the spectrum

JANUARY 1967 BUFFALO ASTRONOMICAL ASSOCIATION EDITOR B. COOK

MONTHLY MEETING

The Observing Section and the Advanced Study Section of the Buffalo Astronomical Association will participate in the program to be presented in the club room of the Museum of Science on Friday January 13th at 8:00 P.M.

A report will be given on the recent activities and future plans of the observing section. Samples of the type of observations made by members of this section and a description of observational practices will be presented.

Members of the Advanced Study Section will present in panel form an abbreviated fac-simile of one of their recent meetings in which the "Milky-Way" was the topic of discussion. It is the intent of this presentation to be both informitive as to subject matter and illustrate to the general membership the form and scope of their activities.

Following the meeting will be our usual coffee & donut social hour-ect.

CONVENTION COMING IN MAY1967

Plans for the coming convention in May are still being formulated, those aspects that must be caried out now have been attended to. For example although many of the visiting groups we expect to attend have already been previously notified and informally invited to attend, now formal invitations are being printed up and sent out to all groups concerned. Together with this formal invitation which includes the program below, the papers committee of the general convention committee has sent out its requests and specifications for papers to be presented at the afternoon sessions on May 27th. It is by no means intended that all the papers presented should be by members of attending groups. The invitation to present a paper or papers is also open to all members of thr B.A.A. Indeed, previous experience has shown that often the most interesting papers presented are by members of the host organization. The paper need not be something new, many of our own members have presented highly interesting talks at our own monthly general meetings, often accompanied by carefully prepared charts and diagrams. This same talk if "dusted off" and perhaps up-dated by more recent information would certainly be an excellent one to present at the convention. So any B.A.A. member wishing to present a paper should notify the Papers committee in writing before February 15th of the topic of his paper and the appropriate length of time required for presentation. Papers requiring more than 30 minutes to present will not normally be accepted by the papers committee unless they prove to be of unusual merit.

At the board of directors meeting on Nov. 19, 1966 it was suggested that the board as a whole, act as the "general chairman", since all board members will be a main part of all committees and will therefore report as a whole on all functions.

The following committees were established:

Publicity:	Paul Redding: chairman
	Carl Kalweit
	Seville Chapman
Exhibit:	Ed Stoklosa: chairman
	Ed Banaszak
Printing:	Dick Zygmunt: chairman
	Frank Fronczak
Papers:	Ron Clippinger: chairman
	Edith Geiger
	Ed Lindberg

Any B.A.A. member interested in participating in convention planning should contact the chairman of any of the above committees. As convention time approaches additional committees will have to be formed, concerned with such things as welcoming, transportation, accomodation, etc. All B.A.A. m members who would be interested in aiding these committees or being of general assistance to the convention committee are requested to contact someone on the general committee as soon as possible.

For your convenience we are reprinting here the program for the convention.

Friday, May 26, 1967
- 6:00 P.M. Registration at Hotel Statler - Maple Leaf Room
- 8:00 PM. Star night at Newstead

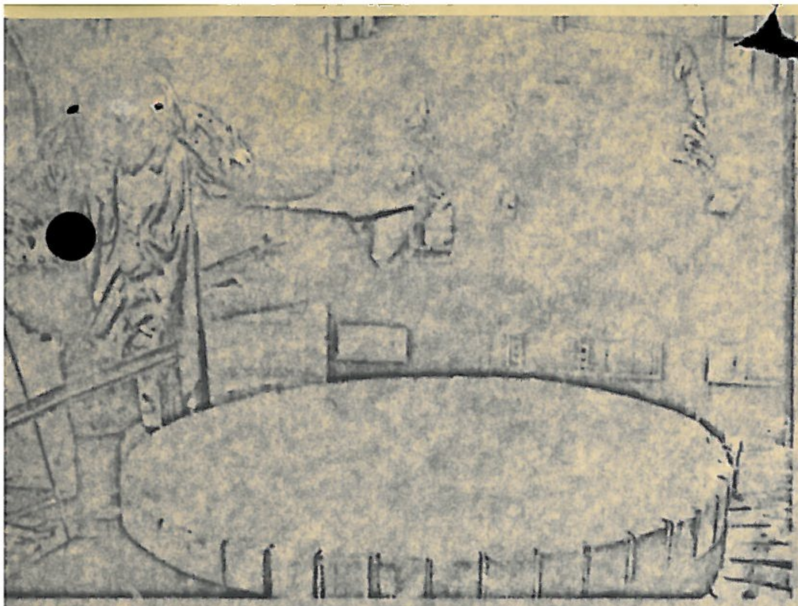
Saturday, May 27
- 8:00 - 9:30 AM Registration and Exhibits - Washington Room
- 9:30 - 11:30 AM. Presentation of Papers - Empire State Room
- 1:30 - 2:30 PM. A.L. business meeting - Empire State Room
- 2:30 - 3:30 PM. "Story of Stellafane" - Empire State Room
- 3:30 - 5:00 PM. Additional Papers - Empire State Room
- 6:30 - ? PM. Banquet, guest speaker - Georgian Room

Sunday, May 28
- 9:00 - ? AM. Continuation of exhibits - Washington Room
- 10:00 - 12:00 Visit to Buffalo Museum of Science Solar Observatory.
- 1:30 - 3:00 PM. Visit to Walter Semerau's Solar Laboratory. Or, if inclement weather, films at the museum.

JANUARY SECTION MEETINGS

The Advanced Study Section will meet on the fourth Friday of January, the 27th at 7:00 PM. This will be followed by the meeting of the Observing Section at 8:30 PM.

There will be no meeting of the Instrument Section this month.



Using an optical pyrometer, a technician takes a temperature reading of the 41-inch mirror blank just out of the melting furnace.

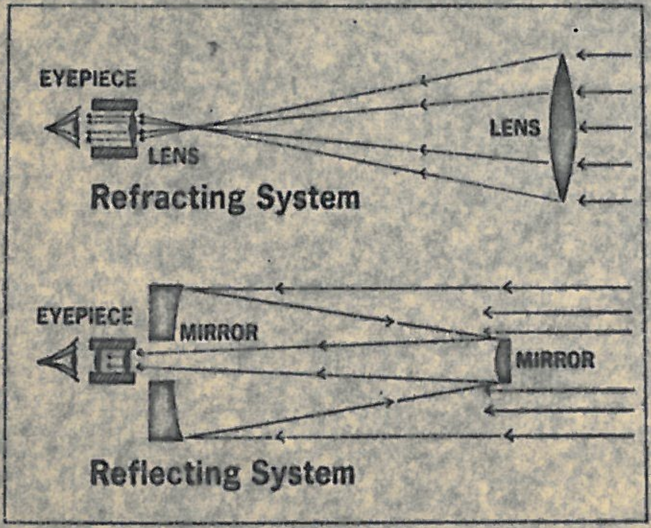
GLASS-CERAMIC FOR TELESCOPE MIRRORS HOLDS GREAT PROMISE

Better photographs of distant stars and other celestial objects are in the offing as the result of a newly developed mirror material soon to be in use in reflective optical telescopes.

The material, referred to by one eminent scientist as "one of the most important technological advances in astronomical mirrors in hundreds of years," is called "Cer-Vit." It was developed by Owens-Illinois in the course of the company's research program at its Technical Center in Toledo.

The advantage of "Cer-Vit" glass-ceramic materials for optical use lies in their extreme stability. A piece of "Cer-Vit" material one inch long will expand or contract no more than one ten-millionth of an inch for every degree it is heated or cooled. The thermal expansion of mirrors made of "Cer-Vit" can be reduced to less than that of fused quartz and other materials now used for reflecting mirrors.

Because the glass-ceramic holds such great promise for optical applications, Owens-Illinois for the first time has gone into the manufacture of mirror blanks for astronomy and astrophysics observatories. Now being processed at O-I's Development Center in Toledo are "Cer-Vit" mirrors for telescopes at three observatories: the University of Toledo's new Ritter Observatory; the Yerkes Observatory of the University of Chicago, at Williams Bay, Wis.; and the McMath-Hulbert Observatory of the University of Michigan.



Refracting and reflecting telescope systems are diagrammed above. "Cer-Vit" mirrors will be used in the latter type.

The primary mirrors of the new reflecting mirror systems being processed for the Ritter and Yerkes sites are 41 inches in diameter. Only a few of the free world's reflecting telescopes are larger. All three mirror systems are scheduled for delivery during 1966.

Dr. A. Keith Pierce of the Kitt Peak National Observatory in Tucson, Ariz., feels that the new telescope material's stability under temperature extremes should produce better photographs of distant stars and other celestial objects as well as provide a substantial increase in the amount of effective viewing time.

"Large mirrors made of present materials always lag far behind the temperature of the surrounding air," explains Dr. Pierce, who is associate director of the Kitt Peak solar division. "Waiting for the mirror to 'catch up' with the local ambient temperature and become stable results in a great loss of time for facilities that are worth millions of dollars and in great demand. Stability of the focus and shape of these present mirrors, and consequently, the sharpness of the image on the photographic plate are very rarely good. This causes a loss of information in photographs and efficiency in the telescope. 'Cer-Vit' low-expansion mirrors should help to solve this problem. They should also make a major contribution to the nation's space program and to the study of the sun and the planets.

"Cer-Vit" mirrors offer an advantage in processing, too. Grinding and polishing telescope mirrors made from present materials is a time-consuming process now because the materials become thermally unstable, necessitating frequent and lengthy halts during the finishing operation. Low-expansion "Cer-Vit" materials, on the other hand, can be ground and polished continuously with no stops.

O-I plans to make mirror blanks for university and professional observatories in the immediate future and, later on, perhaps for related markets.

PARTIAL OCCULTATIONS OF PLANETS BY THE MOON

Ordinarily, several occultations of planets by the Moon occur each year. Near the northern and southern limits of the regions of visibility of these occultations, a graze may be visible. However, since the angular sizes of the planets are larger than the mountains along the Moon's limb (with the exception of Pluto, which is too faint to be seen near the Moon), grazes of planets are not at all like grazes of stars, since planets cannot undergo multiple disappearances and reappearances. A grazing occultation of a planet is properly called a partial occultation, since near the northern or southern limit of an occultation of a planet, the planet is never completely occulted by the Moon, but is only partially covered by the Moon at maximum, or central, occultation. During the partial occultation, the Moon's limb is silhouetted against the planet's disk. At the predicted northern or southern limit of the occultation, the planet will be exactly half-covered by the Moon at central occultation; the partial occultation will be visible from a band several miles wide, the center of the band being the predicted northern or southern limit.

Partial occultations of planets are quite rare; as far as I know, only four have been observed to date: One of Mars, July 31, 1798, by J. Schröter in Germany (SKY AND TELESCOPE, Feb., 1957, page 167); one of Jupiter, April 30, 1944, by several observers in France (l'ASTRONOMIE, Vol. 58, page 102); one of Mars, February 23, 1948, by David Rosebrugh in Waterbury, Connecticut; and one of Jupiter, June 27, 1965, by Bill Fisher and myself near Nevada City, California (SKY AND TELESCOPE, Oct., 1965, page 250). Only the last one was predicted and was the only one observed in the daytime. Since I am now computing predictions for all partial occultations of planets visible from the Earth's surface, many more observations of these interesting events will probably be made.

It is more difficult to predict a partial occultation of a planet than a graze of a star since the changing position and the distance (or horizontal parallax) of the planet must be taken into account. Therefore, I wrote a special computer program (completed in February 1964) to compute partial occultations and take these additional factors into account.

The predictions for partial occultations are in the same format as those for the old "ephemeris" predictions described in OCCULTATION LIMIT COMPUTER PREDICTIONS (attached to ADDITIONAL NOTES), except that a ninth column (PROJECTION, MILES) and interpolated positions are added. Another difference is that only data for the ninth iteration is given for each time, rather than data for the seventh, eighth, and ninth iterations. Note that the time is given in hours and hundredths of hours, rather than in hours and minutes. Similarly, latitude and longitude are given in degrees and decimals of degrees. Note that the longitudes given are east longitudes, contrary to the current predictions for grazing occultations of stars. At the bottom of the ephemeris data, a second heading is given, below which are given four sets of longitude and latitude coördinates, interpolated for equal intervals of longitude. These are east longitude, in degrees and decimals of degrees, and north latitude, also in degrees and decimals of degrees, similar to the ephemeris data. The procedure is to use the interpolated coördinates to plot the northern or southern limit on a map and then use the ephemeris data to determine the conditions (time of central occultation, Moon altitude, etc.) for any place in the limit.

The width of the band from which the partial occultation will be visible can be computed with the help of PROJECTION, MILES. The half-width, q, of the partial occultation band in miles is given by the formula

q equals p times square root of $(\sin^2 D + \cos^2 D \sin^2 a)$,

where p is the number listed under PROJECTION, MILES; D is the difference of the Moon's azimuth and the azimuth of the limit (discussed in the last paragraph of OCCULTATION LIMIT COMPUTER PREDICTIONS and illustrated in Figure I of HOW TO USE THE PREDICTIONS AND PROFILES); and a is the Moon's altitude. The total width of the partial occultation band is 2q miles. The northern edge of the band is q miles from the predicted limit measured approximately northward but measured perpendicular to the predicted limit; the southern edge of the band is measured similarly, but is approximately south of the predicted limit. It is not necessary to know exactly what p is, but for those interested, it is the semi-major axis of an ellipse formed by projecting the planet (assumed spherical, with polar radius used) through the grazing point on the Moon's surface onto a plane tangent to the Earth's surface at the predicted point in the limit; the topocentric distance to the Moon is used in the calculation.

Since the planets are so bright, it is not difficult to see occultations of them in the daytime. However, I expect that daytime occultations (and partial occultations) of Saturn would be quite difficult to observe, especially if the planet is close to the Sun or if the sky is hazy, due to the planet's low apparent surface brightness. If the occultation occurs within about 3 days of new moon, it will not be possible to locate the Moon with the unaided eye. In order to know where to look, observe a star with the planet's approximate declination the night before (or any night before) and at a time when the star will be in the same hour angle as that of the planet at the time of occultation (or shortly before). At that time, line the star up with the top of a telephone pole, tall tree, or tall building and mark the spot where you are standing so you can return to it for the occultation. Care should be taken so that a location which will be in the shade at the time of the occultation is selected. Mr. Fisher and I used the above procedure using the star Beta Herculis for the partial occultation of Jupiter in 1965 and it worked very well. Complete details of this method are given in an article by me on page 32 of the June-July, 1965, issue of THE REVIEW OF POPULAR ASTRONOMY. If you have trouble figuring out which stars to select or when you should observe a particular star for a partial occultation, I will supply the data upon request.

The best place from which to observe a partial occultation is not from the predicted limit but from near the southern edge of the partial occultation band for northern limits and near the northern edge of the band for southern limits (just the opposite in some cases for the polar regions of the Earth when the occultation shadow passes "over the pole"before intersecting the Earth's surface), that is, on the edge of the partial occultation band closest to having a full occultation. This will prolong the partial occultation to its longest possible extent; the planet will be almost completely covered by the Moon at central occultation. If the planet's surface brightness is greater than that of the adjacent limb of the Moon (as it would be if the partial occultation took place on the dark limb; in some cases, mainly during the crescent phases, it would also be true if it occurred against the sunlit limb), observers could time when parts of the planet appear and disappear in deep lunar valleys. Such observations could be used to derive information about the limb corrections (as we do with grazes of stars) and the relative positions of the planet and the Moon. A line of observers could be set up, similar to a graze, from the southern edge of the partial occultation band (for a northern-limit event) to about two miles south of the southern edge, or from the northern edge of the band (for a southern-limit event) to about two miles north of it, to obtain the best information.

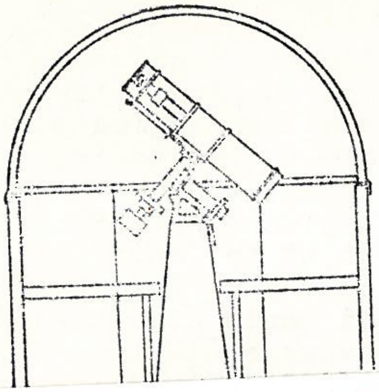
Predictions for grazing occultations of asteroids will be similar to those for partial occultations since the motion and horizontal parallax of the asteroid have to be taken into account, just as they must for planets. In such cases, PROJECTION, MILES will always be zero. Grazing occultations of asteroids, Titan, and the Galilean satellites of Jupiter can be observed like grazes of stars, but partial dimming of these objects would be common since their angular diameters are greater than those of stars. Grazes of Titan and the Galilean satellites can be observed against the Moon's dark limb during the night and at favorable lunar phases; if you want to observe such an event near a predicted northern or southern limit of an occultation of Saturn or Jupiter, send me a letter giving the position angle of graze and width (or half-width) of the partial occultation band in the area where you plan to observe it, and I will try to tell you how many miles north or south of the predicted limit you should travel to see the graze of the satellite.

December 12, 1966

David W. Dunham
Yale University Observatory
Box 2023 Yale Station
New Haven, Connecticut 06520
U. S. A.

TONAWANDA, N.Y.
APR 7
PM
1967
14150

Mr. Bruce Cook
Mrs. Edward Cook
33 Burbank Drive
Snyder, N.Y.
14226



NORTHEASTERN REGION CONVENTION
ASTRONOMICAL LEAGUE

MAY 26-28, 1967