

# THE WASP



THE JOURNAL  
OF THE WARREN  
ASTRONOMICAL  
SOCIETY



## AUG. 1978



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



Comet Kobayashi-Berger-Milon (1975h) was discovered by three astronomy enthusiasts as they searched the heavens. Though not a particularly spectacular comet, 1975h will be recorded in history by the names of the three observers who discovered it. This photograph of 1975h was taken through a 14 inch Schmidt camera on Tri-X film exposed for 15 minutes. The comet's tail was estimated to be five degrees long on Aug. 7. MacLean Observatory photograph.



# Club News

The Warren Astronomical Society (W.A.S.) is a nonprofit organization of Amateur Astronomers. Membership is open to all interested persons. Annual dues are as follows; Student- \$11.00, College- \$13.00, Senior Citizen- \$15.50, Individual- \$18.00, Family- \$23.00, the membership fees listed here include a one year subscription to Sky & Telescope Magazine.

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

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## **OBSERVATORY SCHEDULE**

Dennis Jozwik..Chairman. 754-2037

Lectures for the coming month are listed below.

Aug .. 4/5... Ray Bullock-879-9458  
Aug .. 11/12.....Dave Dobrzelewski-778-9715  
Aug. 18/19 .....Lou Faix-781-3338  
Aug. 25/26 .....Dave Harrington-879-6765

The lecturer may select either the Friday or Saturday, depending on the Weather and their personal schedule. NOTE..If you cannot lecture on your scheduled weekend, please call for a replacement as early as possible. If you wish to use Stargate, please call by 9 pm on the evening you plan to go out.

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## **•buy – sell – trade•**

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FOR SALE...Unitron Unihex. Cost New \$35.25, will sell for half price.  
Mint condition. Bob Shannon-885-4283. Call after 6 p.m.

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FOR SALE...Celestron 8 with: wedge, tripod, 3 eyepieces, aluminum dew cap, counterweights, prism diagonal, piggyback camera mount, off axis guider, illuminated eyepiece, tele-compressor, tele-extender, and 'T' mount and ring for Cannon body. New cost-\$1571.00, selling for-\$1150.00.

Also...a Celestron 5, plus photo accessories, selling for \$600.00. Write  
Richard Hill, 3932 Todd, Midland, Mich. 48640 OR call 1-517-835-5548.

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For sale...Tasco 60 mm telescope (tube only) 2 eye pieces and a 24 mm finder  
..\$25.00. Also, Jagers 4½" reflector (tube only) with a 10X30 mm finder.  
Contact Joe Nunau, 681-2006.

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For Sale...10" f/6 reflector with Optic Craft mount (pipe), asking \$300.00 Also,  
Celestron photographic accessories- A.C.-D.C. drive corrector and off axis  
guiding assembly. F. B. Bruner, 643 Washington, Hope In. 47246

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MINUTES OF THE JUNE 15, 1978 MEETING OF THE WARREN ASTRONOMICAL SOCIETY:

The meeting was called to order at 8:20 p.m. by our new president, Dave Harrington. It was then announced that there would be a Messier Contest at Stargate on Saturday July 8th. In case of cloudy weather, the contest will be held the following Saturday, July 15. Then, on August 11 and 12, we will be hosting a family outing and picnic. Held annually in conjunction with the Perseid Meteor shower, Mr. Harrington added that as an added attraction the Detroit Astronomical Society has been invited. Details would be firmed up by next month.

A new membership roster, drawn up by Loretta Caulley, was passed around for corrections. Robin Bock will make a comparison with treasurer records before a final draft will be presented to the membership. Dave Harrington urged all to bring their dues up to date.

Doug Smith has a three volume Astronomical Atlas which he is offering for \$59. He will lecture on his observation of the 4.0 degree inclination of Venus. Mr. Harrington described his calculation as "phenomenal."

Ray Bullock then stood up to relate a brief and significant news bulletin concerning the launching of Sozus #29 by the Soviets on June 15, 1978.

Observatory Chairman Dennis Jozwik reported that the dome at Stargate has been fixed. He announced that Camp Rotary would be closed between July 3 and 18. He asked for volunteers to paint the observatory. All members were asked to read the code of conduct published in this month's WASP. Everyone wishing to use the Stargate facilities should call either Frank McCullough or Dennis. Lecturers were reminded to keep their appointments and if unable to call a make a replacement.

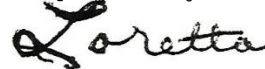
Roger Civic, editor of The Wasp, gave a commentary on a new Coulter Optic reflector priced at \$27.50. Research into the price value ratio of this type of reflector place cost as usually \$45 to \$50. Rick Hill suggested that owners report their experiences with the aforesaid article.

John Searles announced the winners of the Great Lakes Astronomical Symposium awards. Rick Hill received a plaque. Other recipients were Doug Bock and of course, John. Nancy Wagner reported on her 4½ inch reflector telescope which she herself constructed. The 23½ focal length mirror, which took 40 hours to construct, was a real beauty: She received a certificate of merit at the Dayton Apollo Rendezvous. Lou Faix, in testing the performance of the Wagner instrument concluded the "optics were very good."

Doug Bock spoke of the function and uses of celestial co-ordinate systems. Robin Bock invited members to a June 16 Open House at the Detroit Science Center. After intermission Robin gave her Treasurer's Report. It was learned the balance stands at \$260. Frank McCullough's letter, thanking all for their kind solicitations during his hospital stay, was then read. Frank McCullough, Tim Skonieczny, Pete Kwentus and Doug Bock showed slides of recent Aurora, planetary conjunctions and of the Apollo Rendezvous. A movie, entitled "The Jupiter Odyssey" was presented. The treatment was an attractive combination of drama and science which was easy to understand.

The meeting was adjourned at 10:53 p.m.

Respectfully submitted,



Lorretta D. Caulley, Secretary

## The Economical ATM

by Brad Vincent

Having recently entered the field of amateur telescope making, I have made a significant discovery. If you shop purely through catalogs for your optical supplies, you'll get rooked. By snooping around, bargains can be found for good merchandise in some unexpected places. In the coming months, I hope to share some of my bargain discoveries with you. It should help you save some money instead of losing it to 100% markups.

### 1. Telescope Tubes

If you listen to the supply houses, they'll tell you to get fiberglass, resin sprayed paper, or a "revolutionary new material" for your tube. I don't know about the last one, but the first two are correct. Fiberglass is one of the best materials in terms of strength, thermal qualities, and being lightweight. Resin sprayed paper is also good if it's tightly wound. The only problem is the price for these two tubes. A fiberglass tube for a 6" f/8 mirror can cost around \$30! And the paper ones aren't much cheaper.

Learning this, I picked up a hint about a strong, inexpensive cardboard tubing. Next time you're near a construction site, take note of the mold being used to pour concrete pillars. They use a cardboard tubing called either Sonotube or Slek Tube. This tubing varies in inside diameter from a small 8" to a few feet. The tube wall is 0.2" thick and the inside is sprayed with a light coat of waterproofing material. You can ask the builders at a site if they have any excess tube in a size you need. If not, you can prowl around the site after dark and borrow a section for your tube. Or, you can do like I did and look it up in the Yellow Pages. I ended up going to the Boomer Construction Company, 1940 E. Forest at St. Aubin in Detroit. They carry numerous sizes of Slek Tube at reasonable prices. Below is a sample of the sizes and prices for three common telescope sizes:

6" mirror	8" I.D. tubing	\$1.10 / ft.
8" mirror	10" I.D. tubing	\$1.30 / ft.
10" mirror	12" I.D. tubing	\$1.60 / ft.

The Boomer Company told me they try to discourage sales of tubing in lengths less than twenty feet. Luckily, they usually have some scrap pieces laying around which they're glad to get rid of. If a few people are all building 6" mirrors, they could buy a 20' length of 8" tubing and cut it into individual sections. This tubing is best cut on a table saw because it is so hard (I can sit on mine and it won't bend at all). Once you get it home, give it two or three coats of shellac to seal it from the elements. I bought a 5' length of 8" and it took the better part of a quart of shellac to give it three coats inside and out.

Being that 8" I.D. is an odd size tube for a 6" mirror, and 10" is odd for an 8", you may wonder about getting spiders and mirror cells to fit your needs. Kenneth Novak & Co. makes a Research Quality Spider and Secondary Holder that sells for a few dollars more than regular brands. There are a choice of spider sizes and they have one each for the 8" and 10" tube. University Optics sells an Expand-o-Cell for 6" and 8" mirrors which adjusts for a wide range of tube sizes. The cell works fine in both our tube sizes.

Consider the money saved; a 5' length of 8" tube for under \$6 compared to \$30 for fiberglass. The \$25 saved can pay for the mirror kit. By buying or borrowing the Sleek Tube, you've made the mirror kit the single most expensive part of your telescope instead of the tube. If you think about it, that's the way it should be.

Next month: A free grinding stand.

LYRA  
The Harp

Folk yarns about stars and constellations have worked their way up into the culture and arts of diverse civilizations. Perhaps, at midnight tonight, as you gaze at LYRA rising to its zenith, you will recall the legends which have surrounded this beloved summer star formation.

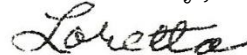
It is to our ancient Chinese star gazers that we learn the most fanciful story. It seems that long ago during the Han Dynasty, there once lived a youth, Tung Yung, who came from an honorable but most unfortunate family. After the failure of their crops, all but our hero survived the resulting famine. Chinese custom dictated that Tung Yung's father should receive a proper burial complete with mourners, incense, gold, silver, paper money, horses, chariots and, a well landscaped burial plot. In order to pay for his father's funeral rites, Tung Yung sold himself into slavery and worked so hard that death seemed imminent. But, the Lord of Heaven looked down on the miserable youth and sent his daughter Chih Nu, the goddess of weaving. Her tender nursing care, delicious cooking and neat housekeeping restored our hero to vibrant good health. As a final accomplishment, Chih Nu, took out her loom to weave tapestries such as no one had ever seen before. Intertwined with jewels in magnificent colors, they were in great demand all over China. Chih Nu's magic weaving soon ransomed Tung Yung from slavery. They married and when their little son was one year old, Chih Nu was summoned to return to her heavenly abode. Thereupon she took to the skies and became Beautiful Vega, the brightest star in LYRA!

To the Greeks LYRA represents the musical instrument which Apollo or Mercury gave to Orpheus. Beautiful Eurydice was Orpheus' wife and upon her untimely death Pluto permitted Orpheus to carry her from the place of departed spirits. He was charged not to look at her until he had emerged from the shades of darkness. Forgetting Pluto's admonition, Orpheus looked at Eurydice thus causing her final disappearance. After Orpheus' death, Jupiter placed his magic Harp in the sky!

Ancient Britons called this constellation "King Arthur's Harp". In Bohemia, LYRA was known as the "Fiddle in the Sky".

Some of the points of interest in LYRA bear repeating. Our solar system is heading in the direction of LYRA at about 12 miles a second. Lying between Hercules and Cygnus, LYRA has as its main attraction, Vega, a blue-white giant. Vega has been and will again in 12,000 years be, the Pole Star. Epsilon star is the renowned double-double. Lyrae B is a variable which can be observed with the naked eye. Each year at about April 21, a swift meteoric shower called "Lyrids" radiates conspicuously. The "Ring Nebula", M 57, is located at the base of the LYRE. Happy looking!

Submitted by,



Loretta D. Caulley

By: Jeff Stanek

## SUMMER MESSIER OBJECTS

I'm writing four articles a year on the seasonal Messier objects. I will write one article every winter, spring, summer, and fall. Starting with the summer Messier object. I will categorize the Messiers into four groups: Nebulae, Globular Clusters, Galaxies, and Open Clusters. Then I will pick 5 of the best Messiers for each category for every season. I will start with the Nebulae.

Summer is the best time of the year for nebulae. It is so because Sagittarius is in the sky. Sagittarius is the constellation with the most Messier objects and the most nebulae. Three of the nebulae I will write about are in Sagittarius, starting with M8, the Lagoon Nebula.

M8- Best known nebula in Sagittarius. Big, bright, it is naked eye in dark skies. It is a nebula with associated star cluster. In size, it is 35 by 60 minutes of arc in extent. The cluster is a clan of hot newborn stars, and is one of the best of its class. The nebula part is diffuse, and fairly bright. It is very worth locating when you are in the area. I will give its 1980 coordinates as I will for every Messier object I list. RA= 18.02 DEC= -24 23

M17- Another good nebula and loose star cluster in Sagittarius. It's the northernmost object in Sagittarius. Called the Omega Nebula, it got its name from peoples saying it resembles the Greek letter Omega. It measures more than  $\frac{1}{2}$  of a degree in extent. RA=18.19 DEC=-16

M20- Is the famous Trifid Nebula in Sagittarius. A very beautiful object, it is well worth locating. The Trifid gets its name from being divided into three parts. It is very close to M8, being only 2 degrees apart. It is also  $\frac{1}{2}$  of a degree in diameter. RA=18.01 DEC=-23 02

M27- The Dumbbell Nebula in Vulpecula. My favorite of the Messiers, this planetary nebula in Vulpecula is a beauty. Second largest of the planetaries, the nebula is surprisingly big and bright in my eight-inch scope. Located in the constellation of Vulpecula (a small constellation just south of Cygnus) the Dumbbell can be hard to locate sometimes. The nebula has a magnitude of 8. RA= 19.58 DEC=+22 40

M57- The famous Ring Nebula in Lyra. Best known of the planetary nebula, this one is also a beautiful sight. With an aperture of four inches or more, you can unmistakably make out the ring shape. This nebula has a magnitude of 9. Its size is 80 by 60 minutes of arc in diameter. The Ring's central star has a magnitude of about 15. Its distance is 1500 light years. RA=18.52 DEC=+33 01

## GLOBULAR CLUSTERS

M13- The Great Globular Cluster in Hercules. It's the best known of the globular clusters. Very bright, it's a must for every Messier hunter. In dark skies, it is naked eye for it is sixth magnitude. There are about 30,000 stars visible down to 21st magnitude. Its distance is 25,000 light years away from us. M13's diameter is about 160 light years. RA= 16.41 DEC= +36 30

M22- A very good cluster in Sagittarius. Easily found in a finder. Also, naked eye in a dark sky. It measures 17 minutes in diameter. Considered 2nd best globular cluster to M13 in northern skies. As M13, M22 is also 6th magnitude. M22 is about 10,000 light years away from us. It is about 1 degree in extent. M22 is easy to find because it is only 2 degrees northeast of Lambda Sagittarii (the top of the teapot). RA= 18.35 DEC= -23 55

M92- Another good globular in Hercules. In any other constellation M92 would be a major show object. M92 and M13 are only 9 degrees apart. Its magnitude is also 6. It is about 35,000 light years distant. Surprisingly bright in a moderate telescope, it is a fine sight. Through studies, we have found out that M92 is slightly older than M13. RA= 17.16 DEC= +43 10

M80- A globular cluster in Scorpio. It is located between Antares and the three stars that make up the Scorpion's head. Its neighbor M4, is also a good globular cluster. M80 has a magnitude of 7, making it a fairly bright globular cluster. It is a pretty sight in an 8-inch scope and is well worth locating if you are in the Scorpion region. RA= 16.15 DEC= -22 56

M4- A very nice globular cluster in Scorpio. It is located right next to Antares. A globular with a magnitude of 6, it is a pretty bright globular cluster. In my 8-inch scope, it is bright and a very nice looking cluster. M4 is very worth locating if you are the area.

RA= 16.22 DEC= -26 27

## GALAXIES

Galaxies, island universes that are millions of light years away from us are beautiful sights in telescopes. It is hard to grasp that every time you look at a telescope, it is a tool that can allow you to look millions of years in the past. In particular, galaxies. I will describe the galaxies: M51, M64, M81, M82, and M104.

M51-The famous Whirlpool Galaxy in Canes Venatici. M51 was the first galaxy to be found to have spiral form. Its 8th magnitude spiral form can be detected in a good 8-inch scope. M51 has a companion galaxy that is connected by spiral arms. RA= 13.29 DEC= +47 18



M64- The Black Bye Galaxy in Coma Berenices. An odd galaxy that has a black patch in the center of the galaxy. So, the name "black eye galaxy" comes from that patch in the center Of the galaxy. M64 has a magnitude of 8. It measures 7½' by 3½' and is easily located about 1 degree ENE from the star 35 Comae. M64 was discovered by J. E. Bode on April 4, 1779. You can make out the "black eye" in a good 6 or 8-inch scope. M64 is about 22 million light years distant.

RA= 12.55 DEC=+21 48

M81- A galaxy in Ursa Major. M81 is a galaxy of 8th magnitude and measures 25 by 12'. M81 has a companion galaxy, M82. M81 and M82 appear in the field of a telescope at low power. They are in the same field of view together. M82 is an interesting galaxy in the sense people once thought that M82 was an exploding galaxy. M81 and M82 are different in the fact that M81 is a spiral galaxy and M82 is an irregular galaxy. M82 has a magnitude of 9 and measures 10 1.5'. The two galaxies make a striking sight in a 6 or 8 inch scope.

M81's coord's- RA=9.54 DEC=+69 09      M82's- ,0- RA=9.54 DEC=+69 47

M104- The famous Sombrero Galaxy in Virgo. Another odd looking galaxy. M104 is an edge-on galaxy that has a dark line across the center of the galaxy. That line across the center cuts the galaxy in half making it look like a sombrero. M104 is a spiral galaxy with a magnitude of 9. With that magnitude, it is fairly bright in an 8-inch scope. In a 6 or 8-inch scope, you can make out the sombrero shape. It is a good sight in a moderate telescope. RA= 12.39 DEC=-11 35

#### OPEN CLUSTERS

The Open Clusters I will describe are: M6, M7, M16, M23.

M6- A very good open cluster in Scorpio. M6 is 6th magnitude and a very good sight in a 6 or 8-inch scope. Because of its brightness, people call M6 the "jewel box". M6 is real close to its neighbor, M7. M6 is a new cluster, which accounts for its brightness.

RA=17.38 DEC=-32 11

M7- Another open cluster in Scorpio. Like its neighbor M6, M7 is a very nice open cluster. Both the clusters are next to the star Shaula (the star that marks the end of the Scorpio's tail). M7 is a little brighter than M6 having a magnitude of 5 compared to M6's 6. M7 is also the southernmost Messier object having a declination of -34 48. M7 is also a good sight in a 6 or 8-inch scope. RA=17.52 DEC= -34 48

M16- An open cluster with nebula around the cluster. The nebula is called the Eagle nebula. It has a magnitude of 7. An object like this is good for photography. Serpens is a constellation north of Sagittarius. A pretty sight with photography or a good-sized scope. RA= 18.17 DEC=-13 48

M23- A open cluster in Sagittarius. It is only 5 degrees west of M24. Possibly best open cluster in Sagittarius. It has about 120 stars over an area of 25 minutes of arc. M23 is 7th magnitude. M23 is a good sight in a 6 or 8-inch scope, M23 is about 2,000 light years distant. RA=17.55 DEC= -19 00

# W.A.S. Summer Star Party

PRIZES

August 11-12  
Camp Rotary

AWARDS

## Friday Night:

- Perseid Meteor Show Watch  
Join the observing team - bring a small or red flashlight - lounge chair & clipboard - charts provided

## Saturday Afternoon:

- Astronomy Slides - Show & tell  
bring your best photos
- Telescope judging
- Daylight telescope resolution tests
- Sunspot Drawing Competition
- ATM and Astronomy Rap Sessions

## Saturday Night:

- Campfire Picnic
- More Perseid Meteor Watches
- Messier Observing Contest  
bring your atlases, star charts etc -  
there will be a new twist on  
this favorite game

# NIGHTWATCH

Well, August is here again and the grand-daddy of all meteor showers is imminent...The Perseids. In this I hope to give you the basics on meteor observing so that you will be able to collect useful scientific data.

The first and easiest method to gather data is to simply count the numbers of meteors in a given area over a certain period of time. Do not try to observe the whole sky. It is best to pick one or two constellation areas about 45° from the radiant. You should do these counts for several nights before the predicted maximum and several after for about one hour each night. Try to observe during the same time period. If you can and are experienced enough try to differentiate between the shower meteors and sporadics. If you see a large number of sporadics coming from one direction, then make note of that too.

The next step involves the use of a tape deck or assistant to do some recording. What you will do here is record the time of each sighting of a meteor. It would help to have a short-wave radio with WWV or CHU near your microphone to record time as well as your voice. With a helper, the time is recorded on a sheet of paper at the time of each sighting.

Advancing the data collection further requires the recording of more descriptive information on each meteor. The data should include the following in the most complete reports:

Time- to the best available accuracy. Try to use short wave time signals or at least set your watch by them. Never use telephone time signals or general broadcast radio time.

Brightness- compare it to a nearby star.

Type- either sporadic or shower meteor.

Speed- Some meteors are so fast you will wonder if you actually saw one. But then I have seen some that take over a full second to burn out.

Length of meteor- This has nothing to do with any lingering train, just the length of the light streak.

Direction- From one star to another is a good way to note this.

Location-This would probably be included in the above, but if not make mention of it

Color- This can be quite distinctive from one shower to the next. It can indicate-true speed of meteor as well as composition.

Train- This refers to the 'smoke-train' left behind the meteor which is really ionized gas. Duration in seconds should be noted as well distortion of the train.

If you wish to photograph meteors this is valuable data as well. From what I am told it is relatively easy though I must confess I have yet to do it. You simply set your camera on an area some 450 from the radiant, open the lens for as long as ½ hour and catch star trails. It is recommended that you close the lens as soon as a meteor passes through the field and note the time of passage. In all cases the time should be accurately noted in case you caught an unseen meteor or a point meteor.

If you have experience in photographing meteors you might try a new twist, purchase a glass replica reflection or transmission diffraction grating and use it with your camera. These gratings can be purchased from Edmund Sci. Co. or better The American Science Center in Chicago (for faster shipment) for which I have catalogs. By putting these as close as possible to your camera lens (less than one cm.) it is easy to catch the spectra of any bright meteor. It turns out that this is a sorely neglected field. There are

only about two hundred of these photos in existence! This is a very promising field for the amateur astro.

Two photographers can put a further twist to this observing. By stationing each other about a mile apart and taking simultaneous photos you can determine the altitude of the meteors through trigonometric means.

So what would ensure the most complete coverage? A team of four observers in the following arrangement: 1. Two photographers spaced about a mile apart with gratings on their cameras, 2. An observer to handle visual descriptions 3. Another observer on the other side of the radiant from the first. Each of the observers should be using tape decks and sky charts like those available from Abrams Planetarium (they're 10¢ ea.) which cover the area above the horizon. On the charts note direction and length but do not dwell on this or you will miss meteors.

The last type of meteor observing is the most common and I would by no means downgrade it. First you get comfortable, laying down with a relaxing view of the area you wish to observe. Then after each meteor observed the words Oooooo and Ahhhhh should be chanted. This can be accomplished with or without a tape deck.

Here are some upcoming showers:

#### DELTA AQUARIDS

They reach a max. on July 28 when the radiant is 1250 from the sun. It has a poorly defined radiant in the general direction of the above star. These can be well seen from Jul. 25 to Aug.4.

#### PERSEIDS

At 139° from the sun this shower reach a max. on Aug. 12 with observable limits from Aug.4 to Aug.16. As many as 50 per hour can be seen normally. The radiant is large and not well defined.

#### ORIONIDS

This shower peaks out on Oct.21 with hourly rates of 10 to 20 meteors per hour. The meteors can be seen from Oct.15 to Oct.25 coming from multiple clustered radiants.

#### LEONIDS

This shower has a variable rate, peaking out on Nov.16. Usually from Nov.15 to Nov.20 many can be seen. Occasionally super-showers occur also known as meteor storms during which times rates of up to 33,000 per hour have been seen! This should definitely be on your list of showers to see.

I recommend the sources below for further information:  
OBSERVATIONAL ASTRONOMY FOR AMATEURS by J.B. Sidgwick  
ASTRONOMY A HANDBOOK by G. D. Roth



## OCCULTATION BY CYBELE

By Ken Kelly

On August 1, the minor planet 65 Cybele will occult the star SAO 93064 at about 6H 56M U.T. (2:56 AM EDT). The exact path over which the occultation will take place is not known at this time, but there is a chance that it could occur over southeastern Michigan. If it does, the brightness of the star will be diminished by a whopping five magnitudes: The magnitude of the star is 8.1, while that of Cybele will be 13.1; thus, the event should be observable even in a small telescope, weather permitting. Cybele will not be visible, except in large telescopes.

It is requested that as many observers as possible try to time the occultation from their home location. The purpose is to determine the diameter of the planet. A secondary purpose is to obtain very accurate positions of the planet and star. The equipment necessary is as follows:

1. A telescope.
2. A short wave receiver which can pick up time signals from WWV (2.5, 5.0, 10.0 or 15.0 MHz) or CHU (3.33, 7.335, or 14.67 MHz).
3. A stopwatch which can be read to 0.1 second.
4. A cassette tape recorder.

If an occultation occurs, it is necessary to time the duration of minimum light in order to determine the diameter. The procedure is as follows:

1. Start setting up the equipment about one hour before the event. This will give you plenty of time to find the proper star and get everything ready. (It might be of benefit to find the star a few days before, in order to become familiar with the star field.) A finder chart is included with this article.
2. Tune in WWV or CHU on one of the above given frequencies. Try several frequencies until the loudest signal is found.
3. Start the tape recorder about 10 minutes before the event.
4. Locate the speaker of the receiver near the microphone of the recorder. Also, hold the stopwatch near the mike so that the click can be recorded.
5. Start the actual observations about ten minutes before the event, in case the occultation occurs earlier than predicted.
6. Watch for secondary light flickers both before and after the predicted time. Such secondary events have occurred during recent occultations of Hebe and Herculina. There were two observations (one with a photometer and chart recorder) of a secondary event which took place before the main occultation of Herculina. This is attributed to a satellite of the planet.

7. If the light of the star dims, click the stopwatch near the mike ~ then callout what happened, As soon as the star brightens back to normal magnitude, stop the watch, making sure that the click can be heard in the mike. Callout what happened, then read the stopwatch with a magnifier, and call out the reading.

8. Continue to observe for about ten minutes, looking for a secondary flicker. Be sure to record it on tape if you see one.

If nothing at all is observed during the time of the event plus or minus ten minutes, this is called a negative observation. Such observations could prove to be very important in limiting the size of the planet, especially if someone only a few miles away got a positive one.

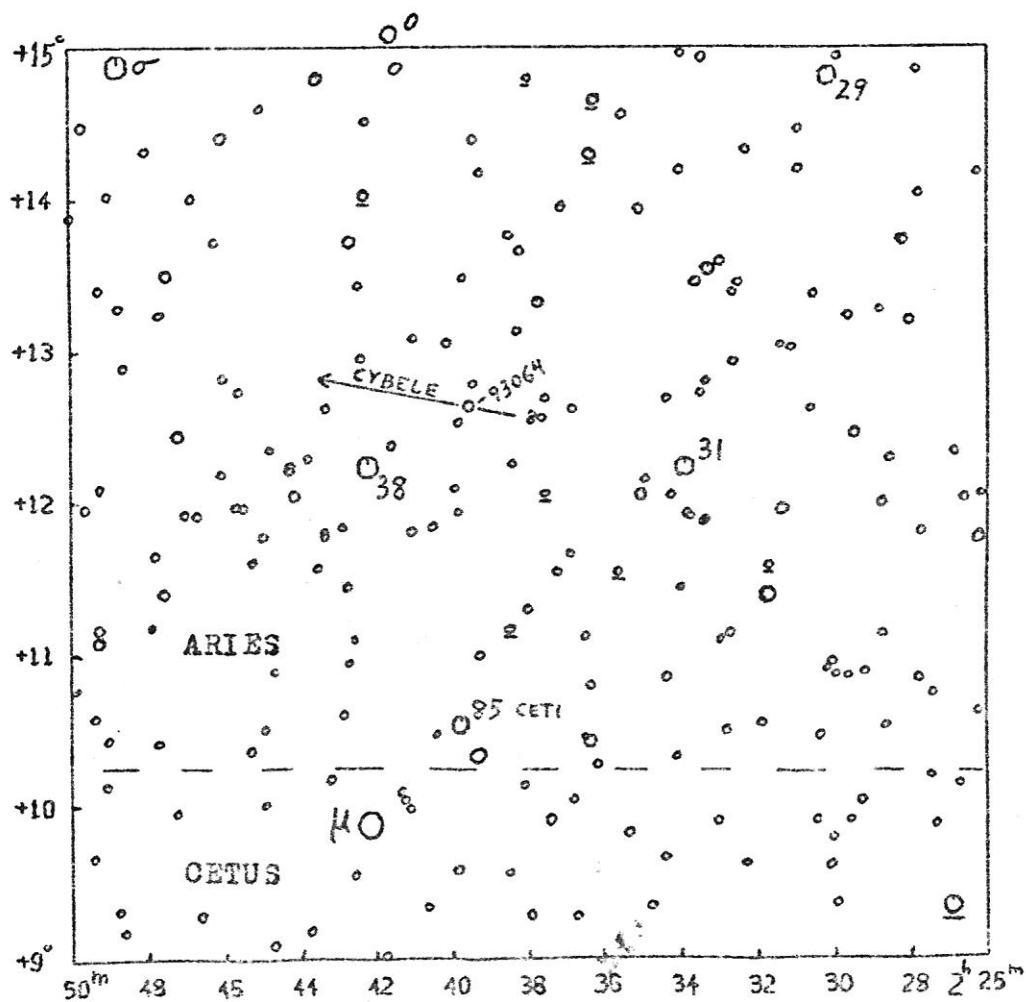
Be sure to report your observations, even if they turn out to be negative. A negative observation is better than no observation at all. If you report your observations to the writer of this article at (313) - 839-7250, I will collect them and call Dr. David Dunham, president of IOTA, and report your results to him. If you get a positive observation. IOTA will most likely want to borrow the cassette and make a detailed analysis. It will be returned to you, and you will be given full credit for your observations in "OCCULTATION NEWSLETTER" and other publications.

Clear Skies.

Ken Kelly

# SUGGESTED FINDING SEQUENCE

STAR	MAG.	R.A.(1950)	DEC.
ALPHA ARIETIS	2.0	2H 04.3M	+23° 14'
MU CETI	4.4	2 42.2	+09 54
38 ARIETIS	5.2	2 42.2	+12 14
SAO 93064	8.1	2 39.6	+12 38



Occultation of SAO 93064 by (65) Cybele, 1978 August 1

Diameter 309 km = 0".12

