude:

1. Avoid using optic systems of  $f/4$  or faster. The star images have very fuzzy edges and an accurate measurement is impossible.
2. When greatly enlarged, a star image taken through even a good achromatic lens will show a white core with a purplish ring around it. Ignore the color halo and measure only the bright center core.
3. A set of AAVSO reference charts is invaluable if you're going to do work down to 12-14th magnitude.
4. It's a great way to extend your viewing hours into those cloudy nights and learn the star fields in more complete detail.





## SHININGS FOR ATM<sup>6</sup>

### HOME-BREWED- CAMERA ADAPTER:

After taking pictures of squirrels and trees, close-up shots of bees or flowers, or a portrait of my wife, I looked for other areas of my photographic "arts".

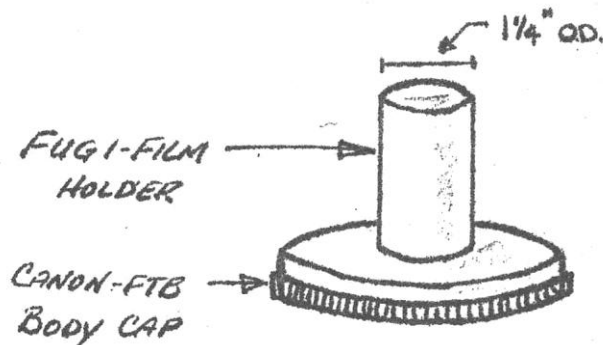
"Behold," I retorted "look at those strange pinpoints of lights in the night sky. Why not take photos of those strange objects?" Turning my camera to the sky, I took a few shots of constellations which Kodak thought were unexposed film (way to go Kodak!). But after a while I did get a few pictures of various constellations, and was amazed! But the problem was, the moon was only a tiny dot on the film. Sure couldn't see too much detail. Turning to my 2¼ inch Super-Sears refractor, I had the idea of turning it into a lens for my Canon F.T.B. "Are you crazy," I thought, "It doesn't fit my camera body." Well, after deciding that welding the 'scope and Camera together was not the solution. I looked into different catalogues for camera adapters and found: \$13.00; \$24.00; \$ 36.00, etc. The camera finger was willing, but the pocketbook was not. Then a thought struck me: "What would the professionals at the W.A.S. do?" The answer came back almost like a super-nova, "DO IT YOURSELF IT'S CHEAPER."

Turning to my camera bag of junk, I found the body cap of my Canon F.T.B. I also noticed that a Fugi film carton (plastic holder) is exactly 1¼ inch O.D. So I drilled and filed a hole in the metal body cap and used Epoxy glue to hold the two together. I was amazed that it looked like it might work.

Now the moment of truth came - I attached the camera adapter to my Canon, and then this whole thing to the 'scope. The first target I shot was the full moon. Like a kid waiting for a special treat, I ran downstairs to my darkroom and developed the photo. Before my eyes there was a full shot in the perfection of clarity of our satellite. The only thing that scarred the print was three telephone wires - thanks to my expert workings of aiming a telescope.

I was very pleased with the results, and hope in passing this along, someone else. might be able to think of another device we amateurs can build in this line. With this system only prime focus can be achieved, but an adapter on the device and the eyepiece holder may work. (Perhaps "Kwentus Enterprises" might think of something!)

Oh, the cost? Only \$2.95 for the camera body cap (Price will vary). Not bad!



*Carl L. Noble*













## 1975 Checklist of Planetary Configurations

Okay all you conjunction, quadrature, opposition, conjunction and other planetary configuration fans; here's the list of your highlights for the rest of 1975 and the first part of 1976. This list was prepared by Robert C. Victor of the Abrams Planetarium in East Lansing, Michigan. -kw

CHECKLIST OF PLANETARY CONFIGURATIONS, 1975				
DATE	EVENT	ELONG	MAGNITUDES	REMARKS
1975 Jan 6	Saturn at opposition	180°	-0.2	In Gemini. Visible all night.
20	Mercury 0°.7 N of Venus	E 18°	-0.6, -3.4	Within 0°.5 of each other on evenings of Jan. 17 & 18.
22	Mercury 1°.1 N of Venus	E 18°	-0.4, -3.4	(pair sets 1 <sup>h</sup> 23 <sup>m</sup> after sun Jan. 17.
23	Mercury greatest elongation	E 19°	-0.3	Favorable. Sets as twilight ends.
Feb 8	Mercury 3°.6 N of Sun	0°		Inferior conjunction.
17	Venus 0°.2 S of Jupiter	E 24°	-3.4, -1.6	Spectacular! Pair sets 2 <sup>h</sup> after sun.
Mar 6	Mercury greatest elongation	W 27°	+0.4	Fair. Rises 1 <sup>h</sup> 08 <sup>m</sup> before sun. Look 16° lower left of Mars.
21	Jupiter 1°.1 S of Sun	0°		Conjunction.
Apr 2	Saturn at quadrature	E 90°	+0.3	In Gemini. Sets 7 <sup>h</sup> after sun.
7	Mercury 0°.9 S of Jupiter	W 12°		Not visible.
13	Venus 2°. 8 S of Pleiades	E 37°	-3.5	Venus sets 3 <sup>h</sup> after sun.
18	Mercury 0°.6 S of Sun	0°		Superior conjunction.
21	Venus 7°.2 N of Aldebaran	E 38°	-3.5, +0.9	Venus sets 3¼ <sup>h</sup> after sun.
May 4	Mercury 2°.1 S of Pleiades	E 16°	-0.7	Mercury sets shortly before twilight ends.
10	Mercury 7°.9 N of Aldebaran	E 20°	-0.1, +0.9	Mercury sets after twilight ends.
16	Mercury greatest elongation	E 22°	+0.6	Year's best evening apparition. Sets after twilight ends.
24	Venus 2°.7 N of Saturn	E 44°	-3.7, +0.4	Pair sets more than 3 <sup>h</sup> after sun.
24-25	Moon total eclipse	180°		Mid-eclipse 1:38 a. m. EDT May 25.
30	Venus 4°.1 S of Pollux	E 44°	-3.8, +1.1	Pair sets more than 3 <sup>h</sup> after sun.
Jun 10	Mercury 3°.1 S of Sun	0°		Inferior conjunction.
16	Mars 0°.5 S of Jupiter	W 65°	+0.8, -1. 9	In Pisces. Pair rises 3¼ <sup>h</sup> before sun.
18	Venus greatest elongation	E 45°	-3.9	In Cancer. Sets nearly 3 <sup>h</sup> after sun.
Jul 4	Mercury greatest elongation	W 22°	+0.6	Unfavorable. Rises 1 <sup>h</sup> 17 <sup>m</sup> before sunrise, in bright twilight.
8	Venus 0°.3 S of Regulus	E 43°	-4.1, +1.3	Pair sets just after twilight ends.
15	Saturn 0°.0 S of Sun	0°		Conjunction.
16	Jupiter at quadrature	W 90°	-2.0	In Pisces. Rises 5 <sup>h</sup> before sun.
18	Saturn 6°.7 S of Pollux	W 2°		Not visible.
21	Venus greatest brilliancy	E 39°	-4.2	Sets shortly before twilight ends.
24	Mercury 5°.7 S of Pollux	W 9°	-1.4, +1.1	Difficult. Mercury rises 48 <sup>m</sup> before sun.
25	Mercury 1°.1 N of Saturn	W 8°		Not visible. Saturn rises 40 <sup>m</sup> before sun.
Aug 1	Mercury 1°.7 N of Sun	0°		Superior conjunction.
11	Mercury 1°.1 N of Regulus	E 11°		Not visible.
14	Mars 5°.4 S of Pleiades	W 81°	+0.4	Mars rises 4¼ <sup>h</sup> after sunset.
17	Mercury 8°.2 N of Venus	E 15°		Not visible; Venus sets before sun.
27	Venus 8°.4 S of Sun	0°		Inferior conjunction.
30	Mars 4°.4 N of Aldebaran	W 57°	+0.2, +0.9	Pair rises within 4½ <sup>h</sup> after sunset.
Sep 3	Venus 8° S of Regulus	W 40°	-3.5, +1. 3	Difficult. Venus rises 38 <sup>m</sup> before sun, Regulus 50 <sup>m</sup> .
5	Mars at quadrature	W 90	+0.2	In Taurus. Rises 4 <sup>h</sup> after sunset.
13	Mercury greatest elongation	E 27°	+0.4	Unfavorable. Sets 48 <sup>m</sup> after sun.
22	Mercury 1°.5 S of Spica	E 24°	+0.7, +1. 0	Difficult. Mercury sets 38 <sup>m</sup> after sun.
30	Mercury 1°.6 S of Spica	E 16°		Not visible.
Oct 3	Venus greatest brilliancy	W 40°	-4.3	Spectacular! Rises 3½ <sup>h</sup> before sun.
3	Venus 4°.4 S of Regulus	W 40°	-4.3, +1. 3	Pair rises 3½ <sup>h</sup> before sun.
9	Mercury 1°.9 S of Sun	0°		Inferior conjunction.
13	Jupiter at opposition	180°	-2.5	In Pisces. Visible all night.
24	Mercury greatest elongation	W 18°	-0.3	Year's best morning apparition. Rises before twilight begins.
26	Saturn at quadrature	W 90	+0.4	In Cancer. Rises 6 <sup>h</sup> after sunset.
Nov 2	Mercury 4°.0 N of Spica	W 16°	-0.8, +1. 0	Mercury rises shortly after twilight begins.
7	Venus greatest elongation	W 47°	-4.0	In Virgo. Rises nearly 4 <sup>h</sup> before sun.
18	Moon total eclipse	180°		Mid-eclipse 5:23 p. m. EST.
28	Mercury 0°.7 S of Sun	0°		Superior conjunction.
30	Mercury 3°.6 N of Antares	E 1°		Not visible.
Dec 1	Venus 4°.2 N of Spica	W 45°	-3.9, +1. 0	Venus rises nearly 4 <sup>h</sup> before sun.
15	Mars at opposition	180°	-1. 6	In Taurus. Visible all night.
1976 Jan 7	Mercury greatest elongation	E 19°	-0.3	Favorable. Sets just before twilight ends.
9	Venus 6°.5 N of Antares	W 39	-3.6, +0.9	Venus rises nearly 3 <sup>h</sup> before sun.

# SKY CALENDAR APRIL 1975

Information for helping teachers and students observe the sky

SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
<p><b>Evening Planets:</b> Venus is brilliant "evening star" in western sky for 3 hours after sun-down. Venus moves rapidly against background (see Apr 10, 13, 21). <b>Saturn</b> appears as brightest object in Gemini. See star map. <b>Mercury</b> becomes visible late in month; see Apr 27, 29. <b>Morning Planets:</b> Reddish <b>Mars</b> rises south of east about 2 hrs before sunrise. <b>Jupiter</b> becomes visible late in month; see Apr 28, 30.</p>		<p>1</p> <p>1 hr before sunrise: Reddish star to lower right of moon is Antares, in Scorpius.</p>	<p>2</p> <p>This morning the moon appears near the point among the stars where the sun is located on December 22nd (the Winter solstice).</p>	<p>3</p> <p> Last Quarter. As you face the rising sun this morning, the moon is 90° (1/4 turn) to your right.</p>	<p>4</p> <p>To the observer who views the sky nightly one hour after sunset, the month of April is a time of rapid transition.</p>	<p>5</p> <p>As this month progresses, watch Orion and his companions approach the western horizon. In the east, watch brilliant Arcturus rise higher.</p>
<p>1 hr before sunrise:  Mars</p> <p></p>	<p>1 hr before sunrise:  Mars</p> <p></p>	<p>1 hr before sunrise:  Mars</p> <p></p>	<p>9</p> <p>Last chance to easily see waning crescent moon this month. It rises nearly due east about 1 1/4 hrs before sunrise.</p>	<p>10</p> <p>The eastward motion of Venus against background stars, now 1.2° per day, is very evident next few nights as Venus approaches the Pleiades.</p>	<p>11</p> <p> New Moon, not visible, in conjunction with sun. Next few evenings are best for viewing "the old moon in the new moon's arms" (earthshine).</p>	<p>12</p> <p>About 45 min after sunset look for very thin crescent moon very low in WNW. Moon sets shortly before twilight ends.</p>
<p>13</p> <p>Tonight Venus 3° south of Pleiades star cluster (look above moon). Spica, at opposition, rises in ESE at sunset.</p>	<p>14</p> <p>Shortly before sunset, look for moon 35° up in W. Using binoculars look for Venus close by. As sky darkens look for Pleiades near Venus.</p>	<p>15</p> <p>As sky darkens look for Aldebaran and the Hyades cluster (the head of Taurus) below the moon.</p>	<p>16</p> <p>Tonight the moon appears near the point among the stars where the sun is located on June 21st (the Summer solstice).</p>	<p>17</p> <p>Early evening: Saturn 3° north of moon.</p>	<p>18</p> <p> First Quarter. As you face the setting sun, the moon is 90° (1/4 turn) to your left. As sky darkens note Castor and Pollux near moon.</p>	<p>19</p> <p>Before Rigel sets, after Vega rises, 11 stars of first magnitude or brighter are visible. Locate them all. See list on map.</p>
<p>20</p> <p>Moon in Leo, approaching Regulus. By tomorrow evening, the moon will have passed the star.</p>	<p>21</p> <p>Venus passes north of Aldebaran. During evening, look for the reddish star 7° to the lower left of the brilliant planet.</p>	<p>22</p> <p>Lyrid meteor shower best this morning about 2 hours before sunrise. Shower members may appear anywhere in sky, but move away from Lyra.</p>	<p>23</p> <p>Pleiades, now 12° to lower right of Venus, will be on far side of sun on May 21. On what date will you last see the cluster?</p>	<p>24</p> <p>Spica close to moon in early evening. From Antarctica, moon appears farther north against background stars and covers Spica.</p>	<p>25</p> <p> Full Moon, rises in ESE shortly after sun sets in WNW. At opposition, moon visible all night and sets just after sunrise tomorrow.</p>	<p>26</p> <p>Moon rises later each evening, but remains visible mornings thru May 9th. Look for moon in daytime each morning until that date.</p>
<p>27</p> <p>Using binoculars, look for Mercury 12° to the lower right of the Pleiades. The planet now sets an hour after the sun and gets easier to see in coming days.</p>	<p>28</p> <p>1 hr before sunrise: Reddish Antares close to moon, in SSW. Jupiter, nearly due E, just rising. You need unobstructed view of horizon to see Jupiter.</p>	<p>29</p> <p>From now until late May, Mercury is an easy naked-eye object. Tonight look low WNW 45 min after sunset, 19° to lower right of Aldebaran.</p>	<p>30</p> <p>Jupiter should be easily visible 45 min before sunrise. Look low in east, 26° to lower left of Mars. Watch these planets next 2 months.</p>	<p>In coming weeks, Rigel, Aldebaran, Sirius, and Betelgeuse will disappear from evening skies. Record dates you see them. On what date will you last see each star?</p>	<p>With clear skies, a given star should disappear the same time of year each year from a particular latitude. This fact was used to make calendars in ancient times.</p>	<p><b>NEXT MONTH'S EVENTS</b> include a total lunar eclipse on the night of May 24-25. Also in May, Venus passes Saturn, then Pollux. Mercury reaches its best evening appearance of the year.</p>

Sunrise and Sunset, East Lansing--Sunrise: Apr 1 7:20 a.m.; Apr 16 6:56 a.m.; Apr 30 6:38 a.m. E.D.T.  
 Sunset: Apr 1 8:01 p.m.; Apr 16 8:21 p.m.; Apr 30 8:36 p.m. E.D.T.  
 Subtract one hour 1 standard time is in effect.