The Warren Astronomical Society Paper

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The W.A.S.P. is the official publication of the Warren Astronomical Society and is available free to all club members as a privilege of membership. Requests by other clubs to receive the W.A.S.P. and all other correspondences should be made with the editor at the above address. Articles should be submitted at least one week prior to the date of the general meeting. W.A.S. members may advertise free of charge in the "W.A.S. Exchange".

Cover photograph: A dense star field near Eta Carinae

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W.A.S.

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

The Warren Astronomical Society is a local, nonprofit organization of amateur astronomers. The Society holds meetings on the first and third Thursdays of each month. The two meeting locations are listed below:

1st Thursday
8:00 p.m.
Cranbrook Institute
500 Lone Pine Road
Bloomfield Hills, MI

3rd Thursday
8:00 p.m.
Macomb County Community College-South Campus
K Building
14500 Twelve Mile Road
Warren, MI

Membership is open to those interested in astronomy and its related fields.
Dues are as follows and include a year's subscription to Sky and Telescope:

Student........................... $12.00
Individual........................ $20.00
College............................ $16.00
Family............................. $25.00
Senior Citizen...................... $16.00

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Stargate

Lectures are given at Stargate Observatory each weekend. The lecture will be either Friday or Saturday night, depending on the weather and the lecturer's personal schedule. If you cannot lecture on your scheduled weekend, please call the Chairman as early as possible or contact an alternative lecturer. Those wishing to use Stargate must call by 9:00 p.m. on the evening of the observing session. The lecturers for the coming month are:

July 18/19 ...................... John Root (464-7908)
July 25/26 ...................... Lou Faix (781-3338)
August 1/2 ...................... Dave Harrington (879-6766)
August 8/9 ...................... Frank McCullough (725-4736)
August 15/16 ................. Jim Yax
August 22/23 ............... Dave Dobrzelewski (979-3273)

Emergency back-up lecturers:
Doug Bock (533-0898)
Dennis Jozwik (754-2037)
Don Misson (727-9083)

The W.A.S. is soliciting requests for items useful in Stargate Observatory. Any donated items, such as star charts, a time or weather radio, reading lamps, eyepieces, photometers, high dispersion spectrographs, measuring engines, microdensitometers, etc., will be appreciated. Contact the Observatory Chairman.
MINUTES OF THE JUNE 19, 1980 MEETING OF THE WARREN ASTRONOMICAL SOCIETY

The meeting was called to order at 8:20 p.m., by the new president Frank McCullough. The evening's program was outlined.

Frank brought the photographic display boards that were used at the Apollo Rendezvous in Dayton, Ohio, June 13 & 14. WAS was the recipient of several awards for participation in the annual Apollo meeting.

WAS group photographs are still available at $3.00 a copy. See Frank for your copy.

Those planning to attend the Great Lakes Region Astronomy League meeting in Mentor, Ohio, June 27-29 were advised to check with Frank regarding car pools.

Dave Dobrzelowski gave an update on the Stargate Observatory dome.

Members are again asked to volunteer to bring refreshments to future meetings.

The membership roster is in the process of being updated. If members have any address, telephone number, etc., corrections, please give them to the new treasurer Nancy Tomczyk.

A discussion was held regarding the increase in annual dues for WAS members. Members voted on the proposed increase. Dues for student and senior citizens to be increased $1.00 and other members $2.00.

Nike Potter gave an interesting talk entitled "Variation Mass Discrepancy in Clusters of Galaxies."

After a short break, Louie Faix presented his slide show "Jets & Jeeps." Louie and Pat Krause visited Kitt Peak outside of Tucson, Arizona. They also visited with Rick and Delores Hill.

The final show of the evening was a short film "To the Moon" by Alan Rothenberg. A great home movie!

The meeting was adjourned and members retired to Denny's.

Respectfully submitted,

Connie Shannon, Secretary
William Herschel, the amateur astronomer born at Hanover in 1738, who gave up his musical career to pursue in earnest his study of the heavens when he came to Bath, England, had only constructed telescopes as a single phase of his voracious appetite for astronomy. In addition to his work with telescope specula construction and theory, as well as the enormous 40-foot scope, Herschel's astronomical observations with them won him much recognition among his contemporary observers.

a. The Lunar Mountains.

Ever since Galileo Galilei first turned his newly fashioned telescope on our moon, and saw that it presented not a perfectly round disk, but actually an irregular, jagged, and mountainous object, Galileo tried to determine the actual height of the mountains on the moon's visible face. Early estimates ranged upwards of five miles! Herschel himself addressed the problem, and, armed with the most accurate estimate of the lunar radius to date, measured various lunar peaks using a bifilar micrometer on a telescope. He used the classic method of measuring the angular distance between the lunar terminator's (sunrise/sunset line) and the peak of the mountain on the dark side of the terminator, just catching the sun's rays. He could then calculate the height of that peak in miles. Herschel concluded from his studies that the lunar mountains probably do not range more than 20,000 feet in altitude, in using the above method, as well as measuring the length of shadows of peaks on the bright portion of the moon, etc. One odd conviction Herschel held was that the moon was inhabited by some form of living creatures, and even as much as expressed a preference for himself of living there, to living on the Earth!

Among his studies of the moon, an early preoccupation of Herschel's, was the phenomena of red points of light being visible inside the dark portion of the moon. He observed an array of these on the reddened disk during a lunar eclipse as well. A theory never was advanced on the nature of this phenomenon, and he later abandoned the study. I don't know if the points on the dark portion can be explained, but could the ones seen during the eclipse be reddened sunlight glinting off glass deposits on the lunar surface?

b. Solar Observations.

Herschel was at times taken into the realm of pure physics by his studies of the sun. Although his chief interest lay in the stars in the night sky, this only made him curious about the nature of our own sun, as he considered it a typical star conveniently located for observation at close quarters.

The nature of sunspots had long puzzled astronomers, and Herschel took it upon himself to observe them to attempt to hypothesize for himself what they were, and possibly the nature of the composition of the sun's interior.
The Glasgow astronomer Alexander Wilson had conjectured that the sun was actually a cold body which was surrounded by a luminous shell or layer, from which all the radiation escaped from the sun, and that the sunspots were actually "holes" in this outer shell, through which the dark, inner surface of the sun's core could be observed. Many astronomers of the day subscribed to this theory, and some still do today.

Herschel himself felt that his own observational evidence supported the theory as well. In a paper he presented to the Royal Society, he discussed his hypothesis that a dark central body was surrounded by an extensive atmosphere, which was composed of several layers of "elastic fluids", or gases, one of which was luminous and the rest transparent. The bright patches, or faculae, he believed to be local accumulations of the luminous material, and the granulation in the solar disk's appearance, he explained as gases floating up from the depths of the atmosphere and by their decomposition, generated fiery clouds to produce the bright granules in the "corrugations".

Also, in the same paper was discussed the possibility of a fluctuation in the abundance of solar heat and light over time. He compared and recorded the price of wheat since 1650 against the record of solar fluctuations. While he could not identify a correlation there, he did find the solar fluctuations ran coincident with the sunspot occurrences. Herschel claimed that the sun ought to be classified with the variable stars as a result of the observed variation in the sun, but it would remain until 1843 when Schwabe "put two and two together", and discovered the sunspot cycle with a period of 11 years.

Herschel also ventured into the realm of physics when, while observing the sun with colored glass shades, he experimented with a variety of shade types, and found that the sensation of heat on his eye seemed to correlate not to the image intensity, but to the color of the glass! He wondered if the colored rays of a solar spectrum through a prism glass would show an unequal distribution of heating rays among the colors. Herschel set out to determine the relationship of color to the apparent heating rays by casting a solar spectrum onto a paste board through which slots were made at varying locations in the spectrum projection, and the rays coming through would fall on a series of thermometer bulbs, and the resulting temperatures would be taken to indicate the relative heating powers of the rays. He thus found that red contained more "heat" than green, and very much more than violet. In fact, it wasn't long before he realized that heating continued beyond red, where no spectral color was present. No measurable heat was present beyond violet, however. In further experiments, Herschel found that solar rays, whether visible or not, were all subject to the same laws of refraction and reflection. He also pioneered in the area of spectroscopy, when, by attaching a prism glass to the eyepiece of one of his telescopes, he resolved the light into spectra of six 1st-magnitude stars.
Wm. Herschel. part 2 con’t.

c. Mercury transit, Mars Study

The planets Mercury and Venus orbit the sun interior to the Earth, and can from time to time pass directly between the Earth and the sun, thus allowing for an excellent opportunity to calculate the distance to the sun, as determined by the latitudes of the observers on the Earth, and times of ingress and egress of the planet against the solar disk.

Herschel observed one such transit of Mercury, not to actually time the event, but to observe the course of events. He reported a sharp Mercurian disk, with no trace of the heretofore claimed presence of a "bright aureole" surrounding the planet by observers of previous Mercury transits, and Herschel recorded no distortion as the planet crossed the solar limb. These observations had been hypothesized by many astronomers to suggest the presence of a mercurian atmosphere.

Herschel observed the planet Mars to determine certain characteristics the astronomers of the day (and in later times, more precisely) sought after. As the Earth rotates on its axis, for example, which is tilted in a certain, essentially fixed orientation in space, Herschel thought that telescopic observation of surface markings of other planets could be instrumental in ascertaining the orientation of their rotational axes.

Other objects, like the sun, provide sunspots: Jupiter, its bands, Saturn, its bands and rings, and so forth. Mars, however, was small telescopically most of the time, and its surface markings were often distinguished only with difficulty. He turned to the white features on opposite limbs of the planet which were consistently visible, and sometimes conspicuous, for measurements from which to work. Herschel had hypothesized that these features were actually polar caps, not unlike the Earth's. He surmised that they were actually regions of ice and snow which partially melted when alternately turned towards the sun, as with the Earth, which is how he explained the variation in the caps' sizes. In observing occasional local changes in the surface features, Herschel was led to surmise that Mars "is not without a considerable atmosphere".

d. Asteroids, Saturn.

Bode's Law, which was realized in the late eighteenth century, 'had established a rough correlation between a mathematical relationship, and the distance of the planets from the sun. A serious flaw existed in it, however, one of the terms of the sequence could not be accounted for in the solar system. Astronomers searched the skies to find the "missing planet" between the orbits of Mars and Jupiter, as there was a vast gap between their orbits wherein no planet was known to be, and the Bode's Law, if taken literally as it seemed to suggest, had an orbit located at that distance. Early in 1801. Piazzi discovered a body in orbit, and he named it Ceres. Herschel soon began observing the unique object, and puzzled over whether to classify it as a planet or a comet. It appeared to be terribly small, and it was found to have a highly eccentric orbit, yet it did not display the characteristics of a fuzzy nucleus or any tail, typical of a comet.
Wm. Herschel, part 2 con’t.

Herschel measured Ceres' disk with his lucid-disk micrometer and reported his observations to the Royal Society. It wasn't long before yet another object like Ceres was found by Olbers, and was named Pallas. Herschel decided ultimately to classify the two objects in a classification all their own, for lack of a better solution. He coined the term, "asteroids", or star-like objects. In time, two more objects, which were named Vesta and Juno, were also observed, and Herschel confidently classed them with Ceres and Pallas.

In considering that many more such objects were likely to be discovered, turned to the problem of resolving the minute discs, in order to observe the shape of these curious objects, in the hopes of better understanding them. He knew that starlight, though essentially point sources, appeared to be round disks in the telescope. He wished to determine whether the aperture, the focal length, or the magnification were chiefly responsible for a telescope's ability to make a tiny planetary disk unmistakable from star's spurious, or Airy disk. In his experiments, he eventually found that masking the central portion of the telescope's mirror reduced the spurious disk, thus to aid in the identification, and observation of other asteroids.

With the planet Saturn, Herschel was intrinsically interested in the constituency of its rings, which Huygens in 1656, identified as a series of rings encircling the planet. Herschel devoted seven complete papers to his observations and analysis of the Saturnian system, the bands and zones, its satellites (of which he discovered two), and the Rings. He never quite considered that the rings could be composed of countless moonlets and fragmented, ice-covered rocks, as we do today, however, he held the notion of a solid object, which indeed they appeared to be in a telescope, not realizing the tremendous internal stresses that would result if that were the case.

Herschel noted the curious variation of the brightness of the satellite Iapetus, which was consistently observed to be brighter on one side of Saturn, than on the other. This he attributed to a moon whose surface is unequally reflective, and which rotates with the same period as its revolution about Saturn. He studied the bands and zones on Saturn's disc extensively, and through observations of occasional peculiar features, deduced a Saturnian rotation period of 10 hours, 14 minutes, just short of today's known value. He also observed a 'seasonal' change in the coloration of the polar regions. Above all, however, Herschel's greatest concern was whether the changes in Saturn's band features suggested the presence of an atmosphere. This question was answered for him during an occultation of one of its satellites, where he noted that the object appeared to 'hang' on to the limb of the planet for a long time before finally fading from view behind the planet. This, he reasoned, could demonstrate the refractive nature of a gaseous atmosphere enshrouding Saturn.

Next time, we explore with Herschel as he makes his greatest contribution to planetary astronomy: the discovery of Uranus!
STARGATE OBSERVATORY CODE OF CONDUCT

Use of the Stargate Observatory is a privilege of membership in the Warren Astronomical Society. We enjoy this privilege because the W.A.S. continues to meet the commitment of providing lecturers each weekend to Camp Rotary. As a result of meeting our commitment, we may use the observatory on almost any clear night of the year. Also, because our observatory is located on the Camp Rotary grounds, it is unique in that someone watches over it on a 24 hour basis, 7 days a week, and at no cost. Because the use of the observatory is a privilege and not a right, and the camp ranger is responsible for watching over the observatory; we must observe certain rules of conduct when we wish to make use of the Stargate Observatory facilities.

1. Any club member wishing to use the observatory must call the Observatory Chairman, or the W.A.S. President, or the VI.A.S. 1st Vice President (in that order) before 8PM on the evening they are going out to the camp. (Lecturers are exempt from this requirement on their scheduled dates only.) When you call you must provide:

   A. Your arrival time prior to 12AM.

   B. The names of all persons coming out with you. (You may bring non-member guests if you have prior approval.)

   C. A description of the cars you will be arriving in.

   D. What facilities you plan to use at the observatory.

Notify a club officer in the order given above and only in that order. The contacted club officer in turn will notify the camp ranger. If you cannot reach one of the above club officers, do not go out and do not call the ranger directly.
Use of the observatory will be allocated on a first come first served basis. If you should happen to be the second or third person to request use of the observatory on a given night, you will be asked to contact the person who called first and obtain their permission to come out and share the observatory. (Some people may not want company. Also, the first person to call is the individual responsible for the observatory on that night--unless he or she has made prior arrangements with the contacted club officer.)

Those who wish to bring out their own equipment, and not use the observatory telescope, may come out anytime. However, they must still contact a club officer before going out to the camp.

2. Lecturers are obligated to show up on one clear evening during their scheduled weekend or find a replacement lecturer for that weekend. After a replacement has been found, the Observatory Chairman must be notified of the change.

3. If you need a key to the observatory you will be loaned a key. The only individuals who are authorized to loan out keys are the three club officers mentioned in item 1. Lecturers' keys are not to be loaned out. Loaner keys must be returned within 24 hours, so that they are available for others to use. The only individuals authorized to have keys in their possession are the club officers and the active lecturers.

4. When you go out to Stargate have your W.A.S. membership card with you.

Even though the camp ranger has been notified you are coming out, he may still ask you to show your card to him.
5. If you should come out to the observatory without prior notification you will be challenged by the camp ranger. Your membership card will do you no good in this situation. For security reasons the ranger has been authorized to ask you to leave the camp grounds. If you do not leave immediately, he may have you arrested. (It should be noted that the camp ranger is often armed when approaching strangers at night.)

6. When you are in the camp drive slowly (less than 10 MPH). Remember, there are frequently many small children in the camp.

7. When at Stargate, stay in the immediate vicinity (within 100 feet) of the observatory. You are not allowed to visit the camps or cabins unless you have been invited by the adult leaders. You may, however, notify the various camp groups that the observatory is open--that is, if you are a lecturer. No one is allowed to roam around the camp grounds or set up their telescope in any location other than at the observatory without the permission of the camp ranger.

(The outhouse to the northeast of the observatory is available for use)

8. While at the observatory, keep all noise to a minimum--especially after 11 PM and during the warmer months. Be careful of loud talking or yelling, slamming car doors, and loud radios. Remember, sound travels easily in the damp still night air.

9. Upon first entering the observatory sign in on the log book, State the date, your arrival time, and who is with you. After you have closed up the observatory for the night, list the time.
High Reflectivity Coating Development

Although aluminum coatings are used for the mirrors of essentially all telescopes and most auxiliary instrumentation they have some serious disadvantages. The reflectivity of freshly deposited aluminum films barely exceeds 90% at wavelengths shorter than 1 micron and dips to 86% at 8500 Å. Furthermore, the coatings tend to show degradation with time; this effect is most severe in the UV. Because of the unprotected nature of the coatings, washing tends to be generally ineffective in trying to restore the reflectivity to the freshly coated level. It is apparent that in typical spectroscopic applications, at least 50% (and more often 80 to 90%) of available photons are lost simply due to reflection losses in aluminum coated mirrors.

It is possible to achieve much higher reflectivity coatings of relatively large optics, but these involve some other penalty. The Coatings Laboratory has developed in-house capability to lay down silver coatings, overcoated with sapphire, on blanks up to 0.5 meter diameter. These coatings exhibit reflectivities of 95:4 at 4000 Å, 98% at 6000 Å and about 99% beyond 1 micron. Because of the protective over-coatings, the reflectivity does not deteriorate with time and it is possible to wash off surface blemishes without affecting the properties of the underlying coatings. The present disadvantage of such coatings is that the reflectivity drops off sharply short of 4000 Å, crossing over that of fresh aluminum at 3800 Å, and being essentially useless short of 3400 Å. This poor UV performance has greatly limited application of the otherwise highly desirable protected silver coatings. There are, however, a number of possible approaches utilizing more complex multiple layer coatings which offer the possibility of achieving the high performance of the present overcoated silver coatings beyond 4000 Å while at the same time providing reasonable reflectivity between 3000 and 4000 Å. The coatings lab plans to investigate some of these possibilities in FY 80 and 81. Obviously, the development of such a coating for widespread use in telescopes and spectrographs would increase throughput by substantial factors in nearly all cases and markedly reduce maintenance requirements.

Don Hall
KPNO staff

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At present the cost of such coatings is vastly higher than aluminum and the costs are not expected to decline. It is not deposited with a resistive process like aluminum but rather by an electron beam gun. The equipment is expensive to buy and operate. KPNO labs puts the coatings on some of the equipment but cannot do any outside jobs ...

darn!

Rick Hill

For sale or trade: "Telescope World" 8" f/15 Classical Cassegrain with equatorial mount and motor drive, slow motion declination control, four foot pier, star diagonal. R.J. Shannon, 194 Moran, Grosse Pte. Farms, MI 48236. Phone (313) 885-4283.

For sale: 10" Star Liner f/5.8 telescope with mounting (same type as Rotary), clock drive, 50 rom finder, 24 and 8mm Brandon eyepieces and Barlow lens. Good condition. $550.00. Dave Mariotti, 714 North Wilson, Royal Oak, MI 48067. Phone (313) 545-6299.
Planetarium Roundup

McMath Planetarium
Cranbrook Institute of Science
500 Lone Pine Road
Bloomfield Hills, MI 48013
645-3225

August: "The Wanderers"
Daily ................................. 1:00 & 2:00 p.m.
Wednesday ......................... Extra show at 4:00 p.m.
Saturday ............................ 2, 3 & 7:30 p.m.
Sunday ............................... 2, 3 & 4:00 p.m.
Planetarium is included with museum admission;
$2.50 adult, $1.50 Student ages 5-21

We hear that.....

● The W.A.S. Solar Group has met 5 times at the residence of Dave Harrington. Dave reports that the sun has been quite active lately with many large complex groups. Meeting regulars Bob Wilson and John Baditoi have been making excellent detailed drawings of the spots. For information on meeting times, call Dave at 879-6765.

● The Michigan State University Astronomy Club will be meeting at the following locations this summer at 9:30 p.m.:

July 22 ............................... Abrams Planetarium
July 29 ............................... M.S.U. Observatory
August 5 ............................. Abrams Planetarium
August 11 ........................... Abrams Planetarium-Rose Lake State Park
August 19 ........................... M.S.U. Observatory

The above dates lie on a Tuesday, except August 11, which is a Monday.

● W.A.S. President Frank McCullough reports that the club was quite successful in recent competitions during the Great Lakes Region convention held in Dayton, Ohio, The Solar and Lunar/Planetary Groups won a first place award "For an Excellent Display." John Dombrzal won a merit award for his RFT. The W.A.S. won another attendance award for the most participants. This year's award included 2 volumes of the American/Russian Astrophysical Conference Report and photos of recent planetary "flybys." Approximately 200 participated in this convention from all parts of the region.

● Two increases in Sky and Telescope magazine subscription price have forced an increase in membership dues. Please note this when renewing your membership.

Remember . . . Things are looking up in the Warren Astronomical Society!
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SOCIETY. PETE KWENTUS OR MYSELF GARRY
WILL BE MORE THAN HAPPY TO BRING
YOUR SELECTION TO THE NEXT MEETING.
THANK YOU
AUGUST 1980

Information for helping teachers and students observe the sky

SKY CALENDAR

Monday, Aug 6
Full moon at opposition at 21:14 UT. At this time moon will be about 18° from Jupiter. Look for the near quarter moon around the 6th and 7th. Look for the near full moon around the 16th.

Tuesday, Aug 7
Mercury is at its greatest angular distance west of the sun (44°), but still remains a difficult object for amateur astronomers. Mercury is visible in the morning sky.

Wednesday, Aug 8
Venus at inferior conjunction. Venus enters the morning sky on the 9th.

Thursday, Aug 9
Venus at greatest eastern elongation. Venus is now visible both in the morning and evening sky.

Friday, Aug 10
Venus at its closest point to Earth. Venus is now visible both in the morning and evening sky.

Saturday, Aug 11
Mercury at its greatest angular distance west of the sun (40°). Mercury is visible in the morning sky.

Sunday, Aug 12
Full moon at conjunction at 01:45 UT. The moon is in the constellation Gemini and is visible in the evening sky.

Abrams Planetarium's 24-hr-per-day CURRENT SKY INFORMATION SERVICE (60-second recording): Call (517) 332-STAR
This chart is drawn for Latitude 40° north, but should be useful to stargazers throughout the continental United States. It represents the sky at the following local daylight times:

- Late July 11 p.m.
- Early August 10 p.m.
- Late August 9 p.m.

This map is applicable one hour either side of the above times. A more detailed chart by George Lovi appears monthly in the publication Sky and Telescope.

The planet Mars is plotted for mid-August, 1980. At chart time 7 objects of first magnitude or brighter are visible. In order of brightness they are: Arcturus, Vega, Altair, Antares, Spica, Deneb, and Mars.

In addition to stars, other objects that should be visible to the unaided eye are labeled on the map. The double star (Db1) at the bend of the handle of the Big Dipper is easily detected. The double star in Scorpius is somewhat harder. Much more difficult is the double star near Vega in Lyra. The open or galactic cluster (OCl) known as Coma Berenices, "The hair of Berenice", is located between Leo and Boötes.

A more compact open cluster is located between Sagittarius and the "tail" of Scorpius. Nearby, marked (Nb) above the "spout" of the "Teapot," is the Lagoon Nebula, a cloud of gas and dust out of which stars are forming. The position of an external star system, called the Andromeda Galaxy after the constellation in which it appears, is also indicated (Glx). Try to observe these objects with unaided eye and binoculars.

--D. David Batch