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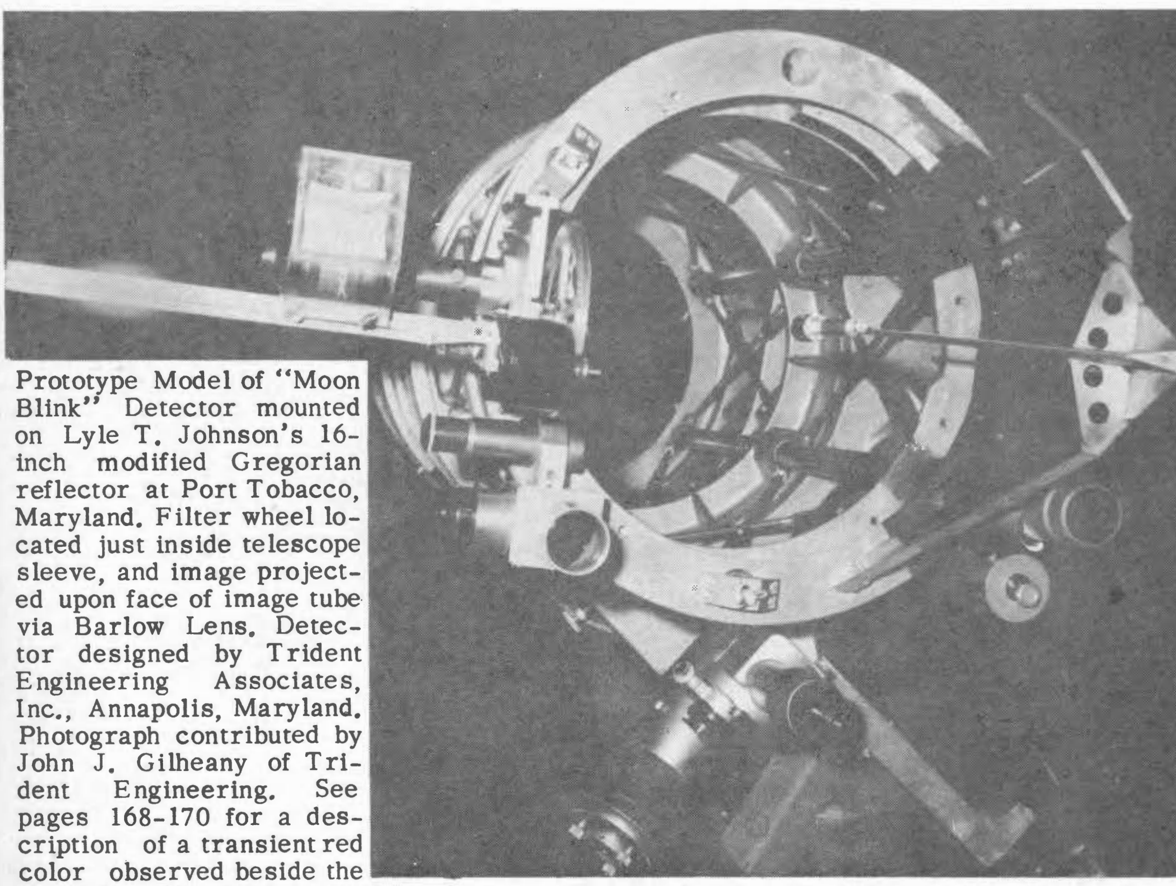

Prototype Model of "Moon Blink" Detector mounted on Lyle T. Johnson's 16-inch modified Gregorian reflector at Port Tobacco, Maryland. Filter wheel located just inside telescope sleeve, and image projected upon face of image tube via Barlow Lens. Detector designed by Trident Engineering Associates, Inc., Annapolis, Maryland. Photograph contributed by John J. Gilheany of Trident Engineering. See pages 168-170 for a description of a transient red color observed beside the central peak of Alphonsus by three persons on October 27, 1964 with Mr. Johnson's telescope, both with and without the "Moon Blink" Detector here shown.

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IN THIS ISSUE

SOME NOTES ON THE COMING 1964-5 APPARITION OF MARS

By: Klaus R. Brasch, A.L.P.O. Mars Recorder

The forthcoming apparition of Mars will be the third unfavorable approach of the planet in the current series of four. The oppositions of 1960, 1963, 1965, and 1967 are near-aphelic, and hence the apparent diameter of the planet's disk remains relatively small during this time. However, since the north pole of Mars is tilted towards the Earth on these occasions, they do present an opportunity to study the less well known northern hemisphere and polar cap. Opposition occurs on March 9, 1965, when Mars will be 62 million miles away and will exhibit an apparent diameter of 14". Useful observations can be carried out during the period commencing at the end of December, 1964, and lasting through June, 1965. During this time the apparent diameter of the disk will be 8" and larger.

Members are asked to submit their observations on the standard A.L.P.O. Mars report forms. These are available upon request from the Recorder and should be returned to him upon completion.

The following is a general outline of a suggested observation program, which if followed should provide observational data of some value.

1) Disk Drawings: It is best to observe the planet for at least fifteen minutes before any sketching is attempted in order to let the observer's eye become adapted, and to obtain a clear picture of the detail visible. The time is then accurately noted to the nearest minute, and the major features are put down carefully as positioning points. When this is done the time is again noted, and the fine detail and finishing touches are added. The entire sketch should be carried out within fifteen minutes so as to minimize error due to the rotation of the planet. Of prime importance in any drawing of Mars is an accurate portrayal of the polar caps, whose size may vary considerably during the course of the apparition. When one is attempting to estimate a cap's size, it is helpful to imagine two parallel lines (similar to the north-south line in Jupiter transit observations) running north-south along the planet's disk, starting at the extreme edges of the polar cap. The width of the space between the lines, or the extent of the cap, can then be estimated as a fraction of the total diameter of the planet's disk, and can be drawn to scale on the report form.

   Such drawings, if carefully executed, can be used for positional measurements, for the construction of a chart of the surface detail, and for the study of the activities of clouds, polar caps, and related phenomena. These observations may usefully be supplemented close to the time of opposition by central meridian transit timings.

2) Filter Observations: Whenever possible, filter observations should accompany the ordinary drawings. Such observations can be valuable for the detection and study of atmospheric phenomena, including clouds, veils, haze, and the blue clearing. Most useful for this purpose are the standard Wratten Filters: no. 57 (yellow green) for white surface haze or clouds, no. 47-B (deep blue) for high altitude white clouds, nos. 15, 21, and 25 (yellow to red), and nos. 38-A, 47-B, and 48-A (blue) for the blue clearing. In the last instance, a comparison is made between the intensity of surface features as seen through both sets of filters. If the intensity is found to be comparable, a blue clearing is indicated.[1]

3) Intensity Estimates: This comprises the recording of the visual intensities of surface markings with reference to a scale ranging from 0 (apparent brightness of the sky in the vicinity of the

planet) to 10 (mean brightness of the polar cap). This scale is the reverse of the one previously employed by the Mars Section[2] but is in keeping with scales used by other A.L.P.O. Sections.

Final Remarks

To be complete, all reports must be accompanied by standard information concerning the time and date on which the observation was made, telescope and magnifications used, seeing and transparency conditions, filters employed, and of course the observer's name, address, and observing station. In addition, all those taking part are urged to exercise the greatest care and thoroughness when undertaking observations; for in order to be of value in modern astronomy, amateur efforts must strive to set the highest standards possible.

References

1) Capen, C., "Filter Techniques for Planetary Observers", Sky and Telescope, Vol. 17, 1958, p. 517.

2) Both, E., "The A.L.P.O. Mars Program for 1960-61", Str. A., Vol. 14, (7-8), 1960, p. 99.

PLANETARY OCCULTATIONS AND APPULSES IN 1965

1. The following occultation by Jupiter has been predicted:

Date	Star	Area of Visibility	Station	Disappearance U.T.	Disappearance P	Reappearance U.T.	Reappearance P
Aug.24	B.D. +22°1032 ($7^m.5$)	W. Australia	Perth	$21^h.6$	35°	$22^h.5$	325°
		Asia	Hyderabad	21 .7	24	22 .3	335
			Tashkent	21 .9	10	22 .2	346

This is a grazing occultation near the north pole of the planet, and thus the times are only given to $0^h.1$. An investigation of the relative positions of satellite IV and the star for a time some twelve hours prior to conjunction with the planet indicates that a fairly close appulse will occur. Thus interested observers in America should watch out at about $09^h 30^m - 10^h 30^m$, U.T. in case of an actual occultation.

2. No occultations of radio sources by planets are predicted.

3. The following appulses may be of interest to observers:

Planet	Date	U.T. of Conjunction	Star	Mag.	Geocentric Separation*	Horizontal Parallax
Mars	May 21	$12^h\ 08^m$	χ Leonis	4.7	-13"	8"
Jupiter	July 30	21 03	B.D. +22°914	7.7	-18	2
	Aug. 16	18 24	B.D. +22°989	8.3	+27	2
	Aug. 21	05 23	B.D. +22°1017	8.5	-28	2
	Aug. 24	22 04	B.D. +22°1032	7.5	-16	2
	Dec. 20	04 53	B.D. +22°1015	8.2	-26	2
Neptune	June 27	14 59	B.D. -14°4102	8.0	-10	0.3

Postscript by Editor. We are again indebted to Mr. Gordon E. Taylor of the Royal Greenwich Observatory at Herstmonceux Castle for the data given above. We again heartily invite all members who are favorably situated to observe as many of these phenomena as they can. We shall appreciate receiving their reports.

*The geocentric separation given here is in the sense $\delta_p - \delta_*$.

A NEW TYPE OF MICROMETER FOR USE AT THE TELESCOPE

By: Philip R. Glaser, A.L.P.O. Jupiter Recorder

Recently a set of Jovian belt latitude determinations was submitted to the Jupiter Section by Mr. Ken Schneller of Cleveland, Ohio. The measures were made directly at the telescope with an inexpensive, simple instrument of Mr. Schneller's own design and construction, which he calls a "comparison micrometer". He writes of it as follows:

"The device is very inexpensive to make and may yield good results. It consists of a finely divided scale (0.1 mm. units) mounted at the focus of an illuminated magnifier equipped with a green filter to reduce glare. The planet is observed in the telescope eyepiece with the right eye while the illuminated scale is viewed with the left eye. The illuminated magnifier is held in the hand (which is propped against a ladder) and pressed against the face to insure a stable grip. The images of the planet and the scale are superimposed, and a reading is made. On the scale, each division corresponds to 0.636 seconds of arc at the magnification which I use. Estimates to 1/10th division are easily made; while in good seeing they can be extended to 1/100th division.

"This 'comparison micrometer' has many advantages over the filar type. Since the scale is illuminated, the end-points are not lost in the dark sky (i.e., planet diameters are more easily measured). The markings on the scale do not block out detail . . . hence more reliable measures. Also, there is no worry about 'play' in a micrometer screw; and corrections for changes in temperature can be disregarded. There is no vibration of the telescope when making readings, since the micrometer never touches it; thus readings can be made much faster than with the conventional filar type. Cost for my 'comparison micrometer', excluding scale, was $1.75.

"It should be understood, however, that the accuracy of this device is not only limited by the quality of the telescope mirror or objective used, but may also be severely dependent upon the use of a well-corrected telescope eyepiece of the orthoscopic, symmetrical, or Plossl type. Under certain conditions, when an image is to be put only slightly off-axis to eliminate chromatic aberration, a Ramsden eyepiece may be used; but, in any event, it is most desirable to reduce field-curvature. This can be achieved by using an achromatic Barlow lens which, in most cases, will not only reduce field-curvature but will also tend to give a beneficially darker field.

"The idea for my 'comparison micrometer' is not exactly original. It is based on Schroeter's 'projection machine', which consisted of a board ruled with squares mounted on the side of his telescope. The grid was observed with one eye; the telescope image, with the other. Schroeter used this device to measure lunar mountain heights (Wilkins & Moore, The Moon, p. 17); so I may thank Schroeter and these authors for my 'inspiration'".

Other amateurs may wish to construct and experiment with Mr. Schneller's "comparison" type micrometer. If so, a suitable scale would seem to be one which is available from American Science Center Inc., 5700 Northwest Highway, Chicago, Illinois (their reticle # 30,323, approximately $6.50). Suitable, but much less accurate, scales may also be made photographically by the amateur himself. Using such scales, an independent series of tests employing Mr. Schneller's method has been made. These results indicate that the necessary observing technique is not difficult to master and that with some practice the "comparison micrometer" may indeed be capable of yielding good lunar and planetary measurements.

Postscript by Editor. The reader is referred to pp. 269-271 of B. M. Peek's classic The Planet Jupiter for diagrams defining zenocentric and zenographic latitude and for the formulae used in reducing measurements.

Readers are cordially invited to discuss the "comparison micrometer" with Messrs. Glaser and Schneller, better still first to construct such a device and then to make some measurements. Mr. Elmer J. Reese recommends, for example, that it would be much better not to hold the magnifier in one's hand but instead to provide a mount, as in binoculars.

A Reduction of Latitude Measurements of Jupiter, Nov. 4, 1964 (UT)

$r = 359.25$ $D_{\oplus} = +3^{\circ}.33$

Belt	$\sin \theta$	θ	Zenocentric latitude β	Zenographic latitude β''
STB, N. edge	172.25/r	-28°.70	-23°.65	-26°.68
SEB_s, center	120.25/r	-19.58	-15.19	-17.31
SEB_n, S. edge	73.75/r	-11.85	- 7.72	- 8.84
NEB, S. edge	29.75/r	4.75	7.78	8.90
NEB, N. edge	75.75/r	12.18	14.75	16.81
NTB, center	132.25/r	21.60	23.69	26.74

All micrometer measurements were made by Mr. Schneller with a comparison micrometer used with an 8-inch Newtonian at 856X with a Barlow lens, S = 6-7, T = 5. A scale was used in which one division corresponds to about 0.5 seconds of arc. One micrometer unit is represented as 1/10th division and can easily be estimated at the above magnification. Errors of measurements are approximately 0°.1. The above values are weighted means of six or more measurements.

SATURN IN 1963

By: Thomas A. Cragg and Joel W. Goodman, A.L.P.O. Saturn Recorders

This report was compiled on the basis of observations submitted by the following contributors:

Bartlett, J.C.,Jr.	Baltimore, Md.	5" Refl., 6" Refl.
Binder, A.	Tucson, Ariz.	4" Refl., 4".15 Refr.
Brasch, K.	Rosemere, Quebec, Canada	8" Refl.
Budine, P.W.	Binghamton, N.Y.	4" Refr.
Capen, C.	Wrightwood, Calif.	16" Refl.
Chalk, K.T.	Montreal, Canada	8" Refl., 6" Refr.
Cooke, D.	Edinburg, Texas	17" Refl.
Cragg, T.A.	Mt. Wilson, Calif.	6" Refr.
	Inglewood, Calif.	12" Refl.
Cyrus, C.M.	Baltimore, Md.	10" Refl.
Delano, K.J.	New Bedford, Mass.	8" Refl.
Dragesco, J.	Thonon, France	7" Refl.,10" Refl.
Goodman, J.W.	San Francisco, Calif.	10" Refl.
	Mt. Hamilton, Calif.	12" Refr.
Gordon, R.	Pen Argyl, Pa.	4" Refr.
Haas, W.H.	Las Cruces, N.M.	6" Refl.,12".5 Refl.,16" Refl.
Knauth, P.	Houston, Texas	12".5 Refl.
Kolman, R.S.	Chicago, Ill.	6" Refl.
Lund, J.	Chautauqua, N.Y.	6" Refl.
Milon, D.	Houston, Texas	12".5 Refl.
Ricker, C.L.	Marquette, Mich.	8" Refl.
Rippen, G.W.	Madison, Wisc.	6" Refl.
Schneller, K.	Cleveland, Ohio	8" Refl.
Spivak, R. B.	Brightwaters, N.Y.	10" Refl.
Wedge, G.	Montreal, Canada	6" Refr., 8" Refl.
Whitby, S.	Brodnax, Va.	3" Refl.

Saturn came to opposition on August 13, 1963. Its declination during the year varied from about 15°S to 17°S. While the apparition was undistinguished from the standpoint of unusual phenomena, it engendered a splendid series of photographs in selected spectral regions by Capen at the JPL Observatory on Table Mountain in California as well as several micrometric measurements of the North Equatorial Belt by Goodman at the Lick Observatory.

The Globe

Equatorial Zone (EZ). Though generally estimated as slightly fainter than the outer part of Ring B, the EZ showed definite evidence of brightening late in the apparition. Throughout August the EZ seemed the darker of the two, but in about mid-September the order appeared to reverse. Although most observers thought the EZ yellowish-white (essentially the normal appearance), Delano considered it much redder using filters of characterized transmission. While Delano's was the only visual filter report, Capen's remarkable photographs fully verified his impression. Images on IV-E and I-N emulsions (orange and deep red, respectively) showed the EZ strikingly brighter than the outer area of Ring B (Figure 1), whereas images on III-O (blue) plates portrayed the EZ fully as dark as the NEB (Figure 2). On this print the area encompassing the EZ and the NEB appears uniform. It appears significant in showing the effect of aperture that E. J. Reese in many views with a 16-inch reflector and Haas with that telescope on August 10 found the EZ markedly yellow or orange.

Equatorial Belt (EB). Seen by about half the observers, most frequently as a very narrow and sometimes discontinuous dark streak. On July 26 and September 15 Budine perceived an enclosed bright area not far from the central meridian, but neither feature was recovered during subsequent views of the same side of the planet. Schneller and Kolman delineated an occasional very faint festoon in the region, but these too proved very transient.

North Equatorial Belt (NEB). Clearly the most conspicuous dark feature on the globe throughout the apparition and duly recorded by all observers. Only on rare occasions was the NEB described as double. Although isolated transits of a few dark spots in the belt were secured, none were recovered for determination of rotation rates. Color estimates consistently depicted the NEB as reddish-brown, a hue confirmed for the most part by Capen's photographs (Figures 1 and 2).

North Temperate Belt (NTB). Ricker, Budine, Kolman, and Haas show this feature rather regularly, others infrequently if at all. It was certainly more difficult than during previous recent apparitions and was devoid of internal detail.

North North Temperate Belt (NNTB). About half the observers noted this feature, but with markedly differing interpretations. It was described as wide and dusky by some but somewhat narrow by others. The evidence, though meagre, indicates that the NNTB was visible only intermittently during the apparition.

North Polar Zone (NPZ). On two occasions in July Ricker saw this area mottled with bright patches, but this appearance did not recur; thus substantiation of the rotation rate of this latitude zone (about 60° N) derived several years ago from transits of the Botham-Dollfus and subsidiary white spots was not possible. The period determined in 1960 was about $10^h 40^m$ (1), which differs significantly from the spectroscopic period ascertained some years before (5). In 1962 Goodman remarked an appearance of the NPZ similar to that described by Ricker (2). The circumstances of the observation were unusually favorable, and 10 inches of aperture were employed. However, the detail could at any time become more pronounced so that a careful watch of this area should be maintained. Resolution of the conflict concerning the true period of rotation at this latitude requires more observational data.

North Polar Region (NPR). Noted by most observers about 2/3 of the time, the NPR appears to have lost the darkened aspect seen with regularity a few years ago. It would seem that a real fading is in evidence since geometry alone could scarcely account for the large change. A color change may be somewhat responsible, however, as suggested by Capen's photographs. As with the EZ, the images on red-sensitive plates do not show a dark NPR, whereas those on blue-sensitive emulsions disclose a very apparent dark NPR extending south to the region normally occupied by the NTB (Figure 3).

South Temperate Belt (STB). Although for the most part the visible portion of the southern hemisphere appeared dusky and devoid of detail, several observers descried a narrow faint belt on rare occasions which, from its position, was most likely the STB.

Latitudes of Belts. The latitude of the NEB, as determined from ALPO observations, has been treated comprehensively elsewhere (3). Goodman measured the positions of the north and south edges of the NEB with a filar micrometer on the 12-inch refractor at Lick Observatory on August 11 and September 15. Since the values for the two dates differed widely, an investigation into the possibility of latitude drift was made by measuring the position of the belt on selected sketches which appeared to represent the planet at regular intervals throughout the apparition. The derived data are given in Table I together with values for the latitudes of other belts which were shown on the drawings. The latitudes in this table are saturnicentric ones.

The figures in Table I supplemented the data previously published (3) and lend little support to the supposition of drift in the NEB. Rather, they throw into sharp relief the difficulty of establishing any but the most patent displacements using the techniques in question; the scatter among values from sketches is considerable. Although it might superficially appear that between late July and mid-August the southern edge of the NEB was positioned further south than it was at other times on the basis of observations by Budine, Whitby, and Goodman, a series of five observations on August 3 convincingly counters this contention (3). There is a distinctly stronger indication that the belt broadened in late July and remained so throughout the rest of the period covered by observers (Table I). However, this issue, too, is clouded by insufficient data and contrasts with the observations of Milon and Binder, the former photographic, on July 7 (3). Finally, the most reasonable explanation for the discrepancy in Goodman's micrometric figures remains a difference of latitude with longitude.

A word of caution concerning latitudes measured from photographs might be appropriate at this point. While it is evident that the correct placement of detail on a photograph is assured, the apparent diameter of the globe is usually less than the real diameter because the limb is underexposed. The error introduced by this differential is not appreciable when measuring a feature near the center of the disk but becomes increasingly significant as the limb is approached. The following analysis should make this problem rather apparent.

The ratio y/r is the factor which largely governs the computed latitude of a belt (2). As shown in Figure 7, the visual and photographic diameters of the planet will probably not coincide. Consequently, sizable errors may result from measurements of higher latitude features. It should be realized, however, that such detail is rare on photographs of Saturn. The pitfall could perhaps be circumvented by exposing for longer periods in order to reveal the true limb, but this involves loss of detail due to seeing effects and overexposure of the central part of the globe as well as the danger of enlarging the disk by irradiation. Some have also measured negatives of photographs, on which the dimmer limb will look brighter than the central parts of the disk.

The Rings

The ring system, though rapidly closing, was nonetheless sufficiently inclined during 1963 to permit considerable study. The saturnicentric latitude of the earth was 14 degrees N. at opposition. Throughout most of the

FIGURE 1. Photograph of Saturn in red light taken by C. F. Capen with a 16-inch Cassegrain reflector at JPL's Table Mountain Observatory. October 13, 1963. I-N emulsion, RG-10 filter. 12 secs. exposure. Note that the EZ is unmistakably brighter than the outer part of Ring B at this wavelength.
In examining Figures 1-4 readers will remember the difficulty of preserving in publication the finest details on lunar and planetary photographs.

FIGURE 2. Photograph of Saturn in ultraviolet light taken by C. F. Capen with a 16-inch Cassegrain reflector at JPL's Table Mountain Observatory. October 13, 1963. III-O emulsion, UG-11 filter. 30 secs. exposure. Note that the EZ and the NEB region are very dark compared to the outer part of Ring B at this wavelength.

FIGURE 3. Photograph of Saturn in blue light, C.F. Capen and 16-inch Cassegrain at Table Mountain Observatory. June 19, 1963. III-0 emulsion, no filter. 4 secs. exposure. Note the striking darkness of the NEB region and the EZ and also the very dark NPR.

FIGURE 4. Photograph of Saturn in blue light taken by C. F. Capen with 16-inch Cassegrain at Table Mountain Observatory. October 1, 1963. III-0 emulsion, BG-12 filter. 12 secs. exposure. Note the dark EZ-NEB and dark NPR. Note also the obvious difference in the brightness of the two ring-arms, with the west or prec. (left) arm much the brighter. Perhaps the best evidence yet available of the curious "bicolored aspect".

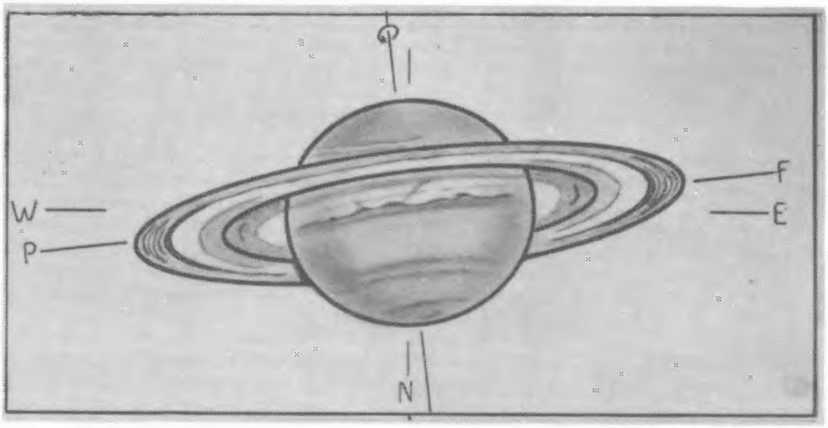

FIGURE 5. Drawing of Saturn by Ken Schneller. July 26, 1963. $6^h\ 11^m - 7^h\ 12^m$, U.T. 8-inch refl. 286X. Seeing 6-7. Transparency 6. Note the doubled Encke Division and also intensity minima A2, A8, and C5. The delicate detail in low latitudes is typical of transient features glimpsed on Saturn in 1963 in the best views but not recoverable for rotation period determinations.

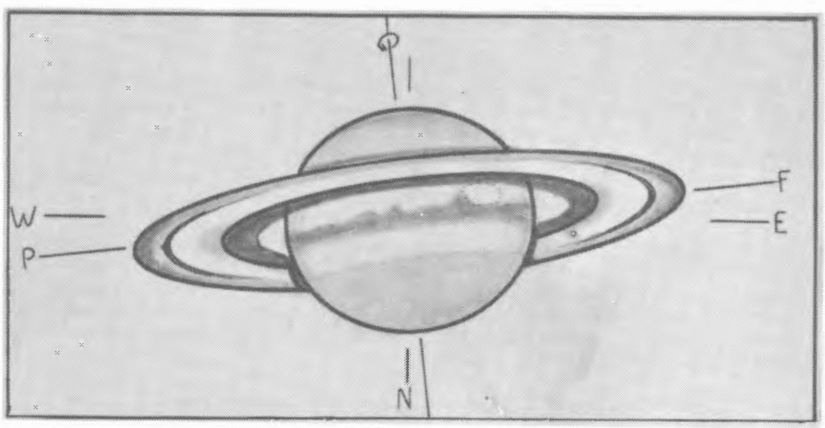

FIGURE 6. Drawing of Saturn by J. Dragesco. July 30, 1963. $22^h\ 30^m$, U.T. 7-inch refl., 165X - 330X. Seeing 5½. Transparency 4½. The bright oval in the EZ and the detail along the south edge of the NEB were very suitable for C.M. transit work for rotation periods, but again they did not endure long enough to be recovered.

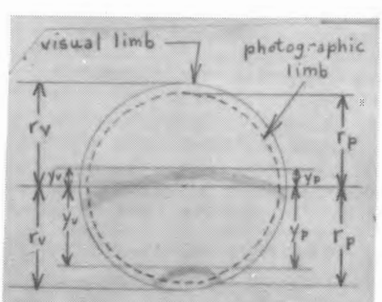

FIGURE 7. Schematic diagram to indicate effect on measured latitudes of differences between photographic limb and true limb. It is primarily the ratio y/r which determines latitude. Errors in latitude caused by failure to select the true limb when measuring photographs can become very large near the north and south limbs of Saturn. See also text.

apparition the outer part of Ring B was the brightest component of the entire Saturnian system; but, as discussed above, the EZ later surpassed it. Capen photographs reveal that only in integrated light did Ring B parallel the EZ in brightness. In red light the EZ was much the brighter, while in blue the opposite was true (Figures 1-4).

Photographs taken by Capen on September 15 and October 1 (Figure 4) are the only ones to the authors' knowledge which show the "bicolored aspect" of the rings, a subject which received considerable attention some ten years ago. Although an acceptable physical explanation of this baffling phenomenon has never been proposed, its existence on these photographs is undeniable. The bicolored aspect has not been reported during recent apparitions. [At least one observer recorded it a number of times in 1964. - Editor.]

Ring A was compared to ring B using color filters by Goodman and Haas. As in 1962 (3), at no time was A considered brighter than B in blue light, although it did appear relatively brighter in blue than in red light. The data are summarized in Table II.

The general appearance of the rings was essentially similar to that of apparitions of the recent past. The outer third of Ring B was the brightest part of the system, the inner two-thirds being much fainter. The outer part of Ring A was consistently fainter than its inner portion. Although presumably difficult, Ring C was reported by all observers. Most observers estimated the inner edge of Ring C to be between 0.4 and 0.5 of the distance from the inner edge of B to the globe.

A considerable number of intensity minima were reported and were described as follows:

Cassini's Division. Observed by all contributors continuously around the visible portion of the rings when seeing conditions were reasonably favorable. Since the rings are narrowing, the projection angle for the segment in front of the globe is undergoing considerable foreshortening. Observers reporting intensity estimates never considered it completely black but rather attributed a low level of brightness to it.

Minima in Ring B. Cooke, Cragg, Rippen, and 2 others perceived B5, but no one did so on every date of observation. Rippen and Schneller delineated B7.5 nearly as often as B5 but were alone in that respect. B2.5 (heretofore designated B3) was seen twice by Cragg, who was also the only observer to sight B0. Surprisingly, he reported it frequently and many times considered it second only to B5.

Ring C. Although Ring C was seen by all observers, C5 was reported only by Schneller on July 26. That discrete intensity variations are perceptible with modest apertures in a feature of such low luminosity is a moot point.

Ring A. Encke's Complex was reported by Binder, Cooke, Cragg, Goodman, Haas, Rippen, Schneller,and Wedge. According to the sketches it was positioned at about A5.5. Schneller descried two components of the complex on two occasions (Figure 5). Schneller also reported seeing A2 and A8. Although the existence of intensity minima at these two positions in Ring A appears to be established by both visual and photometric findings (3), they are extremely difficult features for ordinary apertures.

The Satellites

Since the plane of Saturn's equator is approaching that of the Earth's orbit, transits, eclipses, and occultations of the satellites are becoming observable. Opportunities for viewing these phenomena were rare during 1963 but will occur with increasing frequency during the several subsequent apparitions.

An occultation of Iapetus was predicted to begin on October 17, 1963 at 19^h 07^m U.T. and the related eclipse to terminate on October 18 at 01^h 08^m U.T., with a possible error of 10 minutes in the times. Haas observed the emersion with a 12.5-inch reflector and first spotted Iapetus at 1:23:30 U.T., but states that the satellite may then have been several minutes out of the planet's shadow. No brightening was detected during the next minute or two. Haas estimated that Iapetus was about a magnitude dimmer than Rhea and only a few tenths of a magnitude brighter than Dione, near the east ansa of the rings.

Conclusions

Although spots of sufficient duration to supply reliable rotation rates were not seen during the 1963 apparition, it should be reemphasized that central meridian transits of detail which is clearly and definitely observed are of great value. The initial detection of a major outbreak frequently appears extraordinary in no respect but may resemble, for example, the white spot recorded in the EZ by Dragesco on July 30 (Figure 6). The embryonic stages of such large disturbances, however, provide the opportunities to determine how and precisely where they arise. Should it be found that they occur at preferential locations, then evidence for the rotation rate of the solid surface of the planet may be forthcoming. Furthermore, the accuracy of the derived rates are largely dependent on the duration of time over which the feature was under observation. Thus the earlier a disturbance is detected, the greater is the value of the information which evolves from it.

The value of observations in selected regions of the spectrum is apparent from the contributions of Capen's photographs to the substance of this report. While photography with emulsions of restricted spectral sensitivity provides more objectivity, visual studies with color filters can nonetheless supply vital information in an area which has heretofore been largely neglected.

Table I. Observed Saturnicentric Latitudes of Belts in 1963. Drawings and Micrometric Measures by A.L.P.O. Members.

(1963) Date	Observer	Center NNTB	Center NTB	N Edge NEB	S Edge NEB	Center EB	Center STB
June 16	Cragg			+13°.8	+ 9°.6	+ 1°.0	
July 19	Ricker	+51°.1	+34°.0	+16.0	+10.5	+ 0.1	-38°.5
July 22	Cragg			+16.2	+10.7	+ 0.3	
July 24	Rippen		+32.2[a]		+12.9		
July 26	Budine		+35.3	+19.0	+ 7.6	0.0	
Aug. 4	Whitby		+40.0	+17.7	+ 7.6		
Aug. 11	Goodman[b]			+17.95	+ 5.70		
Aug. 11	Budine[c]	+40.0	+25.5	+11.7	+ 1.4	- 4.0	-32.5
Aug. 26	Cyrus	+50.2		+23.1	+13.2	+ 3.3	
Aug. 28	Budine		+44.8	+19.3	+ 5.2	- 1.9	
Sept.22	Binder			+18.8	+12.5		
Sept.28	Goodman[b]			+13.89	+10.50		
Oct. 10	Cyrus			+21.1	+12.7	+ 4.5	

a. Drawn as NEB but apparently a blend of NEB and NTB.
b. Measurements with a filar micrometer on the Lick Observatory 12-inch refractor.
c. All features apparently drawn too far south by 5 or 6 degrees.

Table II. Intensity of Ring A in 1963 as Observed with Color Filters by Goodman and Haas.

Filter	Transmission Maximum	No. of Observations	Mean Intensity of Ring A*
Wratten #25	617 mμ	12	3.9
Wratten #47	470		
#48	471	12	4.8
Wratten #57	531		
#58	538	12	4.3

*The intensity of the outer part of Ring B is fixed at 5.0 and is used as a reference standard.

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AN APPEAL FOR RADIOFREQUENCY EXPERIMENTS DURING THE MAY 30, 1965 TOTAL SOLAR ECLIPSE IN THE PACIFIC

By: David D. Meisel

[Foreword by Editor. The content of these articles by Mr. Meisel may seem rather far removed from our ordinary A.L.P.O. projects. Nevertheless, we are glad to publish them as a general service to amateur astronomy. We shall be very amply rewarded if some of our readers will be able to pursue the experiments described during the total solar eclipse on May 30, 1965 and at other total and annular solar eclipses. The participation of A.L.P.O. members critically located with reference to the May 30, 1965 eclipse path is particularly urged.

Mr. Meisel is now doing advanced graduate work at the Ohio State University. Persons and groups seriously interested in the radio monitoring described and having proper equipment for such experiments may contact him at 5633 Selby Court, Worthington, Ohio 43085.]

Personal research and experience have shown that it is worthwhile to attempt passive monitoring of radio signals reflected by the ionosphere when affected by a total solar eclipse. Several experiments have been attempted in the past, but a number of points remain obscure. Since it is impossible for professional investigagors to obtain the necessary geographical distribution of stations for the investigation of a variety of possible effects, amateur operators and SWLs are encouraged to attempt monitoring experiments during the coming eclipse. Since this eclipse is almost entirely over water,oblique angle soundings are required for proper coverage of the radio events. It is the purpose of this communication to bring the event to the attention of the radio "community" in time for experiments to be planned well in advance.

The author, as a professional astronomer, appeals to all SWL, amateur, and other radio clubs, as well as commercial shortwave stations broadcasting to or from the Pacific area, to attempt experiments with transmissions at various frequencies. Stations especially near the path of totality are asked to plan broadcasts during the local time of the eclipse. It would also be helpful if commercial stations could plan similar transmissions into, out of, or across the eclipse area. The transmissions should cover the following dates and times:

May 25 to June 4, 1965 $19^h\ 0^m$ to $23^h\ 0^m$, Universal Time (or GMT)

It is hoped that stations, radio clubs, and electronics magazines will publicize the event and coördinate and propose some experiments for their listeners and readers. For the benefit of those who wish to plan experiments, the ground level central line positions from the American Ephemeris and Nautical Almanac at several times are as follows:

Date	Universal Time	Latitude	Longitude
May 30, 1965	$19^h\ 43^m$	S 33° 42'	E 176° 40'
	20 0	S 20 57	W 161 22
	21 0	S 04 14	W 139 15
	22 0	N 00 52	W 120 50
	22 52	S 07 41	W 83 26

Because of previous commitments, theauthor cannot actively participate in coördination, or planning, of radio experiments for this eclipse; but any work which you or your associates might be able to do would be appreciated. Reprints of articles and communications in connection with this appeal and/or subsequent experiments would be appreciated also.

Thank you.

SUGGESTIONS FOR SHORTWAVE MONITORING DURING A TOTAL SOLAR ECLIPSE

By: David D. Meisel

From personal experience, I would like to offer the following suggestions to amateurs, SWLs, radio clubs, electronics magazines, and commercial shortwave stations for monitoring and transmitting test programs as solar eclipse experiments. Amateur as well as commercial shortwave stations are urged to plan broadcasts during coming total and annular eclipses. Transmissions should be made several days before and after, as well as during,the eclipse day at times which bracket the times of partial phase. Although stations especially near to the paths of totality are very important, it would be helpful if commercial stations could plan test transmissions across the paths of totality of coming eclipses. Transmissions across central lines of annular eclipses may also produce valuable results.

Suggestions for Transmissions

1) Although several frequences would provide good coverage, the lowest useful frequency for the transmission path under non-eclipse conditions should be used in order to obtain maximum eclipse reaction.

2) Transmissions that are beamed approximately tangent to the eclipse central line will probably show the greatest eclipse reaction. While transmissions across the central eclipse line may show various degrees of eclipse-induced effects, transmissions only within the partial eclipse zones probably will not show any significant changes, especially at high frequencies.

3) Announce transmission frequencies well in advance of the eclipse date so that good receiving coverage can be obtained. Transmissions should be at identical power output for all transmissions including those on the non-eclipse days. Technical difficulties during each transmission, if they occur, should be made known as soon as possible by appropriate voice announcements.

4) It is suggested that program content of these test transmissions be limited to voice "mirrors" featuring the station I.D. and interval signal. Times of transmission should bracket the partial phases, as well as totality,to be the most useful. If this is not possible, the transmission should be arranged to bracket the time of maximum eclipse on the eclipse path at a point nearest the transmission path.

Suggestions for Monitoring

1) Select a transmission receivable in your area which most nearly fulfils the above requirements.

2) The transmission chosen should be monitored for as long as possible, during an interval which brackets the partial phases, on a number of days around the eclipse date.

3) Monitoring should be done without automatic controls or other limiting devices in the circuit. Initial receiver, antennae, and other instruments should be set initially and left unchanged during each test transmission. The same settings should be used for each monitoring session.

4) Tape recorded data or direct graphs should be used if such devices are available. Otherwise, estimates at 5-10 minute intervals of the transmission quality in the SINPFEMO or similar code should be made.

5) Instrumentation should be calibrated prior to use for monitoring. Of special interest is the conversion between field intensity and audio power for the antenna-receiver combination at the particular setting which is to be used during the eclipse.

6) Although single antenna-receiver combinations can give useful information, arrangements which enable nearly simultaneous monitoring of the signals received by a horizontal antenna and a vertical antenna can provide sufficient information to solve for the virtual height of the layer. Two receivers are preferable to one. If possible, the horizontal receiver should have the direction of maximum gain toward the eclipse area.

IMPROVING IMAGE CONTRAST IN REFLECTING TELESCOPES

By: Lyle T. Johnson

Since we all want maximum performance from our telescopes, Mr. H. M. Hurlburt's article Improvement of Image Contrast in a Newtonian Telescope[1] is a welcome addition to the literature. I should like to make a few comments on Mr. Hurlburt's curves and then discuss some of the more practical aspects of implementing his suggestions.

Each of Mr. Hurlburt's curves shows how the contrast factor changes with the focal ratio as the angular field of view is kept constant. The contrast factor is the ratio of the useful light in the central spot of the Airy disk to the harmful light in the rings. A contrast factor of 5.2 is the maximum attainable.

We may be interested in finding what curve develops if we just fill the field of a given eyepiece at various focal ratios at a given aperture. If the eyepiece field is ½° wide at one focal length, it will be ¼° wide at twice that focal length. Hence we can draw a curve (nearly straight) through the f: 4 point of curve No. 13 and the f:8 point of curve No. 14 on Mr. Hurlburt's published graphs. Similar curves may be drawn through the f:5 and f:10 points and through the f:6 and f:12 points of curves 13 and 14. In a similar manner curves may be drawn through corresponding points of other pairs of curves such as the f:5 point of curve No. 1 and the f:10 point of curve No. 5.

All of these curves show an improved contrast factor at greater focal ratios. Here is another reason for the superiority of long focal length mirrors.

To compare your telescope with the curves, divide the diameter of the central obstruction by the clear aperture of the mirror and get the contrast factor from this table:

Central Obstr./Mirror Dia.	0.25	0.20	0.15	0.10	0.05	0.00
Contrast Factor	2.60	3.25	3.80	4.50	4.95	5.25

These figures neglect the effect of the spider, which decreases the contrast factor further.

Some of the lenses listed as "erectors" in the surplus catalogs may be suitable for use as transfer lenses as in Hurlburt's Fig. 16.

A small diameter transfer lens might be mounted on the optical axis as is the Barlow in Hurlburt's Fig. 15. Low power microscope objectives of about 2" focal length should work well in this manner since they are corrected for a distance to eyepiece between 6" and 7½". An objective of Numerical Aperture 0.08 could be used with mirrors of f:6.3 or slower, and one of N.A. 0.10 with mirrors as fast as f:5. The field would be wider with slower mirrors.

Barlow Lenses suitable for use with a small diagonal are not available.

Someone should design and market a small Barlow suitable for use in a variety of amateur size Newtonians. Such a Barlow could be ½" in diameter with a focal length of -4½", designed for an amplification factor of 3. If the Barlow is placed 3" inside the prime focus, a magnified image would be formed 9" from the Barlow. This Barlow Lens could be used with Newtonians from 6" to 12½" aperture and at focal ratios from f:6 to f:12 or greater.

The table below shows the focal lengths and angular coverage obtained when such a Barlow is used with various mirrors. When used with an f:6 mirror at an amplification of exactly 3 the field is zero; but if the Barlow is moved a little closer to the prime focus, the amplification and focal length will increase so that the field will be larger than zero and usable on a planet or small portion of the Moon.

Performance of various mirrors with proposed small Barlow Lens described above.

	F:6 Primary			F: 8 Primary			F:10 Primary			F:12 Primary		
Mirror Diam.	6"	8"	12½"	6"	8"	12½"	6"	8"	12½"	6"	8"	12½"
Focal Length	36	48	75	48	64	100	60	80	125	72	96	150
Final Foc.L.	108	144	225	144	192	300	180	240	375	216	288	450
Field, Mins.	Zero Plus			9.0'	6.7'	4.3'	11.8'	8.6'	5.5'	11.9'	8.9'	5.7'

The field referred to here is the unvignetted field which is fully illuminated by the mirror and has full resolving power. The partly illuminated field will be much larger -- in excess of two inches if there is no vignetting between Barlow and eyepiece.

It would be good if small diameter elliptical diagonals of high quality were on the market, but in their absence we can use small prisms. If the transfer lens system is used, the hypotenuse face of the prism is aluminized and used as a first surface flat because a prism in the cone of light from a fast mirror will introduce spherical and chromatic aberration[2]. But if a Barlow or Transfer Lens on axis is used, a prism can be used in the slim cone of f:15 or more without introducing harmful abberations. If one face of the prism is sealed to the Barlow cell, there will be only two optical surfaces to keep clean.

However, the requirements on the prism when used as a prism are more severe; for all faces must be good, not just the hypotenuse. Various small prisms are available, some surplus and of excellent quality while others may be seconds with various defects.

Most of my observing since 1948 has been done with two telescopes which have small diagonals, and I have been well pleased with the results. Fig. 8 shows the "folded Gregorian" optical system which I use[3,4,5]. A small diagonal just inside the prime focus reflects the light to an off-axis portion of a 6" ellipsoid at the side of the tube, from whence it is reflected back across the tube to the eyepiece. A large removable diagonal can be used to give wide angle coverage at the Newtonian focus.

In the 10" the small diagonal was a 7/16" prism with the hypotenuse aluminized to form a first surface mirror mounted in a cell less than 3/4" in diameter. The same 6" ellipsoid is used in the 16" reflector. Its diagonal is a 3/4" aluminized prism in a 1" diameter cell. If an ellipsoid had been made especially for the 16", the smaller diagonal from the 10" could have been used with it too. Neglecting spider diffraction the contrast factor of the 10" is about 4.8, and that of the 16", 4.9. If I had used the wire spider to be described later, the drop in contrast below these figures due to the spider would have been negligible.

My method of mounting these small diagonals is shown in Fig. 9. A square cavity was milled out of a piece of aluminum rod to form the cell A. The prism B was held in place by a piece of thin metal C attached with three 2-56 screws. Pieces of paper were used as shims to take up any looseness of the prism. A Barlow Lens could be added to such a cell by drilling three holes in the cell of the Barlow D and attaching it with screws in place of piece C.

A number of inexpensive surplus prisms were bought and tested for flatness of the hypotenuse face. The best one was aluminized and used.

We will now consider the effects of various types of spiders, for it does little good to use a small diagonal if it is supported by a poorly designed spider. According to Everhart and Kantorsky,[6,7] the amount of diffracted light is proportional to the area of the struts so that they should be as thin as possible.

The distribution of the diffracted light is determined by the shape and thickness of the struts. A thick strut will produce short bright diffraction spikes with most of the diffracted light close to the Airy disk where it will do the most harm. A thin strut will produce long faint spikes. Much of the light from a very thin strut will be completely outside of a small planetary image and thus will do no harm at all.

Figure 10 shows various types of diagonal supports I have used, and above each is the diffraction spikes formed by it. A four legged spider E will produce four diffraction spikes, and six spikes one-half as bright will be produced by a three legged spider F. Therefore the latter diffracts 25% less light. A curved spider G spreads the diffracted light uniformly around the central disk making a very pleasing spikeless image. The total length of the supports is reduced, but they must be thicker so that the diffracted light is closer to the central disk and the improvement is small. Mounting the diagonal on the end of a single heavy strut H will produce two short bright diffraction spikes with poorer resolution in the direction of the spikes than at right angles to them. This result could lead to misinterpretation of delicate planetary detail.

Some of us have used three and four legged spiders made of strips of 0.005" thick phosphor-bronze under tension. We can not hope to make a strut much thinner than this amount, and it is one of the best designs but still doesn't completely overcome another difficulty.

The spider and diagonal are seldom at the same temperature as the air and usually are cooler due to radiation to the open sky. These cooler parts will be surrounded by a sheath of cool, dense, slowly moving air which has an effect similar to increasing the width of the struts. Polishing and plating the struts rather than painting them black will improve the situation by reducing heat loss due to radiation[8]. Making the struts as thin as possible and the diagonal small will decrease the heat capacity of these parts and allow them to follow changes in air temperature more rapidly.

Both thermal and diffraction effects due to the spider can be made insignificant by using fine wires under tension for the diagonal support.

I have recently performed experiments illustrated by Fig. 10I. Holding a wire across the end of the tube of my 16" reflector while looking at the star, Altair, I compared the diffraction spikes from the wire with those produced by the single tapered strut supporting the small diagonal. Wires from 0.032" to 0.003" diameter were used. The wire (twice as long as the strut) produced spikes which appeared somewhat brighter than those from the strut over most of the field. However, at the center there was a gap in the spikes from the wire, just where the spikes from the strut were the brightest. The gap was estimated to be nearly as long as the major axis of Saturn's rings (42 seconds of arc). A wire spider should be especially useful for planetary observing because practically all the light diffracted from the spider will be thrown harmlessly outside of the planet's image.

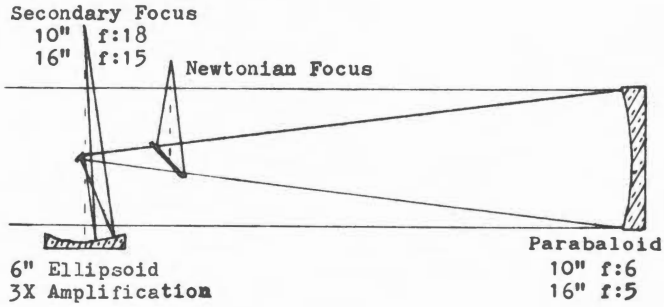

Fig. 8. Telescopes used by Author

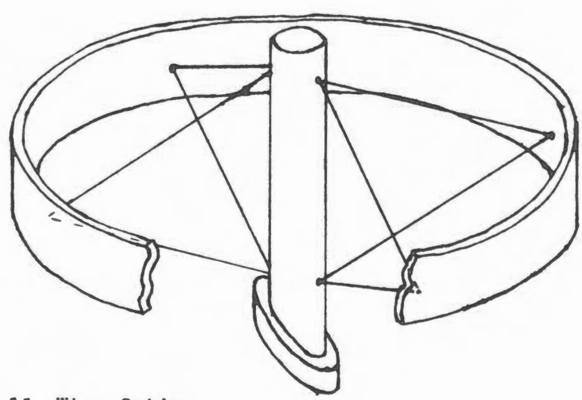

Fig. 11. Wire Spider

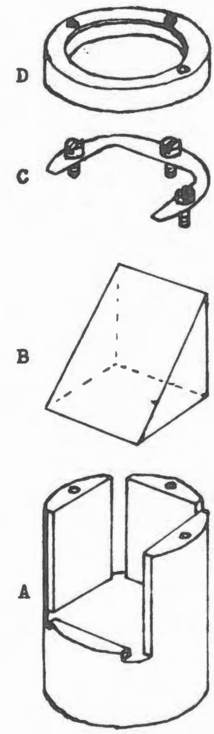

Fig. 9. Prism Cell

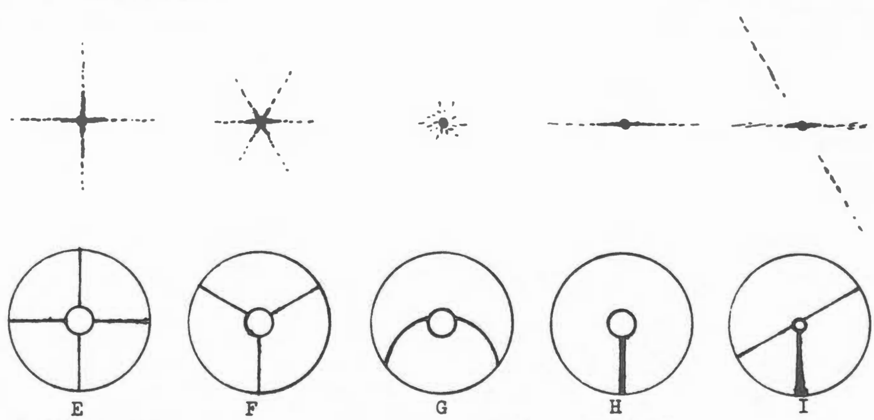

Fig. 10. Diffraction Spikes Produced by Various Spiders

FIGURES 8 - 11. Sketches prepared and contributed by Lyle T. Johnson to illustrate ideas in his article "Improving Image Contrast in Reflecting Telescopes" in this issue. Figure 8 shows the optical design of both of the modified Gregorian reflectors employed by Mr. Johnson. Figure 9 shows the method of mounting the prisms used as diagonals with these telescopes. Figure 10 shows various kinds of spiders used to support the secondary. Above each one is the pattern of diffraction spikes which it produces. Figure 11 shows a method of supporting a small diagonal with very thin wires, thus reducing diffraction effects. See text of article for further details.

To prevent rotational vibration of the diagonal, the wires must not radiate from a common center but must meet at two different centers.[8,9] This can not be done with a six wire spider, and an eight legged spider (truly an arachnid) as in Fig. 11 is the result.[7] When properly aligned, 4 wires will hide the other 4 as seen from the center of the field so that the diffraction effects will be those of a four legged spider.

Some method of adjusting the tension of the wires equally is needed. The end of each wire could be wrapped around a bolt which could be turned until properly "tuned" by ear and then a lock nut could be tightened. A non-stretching wire should be used, preferably stainless. The end of the telescope tube may need to be reinforced with a ring to stand the tension. A 0.015" diameter steel piano wire will support 65 pounds while a hard drawn phosphor bronze wire will support only 17 pounds. I would consider the latter too weak in this diameter to withstand accidents, but it is stainless and might be used in a larger size.

The diagonal can also be mounted on a plane-parallel optical glass disk as large as the primary mirror.[5,10] There would then be no spider diffraction, which would be a small improvement over the wire spider. There would be the further advantages of sealing the telescope tube, thereby reducing tube currents, eliminating dewing of diagonal and primary, and keeping mirrors clean (less scattered light) and dry, thereby greatly prolonging the life of their aluminum coats.

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A SUMMARY OF A. L. P. O. JUPITER ROTATION PERIODS, 1946-64

By: Elmer J. Reese, former A.L.P.O. Jupiter staff member

This paper presents a summary of rotation periods of various Jovian latitudinal currents, as determined by observations by A.L.P.O. members, for each apparition from 1946 to 1963-4, inclusive. [Mr. Reese reduced the data to obtain the rotation periods here presented and in addition himself made a considerable number of the observations.] Nine hours should be added to the numbers in the tables, which indicate only minutes and seconds. For example, 55:12 means 9 hrs., 55 mins., 12 secs. Readers will note that many currents often did not furnish enough long-lasting features to be identified. When a number of rotation periods of different objects were determined in a given current in a given apparition, an average period was taken. The abbreviations for the different currents are the standard ones familiar to students of Jupiter: N for north, S for south, C for current, Te for temperate, Tr for tropical, E for equatorial, B (when part of a feature name) for belt, RSH for Red Spot Hollow, p for preceding, f for following, and Z for zone.

It is to be hoped very much that amateur observers will continue to record in sufficient numbers the Jovian central meridian transits on which such rotation periods are based, for the usefulness and possible physical significance of tables like this one constantly increase with longer periods of coverage.

Current	1945-6	1947	1948	1949	1950-1	1951-2	1952-3	1953-4
NNNTeC	--	--	--	--	--	55:17	55:23	--
NNTeC	55:41	--	55:40	55:43	55:39	--	--	--
NTeC-A	56:09	56:03	56:04	56:04	--	56:01	55:57	--
NTrC-A	55:31	55:22	55:26	55:32	55:16	55:13	55:24	55:31
NTrC-B	--	--	--	--	--	--	--	--
mid NEB	--	--	53:42	53:51	--	53:19	52:40	--
NEC	50:21	50:19	50:20	50:18	50:19	50:19	50:21	50:38
SEC-A	--	50:24	50:26	50:14	50:51	50:49	50:27	--
SEC-B	--	--	--	--	--	--	--	--
S. edge SEB_n	--	--	53:17	--	--	--	--	--
SEBZ	--	--	--	54:27	--	--	54:13	--
SEB_s (normal)	--	--	--	55:47	55:24	--	--	--
SEB_s (Disturbance)	--	--	--	58:31	--	--	--	--
Red Spot/RSH	55:42	55:40	55:41	55:43	55:42	55:42	55:42	55:43
S. Tr. Streak	55:24	55:22	--	--	--	--	--	--
STrZ (p.RS)	--	54:58	55:04	54:24	--	--	54:53	54:40
STrZ (f. RS)	--	55:59	55:52	55:47	--	--	55:49	55:41
mid STB	--	55:05	55:05	55:08	55:10	55:09	55:08	--
STeC	55:07	55:07	55:09	55:09	55:10	55:11	55:11	55:13
SSTeC	--	--	--	55:04	55:07	--	--	--

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Current	1954-5	1955-6	1956-7	1958	1959	1960	1961-2	1962-3	1963-4
NNNTeC	--	--	--	--	--	--	55:21	55:22	55:15
NNTeC	--	--	--	--	55:38	55:40	55:39	55:30	55:38
NTeC-A	--	56:10	--	--	--	--	--	--	--
NTrC-A	55:31	55:25	--	55:34	55:27	55:26	55:28	55:28	55:27
NTrC-B	--	55:03	--	--	--	--	55:05	--	--
mid NEB	--	--	--	--	--	52:55	55:17	55:23	55:22
NEC	50:16	50:32	50:30	50:31	50:27	50:27	50:31	50:31	50:27& 50:48
SEC-A	--	--	--	50:29	50:57	50:47	50:30	50:25	--

Current	1954-5	1955-6	1956-7	1958	1959	1960	1961-2	1962-3	1963-4
SEC-B	--	--	--	51:23	--	--	51:10	--	51:04
S.edge SEB_n	--	--	*	53:11*	--	--	**	51:05	53:28
SEBZ	54:11	55:31	--	54:02	--	--	--	54:53	55:41
SEB_s (normal)	--	--	--	--	55:45	55:40	55:43	--	55:41
SEB_s (Disturbance)	--	--	--	58:02	--	--	--	58:12	--
Red Spot/RSH	55:43	55:41	55:42	55:42	55:41	55:43	55:42	55:42	55:41
S. Tr. Streak	--	55:30	55:20	--	--	--	--	--	--
STrZ(p.RS)	--	--	--	--	55:01	--	--	54:44	--
STrZ(f.RS)	--	--	--	--	--	--	--	--	--
mid STB	--	--	--	--	55:08	55:05	55:13	55:07	55:10
STeC	55:12	55:09	55:09	55:08	55:09	55:11	55:13	55:11	55:15
SSTeC	--	55:04	55:04	--	55:05	55:12	55:08	55:04	55:11

*Not including a small hump on the S. edge SEB_n closely preceding the Red Spot. This hump probably marked the north-preceding shoulder of the otherwise invisible Red Spot Hollow.

** See report for this apparition, Str. A., 16, 193-205, 1962.

SOME MONTREAL CENTRE OBSERVATIONS OF MARS IN 1962 - 63

By: Klaus R. Brasch, A.L.P.O. Mars Recorder

The approach of Mars two years ago was by all standards an unfavorable one, belonging to the aphelic pair of oppositions of the current cycle. The planet came no closer to the Earth than about 62 million miles, and displayed an apparent diameter not exceeding 14" of arc. To make matters worse, opposition occured on February 4, 1963, a time of year during which temperatures of -10° to -20° F. are not infrequent in Montreal, enough to dampen the enthusiasm of even the most ardent observer. Despite all this, a total of 26 usable observations was secured, and these form the basis of the present report. Instruments from 6 to 8 inches in aperture were employed throughout.

The aim of the observation program was threefold: (1) Obtaining a sufficient number of drawings to enable the construction of a chart of the surface detail, (2) Studying the North Polar Cap shrinkage and associated phenomena, (3) Detecting by means of filters (Wratten 23A and 47B) clouds and atmospheric haze phenomena. In all three endeavors we were only partially successful, being limited of course by the rather small number of observations secured.

For the construction of the chart, we were fortunate enough to obtain at least one good view of every section of the entire globe of Mars so that while actual positional measurements could not be made, detail could be filled in, using the I.A.U. map as a base. Our chart appears on pages 150 and 151. Agreement is reasonably good with other standard Mars maps. (For comparison, see the A.L.P.O. chart for 1960-61, Vol. 16, pg. 22, 1962, of this journal.) Figure 13 shows a drawing made under particularly good seeing conditions, at which time a large amount of the finer detail was noted, including several major canals of the Sinus Meridian and Mare Acidalium complex.

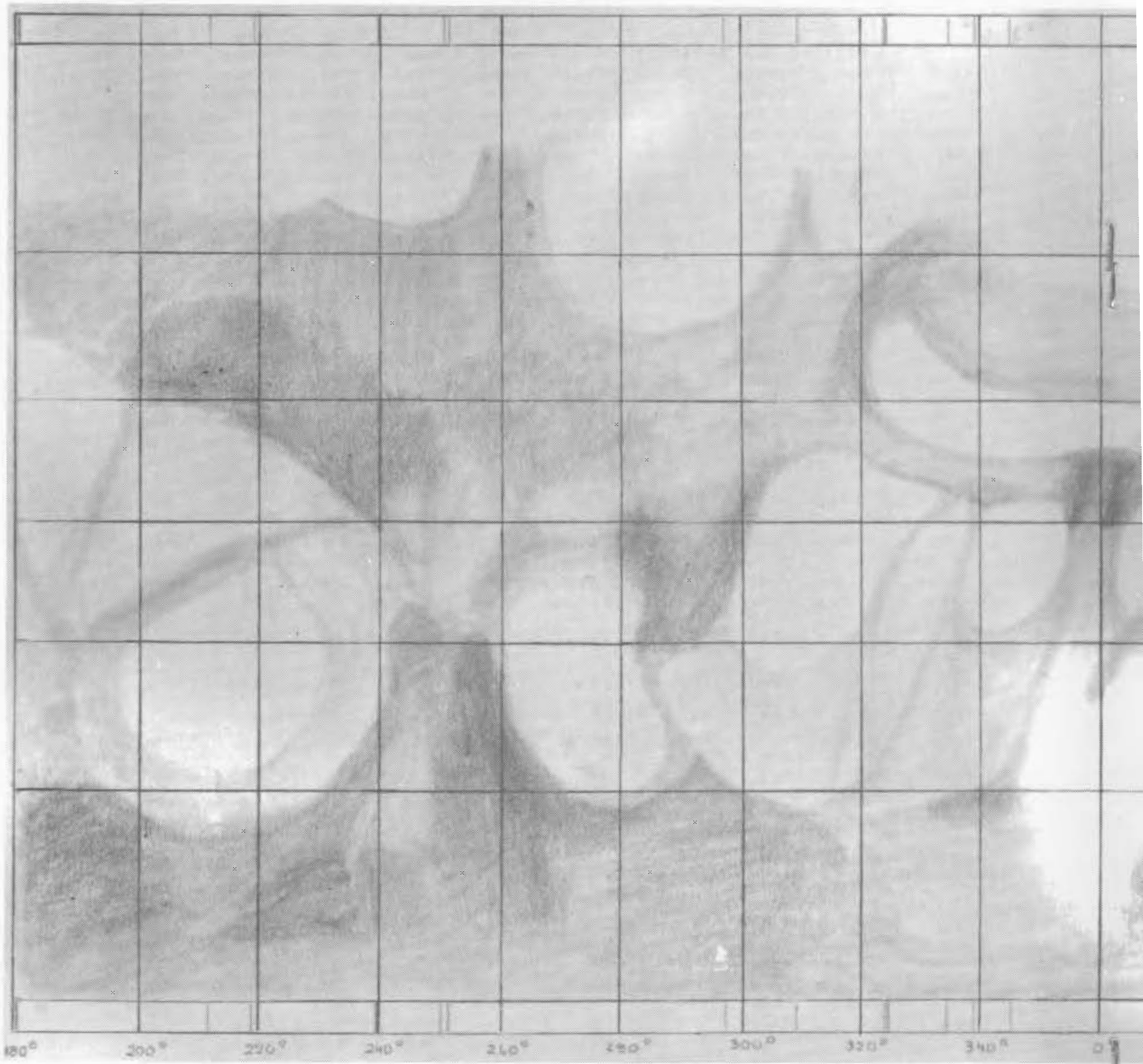
A study of the activity of the North Polar Cap constituted the second phase of the program. To be entirely successful here, one must meet two conditions. First, a fairly large amount of drawings, preferably several per night, should be made so that when cap measurements are taken, a mean value for a given date can be obtained. Secondly, the observations should cover a reasonably uninterrupted span of time so that any irregularities in the behavior of the cap will be noted. On both points we met with partial success only, being limited once again by the quantity of the observations. (It is here that the adverse weather conditions in Montreal played so large a role. An observer can brave temperatures of -15 degrees for perhaps half an hour and secure one observation a night; but even with mind willing, his fingers and toes will not cooperate for a second try). Figure 14 shows the results of these measurements. Apart from compensation for the planet's tilt, no correction factors, e.g., personal equation, polar haze, etc., were applied, the sample of values being too sparse for that purpose. The observations were confined mainly to the period corresponding to Martian late Spring, Vernal Equinox and Summer Solstice for the Northern Hemisphere occurring at 88° and 178° heliocentric longitude respectively. On numerous occasions, therefore, a prominent melt band was noted at the periphery of the retreating cap, as well as irregularities in the latter's break-up. (See Figure 15a.)

The last phase of the project, the detection of clouds and blue veils associated with the morning and evening limbs of the planet, as well as the study of general atmospheric haze, was perhaps the most fruitful aspect of the program. On several occasions one or more of the above phenomena were either definitely noted or strongly suspected. The results are tabulated below, the following abbreviations being employed:

WC - white cloud, BV - blue veil or haze, PH - polar haze

Date 1963	Time UT	Phenomenon	Location (IAU nomcl.)	CM	Comments
Jan. 18	04^h00^m	WC	Thymiamata	324°	suspected
Jan. 18	05 50	WC	Thymiamata	339	suspected
Jan. 26	04 50	BV	Insidis R.	253	definite with
Jan. 26	04 50	BV	Elysium	253	Wratten 47b filter
Feb. 11	03 25	WC	Tempe	92	suspected
Feb. 27	02 30	WC	Neith R.	296	suspected
Mar. 16	02 00	WC	Amazonis	139	fairly definite
Mar. 23	01 35	BV	Amazonis	67	definite with
Mar. 23	01 35	PH	NP Cap	67	Wratten 47b filter
Apr. 14	01 15	BV	E & W limbs	219	definite with
Apr. 14	01 15	PH	NP Cap	219	Wratten 47b filter

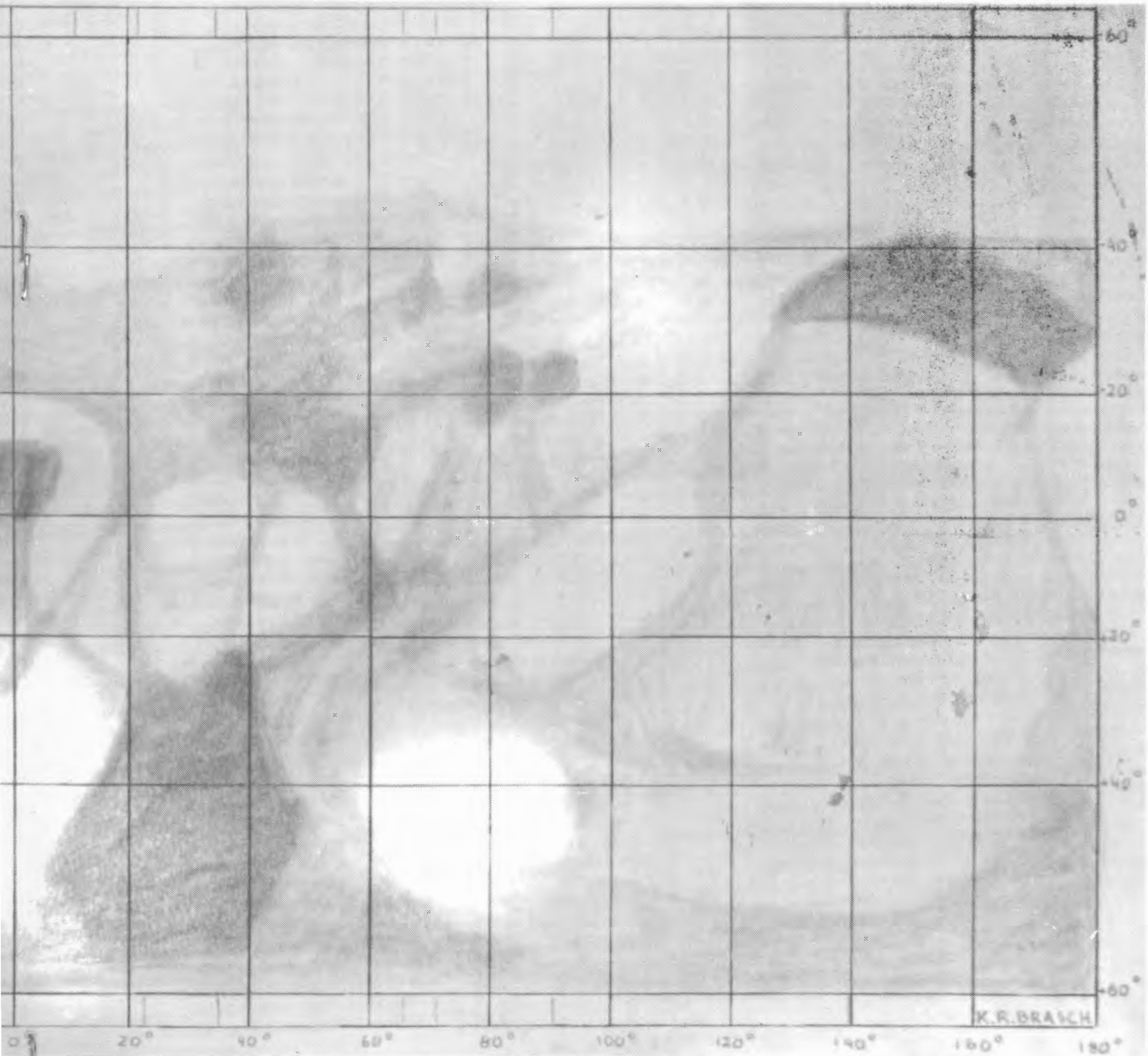
Figures 15a and 15b illustrate the type of observations through which atmospheric phenomena were detected. The first drawing shows detail visible directly and with a red filter (Wratten 23A), while in the second drawing a blue filter was employed. On the latter drawing, note the prominence of the polar region as well as the blue veils on the morning and evening limbs of the planet, which appear brighter than the center of the disk.



MONTREAL CENTRE R.A.S.C.

MAP OF MARS DURING ITS 1962 - 3 APPARITION PREPARED BY KLAUS R. BRASCH FROM OBSERVATIONS BY MEMBERS OF THE MONTREAL CENTRE OF THE ROYAL ASTRONOMICAL SOCIETY OF CANADA. BASED ON 26 OBSERVATIONS WITH APERTURES OF 6 TO 8 INCHES. MERCATOR PROJECTION.

1962-63



MAY 1964

SOUTH AT TOP. OPPOSITION ON FEBRUARY 4, 1963, ABOUT MIDWAY BETWEEN THE VERNAL EQUINOX AND THE SUMMER SOLSTICE OF THE NORTHERN HEMISPHERE OF MARS. ON THE DATE OF OPPOSITION THE ANGULAR DIAMETER OF MARS WAS 14", AND THE LATITUDE OF THE CENTER OF THE DISC WAS 15 DEGREES N.

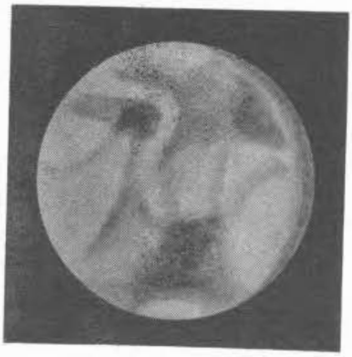


FIGURE 13. Drawing of Mars by Klaus R. Brasch on March 29, 1963 at 2h 10^m, U.T. 8-inch refl., 370X. Seeing 5 - 7, transparency 5 - 6. C.M. = 22°.

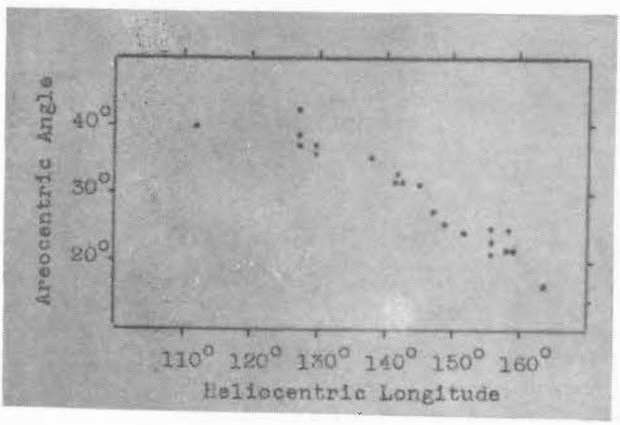


FIGURE 14. The observed areocentric angle subtended by the North Polar Cap of Mars at the center of the disc as a function of heliocentric longitude in 1962-3. Size of cap corrected for tilt of axis of Mars. The vernal equinox of the northern hemisphere falls at heliocentric longitude 88°; the summer solstice, at 178°. Graph prepared and submitted by Klaus R. Brasch, from 26 observations by Montreal Centre members.

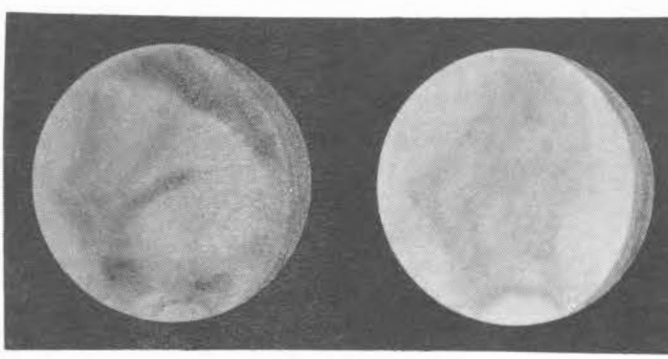


FIGURE 15. Drawings of Mars by Klaus R. Brasch on April 14, 1963 at $1^h 10^m - 1^h 15^m$, U.T. 8-inch refl., 370X, transparency 6. C.M. = 219°. Left drawing (a) in integrated light and red light. Right drawing (b) in blue light. Seeing 3 - 5.

Postscript by Editor. It is not intended, of course, that this note by Mr. Brasch should in any sense be the A.L.P.O. Mars Report for the 1962-63 apparition. It may rather be regarded as a helpful guide to amateur observers of the Red Planet during the spring of 1965 and as an indication of the results which well-used modest instruments can achieve. It is thus similar in concept to Mr. Alan Binder's independent report on Mars in 1962-63, published on pp. 217 - 220 of our Nov.-Dec., 1963 issue. Readers will find it instructive to compare these two accounts.

Late in 1964 Ernst E. Both expressed his expectation of soon completing the reduction of all available A.L.P.O. data on Mars in 1962 - 63, a considerable task. We shall try to publish his article as soon as we can and regret the delay in its appearance.

URANUS AND NEPTUNE - 1965

By: Leonard B. Abbey, A.L.P.O. Uranus-Neptune Recorder

With the exception of Pluto (and perhaps Mercury) Uranus and Neptune are the most difficult planets within reach of the amateur's telescope. In comparison with the imposing appearance of their Jovian brothers, Jupiter and Saturn, Uranus and Neptune appear to be small, dim, blue-green specks in all but the largest instruments. The reason for this unimpressive appearance is that these planets are situated at enormous distances from the Sun (and therefore from the Earth). Under optimum conditions it is possible to detect Uranus (but not Neptune) with the unaided eye. Solar distances and apparent magnitudes of the Jovian planets are included in Table A, which shows several factors of interest in studying the visibility of these planets.

Table A[1]

	Mean Distance from Sun A.U.	Miles	Apparent Diameter	Magnitude (Visual)	Albedo
Jupiter	5.2	483×10^6	47".6	-2.3	0.73
Saturn	9.5	886×10^6	17 .2	+0.8	0.76
Uranus	19.2	1782×10^6	3.96	5.7	0.93
Neptune	30.1	2792×10^6	2.50	7.7	0.84

The apparent diameters and magnitudes are for the opposition dates of the respective planets in 1965. The albedo of a planet is the ratio of the total amount of sunlight reflected, in all directions, to the amount falling on the body.

Finding these planets in the telescope is not always an easy job, especially when you are hunting for them for the first time. The task is greatly simplified, however, if you are using a map with the planet's path marked on it. (Of course, there is no problem if you have circles.) Such maps are published annually in the January issue of Sky and Telescope, and in The Handbook of the British Astronomical Association. These maps always include at least one star that is bright enough to appear on a good star atlas. Norton's Star Atlas is ideal for this purpose. The best procedure is first to locate the brightest star on the map of the faint planet's position with the aid of Norton's Atlas. After this star has been found in the telescope, the planet can be easily located by use of the more detailed map. The lowest available magnification should be used to locate the planet since this power will give the widest field of view. It is also important to observe the proper orientation of the maps, especially the detailed map of the planet's position since it will not contain many naked eye stars. With a refractor, proper orientation of a map is achieved by holding the map perpendicular to the eyepiece with the end of the map marked "South" pointed toward the north celestial pole (in the direction of Polaris). Do not attempt to use a diagonal eyepiece while locating an object with a map. With a Newtonian reflector, the map should be held perpendicular to the eyepiece, with the right ascension lines on the map perpendicular to the telescope tube, and the end of the map marked "South" on the side of the tube that is nearest the north celestial pole. This rule for Newtonian reflectors is true only when the eyepiece of the instrument is oriented so that it points in the same direction as its declination axis (and toward the counterweight in a German mounting). Map orientation for a Cassegrainian reflector is the same as that for a refractor. Again, diagonal eyepieces should not be used.

Even the smallest commercially available astronomical telescopes suffice to show the planetary nature of Uranus and Neptune. In telescopes less than 4 inches in aperture they often appear to be faint stars that will not quite come into focus. In larger instruments, their disks are readily apparent provided that moderate magnification is used. In fact, the discovery of Uranus can be attributed to the fact that it presents a noticeable disk in a 6" telescope.

Of course, everyone who has done even a moderate amount of reading in astronomy is familiar with the story of Uranus' discovery. From the night that it was first seen, this planet has presented a unique set of problems which to this day have not been completely unraveled. The most important of these is that the planet refuses to follow a path that can be described by any calculated orbit. The discovery of Neptune in 1846 enabled mathematicians to predict Uranus' path with far greater accuracy, but the problem is still not completely solved. Almost as frustrating as this unusual behavior is Uranus' observational situation. Here was a planet whose surface details could not be readily observed and mapped. (Venus is also an exception, but it must be realized that failure to detect surface markings is in this case due to their extreme difficulty or non-existence rather than to the apparent diameter of the planet.) During the first years of observation of Uranus, attention was focused on positional rather than cartographical problems. It was only after the discovery of Neptune apparently solved the problem of Uranus' orbit that attention was actively directed to the nature of the planet's surface. (It is important to note, however, that Herschel, the earliest observer of the planet and one of the most accurate and reliable planetary observers of the day, did not report any markings, although it is almost certain that he would have searched for them.)

It appears that the first report of markings on Uranus was made by William Lassell during his Malta expedition (c. 1853). Webb's report of the observation, which gives no details, appears to be the only one extant.[2] No great controversy appears to have developed, probably because of the extreme difficulty of making satisfactory observations. Since that time, sporadic observations have been reported, most of which seem to fall into one of the four following categories:

1) Those which show the disk to be totally devoid of detail.
2) Those which show large ill-defined light and/or dark patches.
3) Those which show definite markings, seen with difficulty.
4) Those which show fairly obvious belts and zones, similar to those of Jupiter and Saturn.

Observations in group four can readily be discarded, since they are invariably made by inexperienced observers using inferior instrumentation and liberal quantities of imagination. To determine which of the first three groups most accurately describes the appearance of Uranus is the immediate task of the Uranus Section. (Professional astronomers are of no help here, for they have consistently refused to examine the problem. As a body they hold that no details are visible, and that all reports of surface markings are false, especially those made with moderate instruments. Like Aristotle, they have seldom resorted to actual observation. In light of the recent confirmation by professionals of "heretical" reports by amateurs, namely, light flashes on the moon, this attitude must be frowned upon.)

Following the pattern set by history, observations of Uranus reported to the Uranus and Neptune Section have been few and far between. However, shortly after the Section was established, a number of observations were received which showed classical parallel belt patterns. The observations in question do not fall into group four since they were made by reliable observers, and the details reported were admittedly hard to see. In the Section Report published in June, 1961[3], it was pointed out that since the pole of the planet was at that time situated two-thirds of the way from the western point of the apparent disk's circumference to its center, any belts present would appear as concentric circles (unless, of course, they were of an extremely unusual nature). Drawings immediately began to pour in showing concentric circles! This example shows that those markings which are present are sufficiently difficult to observe to make the subjective attitude and preconceptions of the observer of great importance.

Further evidence that observers of Uranus tend to see only what they expect to see is that very few observers have reported any degree of limb darkening. If the constitution of Uranus is similar to that of Jupiter, as we have reason to believe, limb darkening should be quite noticeable.

The only practical approach to the problem, short of extensive use of very large telescopes, is the simultaneous observation of Uranus by many observers. It seems that only by such planned observation can we compare many drawings of the same aspect of the planet made by many different observers. Careful comparison of these drawings should enable us to determine which, if any, of the reported markings are actually present. This project is to be known as Project Herschel, which should be some consolation to the Hanoverian astronomer for having his name removed from the planet that he discovered.

The local evening Standard Time dates for simultaneous observation are given in Table B. (It is expected that most observations in the United States will be in the evening hours.)

Table B

			Age of Moon	
First date:	April 30, 1965	(Friday night)	1 day	(U.T. date May 1)
Second date:	May 2, 1965	(Sunday night)	3 days	(U.T. date May 3)

Observe on the first date if weather conditions in your location permit. If observation on the first date is impossible, try again on the second date. Each report should consist of a sketch of the planet, or of an accurate written report of what was seen. A sketch is preferable, providing that the information to report warrants it. Each report should also include the following information: observer's name and address, size and type of telescope (s) used, magnification(s) used, seeing and transparency conditions (describe scales used), and time(s) of observation. Observations are to be made at any time of the night, beginning on the first date listed in Table B. It is hoped that there will be enough observations to insure the overlapping of at least some of them.

During these and all other observations of Uranus, the observer should be watching for the satellites of the planet. Not many amateurs seem to be aware that at least some of the satellites are visible in moderate sized instruments. Table C gives the mean visual opposition magnitude of these satellites. Due to Uranus' great distance from the Earth, the magnitudes of the satellites will not vary noticeably from these values at any given time.

Table C

Satellite no.	Satellite name	Mean visual Opposition magnitude
I	Ariel	14.4
II	Umbriel	15.3
III	Titania	14.0
IV	Oberon	14.2
V	Miranda	16.5

Titania, Oberon, and possibly Ariel should be visible in a 10-inch instrument. Umbriel requires at least 16 inches, while Miranda is beyond the reach of all instruments less than 20 inches in aperture. When observing, make note by means of a small sketch of all faint stars near the planet. The apparent position of each of the satellites with respect to the planet can be calculated by use of tables published annually in The American Ephemeris and Nautical Almanac. If access to this volume cannot be readily had, the Recorder will perform the required calculations for any sketch sent to him.

Just how much has been seen on Uranus in the past is actually somewhat of a mystery (witness the incomplete report of Lassell's observation, cited earlier). In the case of a planet like Uranus, where every observation counts, and the loss of these older observations is far more damaging than would be the case with any of the more well-observed planets. It is therefore important that the Uranus-Neptune Section conduct as extensive an historical search as is possible. All A.L.P.O. members who have access to libraries that might house reports of such observations are urged to investigate this possibility as early as is feasible. Abstracts of material cogent to this search should be sent to the Recorder at the address listed in the back of this publication. This is a good way in which those who have small telescopes, or no telescope at all, can make a meaningful contribution to the Section. The importance of this project cannot be overestimated.

All of the restrictive remarks that have been made concerning the observation of Uranus apply doubly to Neptune. At present, the program of the Uranus-Neptune Section does not include the active observation of Neptune. Historical reports of observations of Neptune are welcomed, however. After we have conquered Uranus, we will attack Neptune.

The final activity to be discussed in this report concerns an expansion in scope of the Uranus-Neptune Section. An exact knowledge of the limits imposed on visual observation of the planets by the telescope itself is of great importance to all sections of the A.L.P.O. It is of even greater importance to the Uranus-Neptune Section, where observable details (should they exist) are near the limits of the telescope's ability to disclose them. From now on, this Section will also be concerned with the investigation of the limits of telescopic performance. Members who have opinions concerning this matter are invited to get in touch with the Recorder. Papers and experiments of interest are welcome. Our primary goal here is to investigate, tabulate, and publish information concerning exactly what can and what cannot be expected of a particular telescope used for visual observation. Interested readers should try to locate the series of articles on this subject published in _The Strolling Astronomer_ in 1953 and 1954. The exchange of views in those reports was a very healthy thing for the A.L.P.O. Since then, the subject has unfortunately been neglected.

It is hoped that many A.L.P.O. members will find at least one of the activities suggested here to be congenial to himself and his resources. The Recorder always welcomes suggestions and comments.

Footnotes

[1] _The Handbook of the British Astronomical Association_ (1965) pp. 31, 38, 47, 66, 67.

[2] T.W. Webb, _Celestial Objects for Common Telescopes_ (Dover edition) vol. 1, p. 221.

[3] L. B. Abbey, "Uranus-Neptune Section Report Number Three", _The Strolling Astronomer_, May-June 1961, vol. 15, p. 82.

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BOOK REVIEWS

Planets for Man, by Stephen H. Dole and Isaac Asimov. Random House, New York, 1964. 242 pages. $4.95

Reviewed by Kenneth J. Delano

Anyone with an adventuresome mind and imagination will thoroughly enjoy Planets for Man, by Stephen H. Dole and Isaac Asimov. The book is well founded on scientific fact, for it is based on the Rand Corporation research study, HABITABLE PLANETS FOR MAN by Stephen H. Dole. Isaac Asimov, as co-author in this more popular presentation of Dole's study, presents a book which is very thought-provoking and a pleasure to read.

In the preface the authors tell the reader that no attempt has been made to present all points of view on controversial questions and advise him to consult HABITABLE PLANETS FOR MAN for detailed technical substantiation of the ideas presented. In addition, the authors provide a good list of related reading material.

A comparison with the well-known book, Life on Other Worlds by H. Spencer Jones, immediately suggests itself. The two books are quite different. Jones concentrates his attention largely on the planets of our Solar System, while Dole and Asimov rather quickly rule out the sun's planets and concentrate their speculations on other planetary systems.

Dole and Asimov adopt a rather strict definition of a habitable planet "as one in which large numbers of people can live comfortably and enjoyably, without needing unreasonable protection from the natural environment and without dependence on materials brought in from other planets". After offering their definition the authors set out on their three-fold plan of attack:

First, to describe the environmental conditions required to make a planet habitable, (i.e., a suitable temperature, light, gravity, atmosphere, and the absence of excessive wind velocities, dust, radioactivity, meteorite-infall, vulcanism, and electrical activity).

Second, to consider the combination of astronomical circumstances which will produce those environmental conditions, (i.e., a planet with a mass between 0.4 and 2.35 Earth masses, with a period of rotation less than 96 hours, with an equatorial inclination not between 80° and 100°, with an orbital eccentricity less than 0.2, and with a primary having a mass less than 1.43, but greater than 0.72, times the mass of our sun).

Third, to estimate the probabliities that the necessary combinations of astronomical circumstances will be found elsewhere in the galaxy.

Listing the probabilities that there is a habitable planet encircling the likely main sequence stars from F2 to G1, the authors conclude that 1 out of every 27 stars of these spectral classes will have a habitable planet, which would mean that there are about 600 million habitable planets in our galaxy alone.

Planets for Man,with its fine introductory paragraphs to each chapter and its good, concise summaries, is outstanding in its orderly presentation of its theme. Furthermore, the authors' ability to take you to these distant worlds heightens the sense of adventure, which is yours to enjoy by reading the book.

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The Moon, Meteorites, and Comets, edited by Barbara M. Middlehurst and Gerard P. Kuiper. University of Chicago Press, 1963. 810 pp. $15.00.

Reviewed by William Roberts

This work is the fourth in the Middlehurst and Kuiper series on the Solar System, put together from papers contributed by highly qualified specialists in the various fields making up the subject matter. Its immediate predecessor, Planets and Satellites, has already been reviewed in these pages (Str. A., Vol. 16, Nos. 7-8, pp. 186-187), and the present work continues the series along the same lines.

One of the impressive features of this work is the alliance of celestial and terrestrial studies to create a more powerful understanding of earth and sky. This becomes evident in the first chapter, The Lunar Surface: Introduction, in which vulcanism and meteoritics are considered as they affect both the lunar and terrestrial surfaces. A number of other lines of investigation are considered in this paper, which makes an excellent stimulus to the serious study of the moon. The inquisitive mind will delight in the eight-page bibliography at the end of the section. D.W.G. Arthur contributes a chapter on mathematical selenography. Most of the formulae should be within the grasp of a freshman mathematician, although one suspects that a computer would read them more appreciatively. Y. N. Lipski's article on Investigation of the Far Side of the Moon with the Aid of Rockets describes the Soviet project in relatively simple language. Ewen Whitaker describes his efforts to obtain further information from the Lunik photographs through photographic laboratory techniques in Evaluation of the Soviet Photographs of the Moon's Far Side. The Scattering Properties of the Lunar Surface at Radio Wave Lengths, by Evans and Pettengill, closes the lunar group with a rather stiff discussion of radio techniques in exploring the lunar surface.

The next nine chapters cover the subjects of meteorites and meteorite craters. Although this is not an A.L.P.O. field of investigation, its relation to various studies that are under the A.L.P.O. makes it very profitable reading. The articles run the gamut from non-technical to treatises on impact mechanics and carbonaceous chondrites. One of the most fascinating parts in the entire book for the reviewer is Fossil Meteorite Craters by C. S. Beals, M.J.S. Innes, and J. A. Rottenberg, describing the efforts of Canadian investigators in the field. The illustrations of possible meteorite craters as discovered on the aerial survey photos excite the imagination. The comparison of Nastapoka Island Arc in Hudson Bay to Mare Crisium can scarcely fail to delight any lunar investigator. Krinov discusses the Tunguska and Sikhote-Alin meteorites, and comet observers will be interested in the possible cometary origin of the Tunguska Meteorite.

The third part of the book covers comets and meteors. Elizabeth Roemer leads off with Comets: Discovery, Orbits, Astrometric Observations, which could very well become a standard reference for the amateur comet observer. J.G. Porter covers Statistics of Comet Orbits, not inappropriately. A series follows, dealing with the physics and structure of comets. J. H. Oort contributes a short piece, Empirical Data on the Origin of Comets, which should provoke discussion in the light of recent work in cometary origins. Peter Millman and D.W.R. McKinley contribute 100 pages on Meteors, including nine pages of bibliography. Luigi G. Jacchia ends the book with Meteors, Meteorites, and Comets.

While the chapters vary very considerably with respect to the difficulty of grasping the ideas contained therein, this reviewer does not feel that any chapter should be exempted from investigation by the curious amateur; for each has meat in it to reward the diligent. It is manifestly impossible to cover the book properly in a review of this scope: one would like to see each of the three main groups criticized by experts in the field.

This work is as up to date as it is possible to have it in this period of rapidly increasing knowledge. Ranger VII, for example, has altered many of our ideas concerning the nature of the lunar surface. Yet the material is sufficiently fundamental to provide sound and valuable reference to the amateur for some years to come.

A.L.P.O. COMETS SECTION 1963 FINAL REPORT, PART III

By: David D. Meisel, Michael McCants, and Dennis Milon

Comet Pereyra 1963e

Considerable interest was aroused with the announcement by Pereyra of the discovery of a second magnitude comet in the morning sky on September 14, 1963. However, A.L.P.O. observers found the comet to be of only 6th magnitude with a tail several degrees long. A preliminary orbit was calculated by Mike McCants from positions telegraphed to him in Houston by C. F. Capen, and also from positions by Alan McClure and McCants. McCants' orbit was the first to be published but was later superseded by a more accurate one computed by Michael Candy. Since Pereyra was a sun-grazer, passing only 240,000 miles above the sun's surface on August 23, 1963, quite accurate positions were needed to determine the orbital elements. Some observations of this comet by Capen were published in Str. A., Vol. 17, Nos. 9-10, pp. 178-181, 1963.

The following are Candy's orbital elements from Harvard Announcement Card 1619.

Comet Pereyra 1963e

T	August 23.387, 1963, E.T.
ω	82°.387
Ω	1°.082
i	143°.670
q	.007262

Although there has been speculation that Comet Pereyra might have been the faint eclipse comet reported by the N.A.S.A. team in Maine, McCants has shown that Pereyra was 20 degrees from the sun on July 20, 1963 and does not fit this observation.

Reports on Comet Pereyra were contributed by the following:

Rev. Leo Boethin	Pamplona, Cagayan, Philippines.	3-inch refractor
Dennis Milon	Houston, Texas	1-inch F/4 camera
C. F. Capen	Wrightwood, California	58mm. F/1.4 camera
Alan McClure	Los Angeles, California	7-inch F/7 camera 35mm. F/0.9 camera
Michael McCants	Houston, Texas	Eye

The visual stellar magnitude estimates were corrected to Bobrovnikoff's standard aperture of 2.67 inches. They were then corrected to unit geocentric distance and are plotted in Figure 16, using the values below:

1963	Observed Mag.	Corrected Mag.	Corrected Mag. minus 5 logΔ	log r
September 16	6.0	6.0	5.0	-.046
20	6.1	6.4	5.2	0
21	6.0	6.3	5.2	.009
22	6.0	6.6	5.5	.019
24	7.2	7.0	5.9	.038
October 2	8.0	7.8	6.6	.104

If the variation had been a power relationship with heliocentric distance, the plot in Figure 16 would have been a straight line. If the points are fitted roughly to a straight line, the following formula results for the stellar magnitude of the coma:

$$M_r = 5.5 + 11 \log r, \qquad n = 4.4,$$

where M_r is the heliocentric visual stellar magnitude and r is the heliocentric distance of the comet. A stronger variation of M_r with r appears likely for the subsequent fading of the comet.

From an out-of-focus exposure by Capen, it was possible to derive a color index for the comet: Sept. 22, 1963, C.I. = $0^{m}_{.}9$ or about G8 spectral class. This result might indicate that the comet was predominantly dust and that it gave reflected sunlight at r = 1.0 A.U.

Photographs by McClure, Capen, and Milon indicate that the tail length was about 0.6 A.U. on Sept. 16. The tail rapidly decreased in length as the distance from the sun increased.

Comet Alcock 1963b

Comet Alcock was not so spectacular as Comet Pereyra, but its all-night visibility provided more opportunity for observation. The orbit here selected and the list of observers have already been published in Str. A., Vol. 17, Nos. 11-12, pg. 234, 1963. In Figure 18 the heliocentric magnitudes obtained after correction for aperture and geocentric distance have been plotted against time. No correlation was obtained by plotting heliocentric distance instead. Two brightness maxima are very definite. Figure 17 shows the unit distance coma diameter as a function of time during the same period. On the average the photometric observations appear to be close

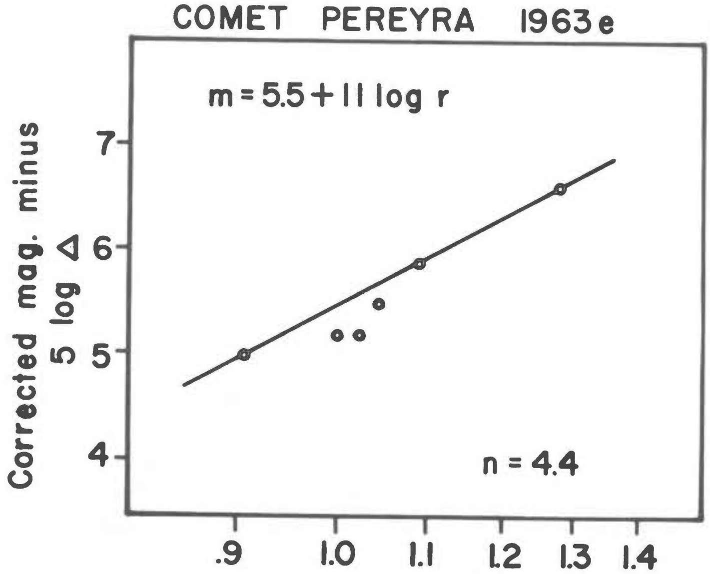

FIGURE 16. The observed corrected, unit distance, visual heliocentric magnitude of Comet Pereyra plotted against its distance from the sun in astronomical units on a log scale. See also text. This graph compiled by Michael McCants and drawn by Steve Larson.

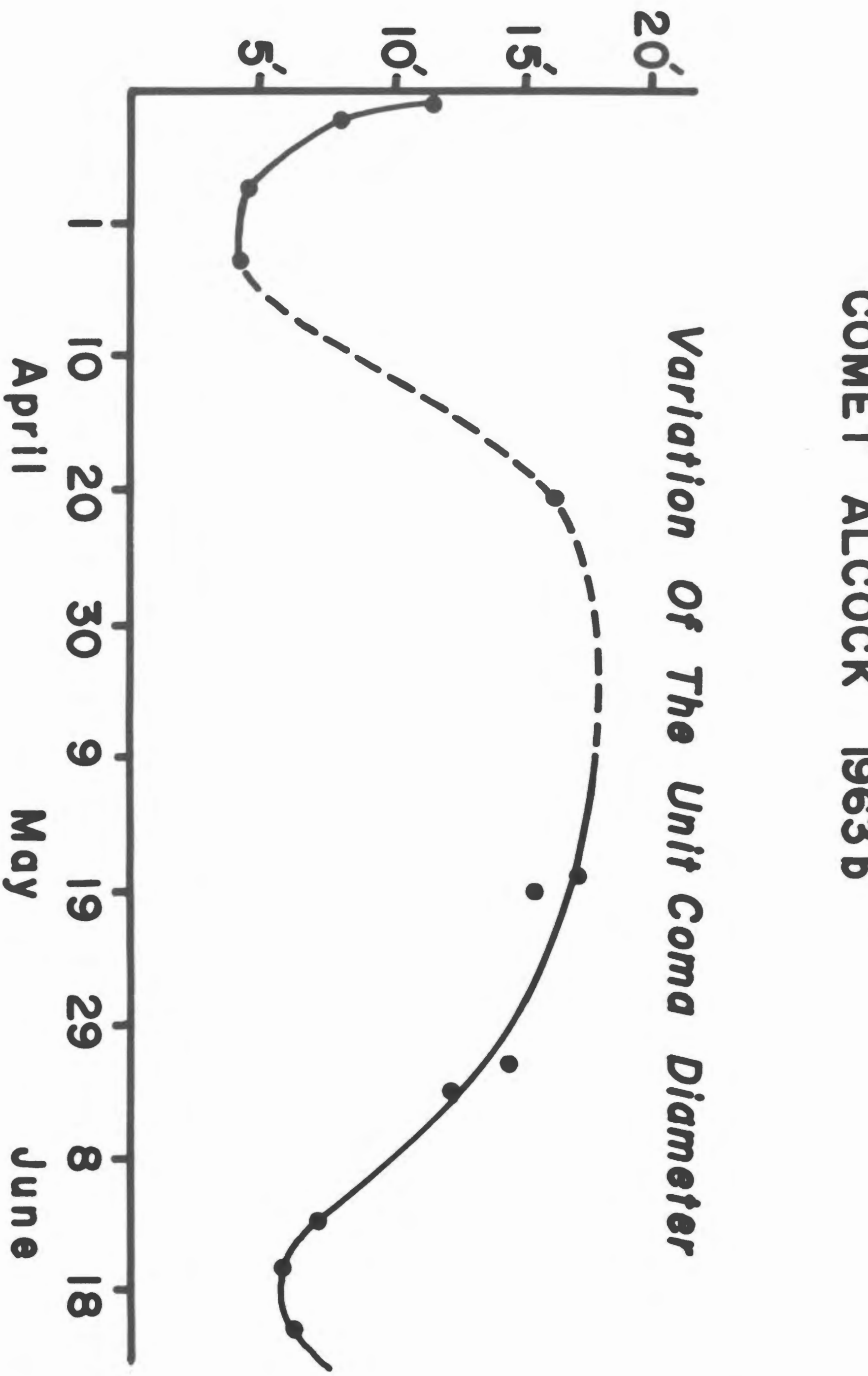

FIGURE 17. The observed coma diameter of Comet Alcock plotted against date in 1963, corrected to a distance of one astronomical unit from the earth. Chart compiled by David Meisel and drawn by Steve Larson.

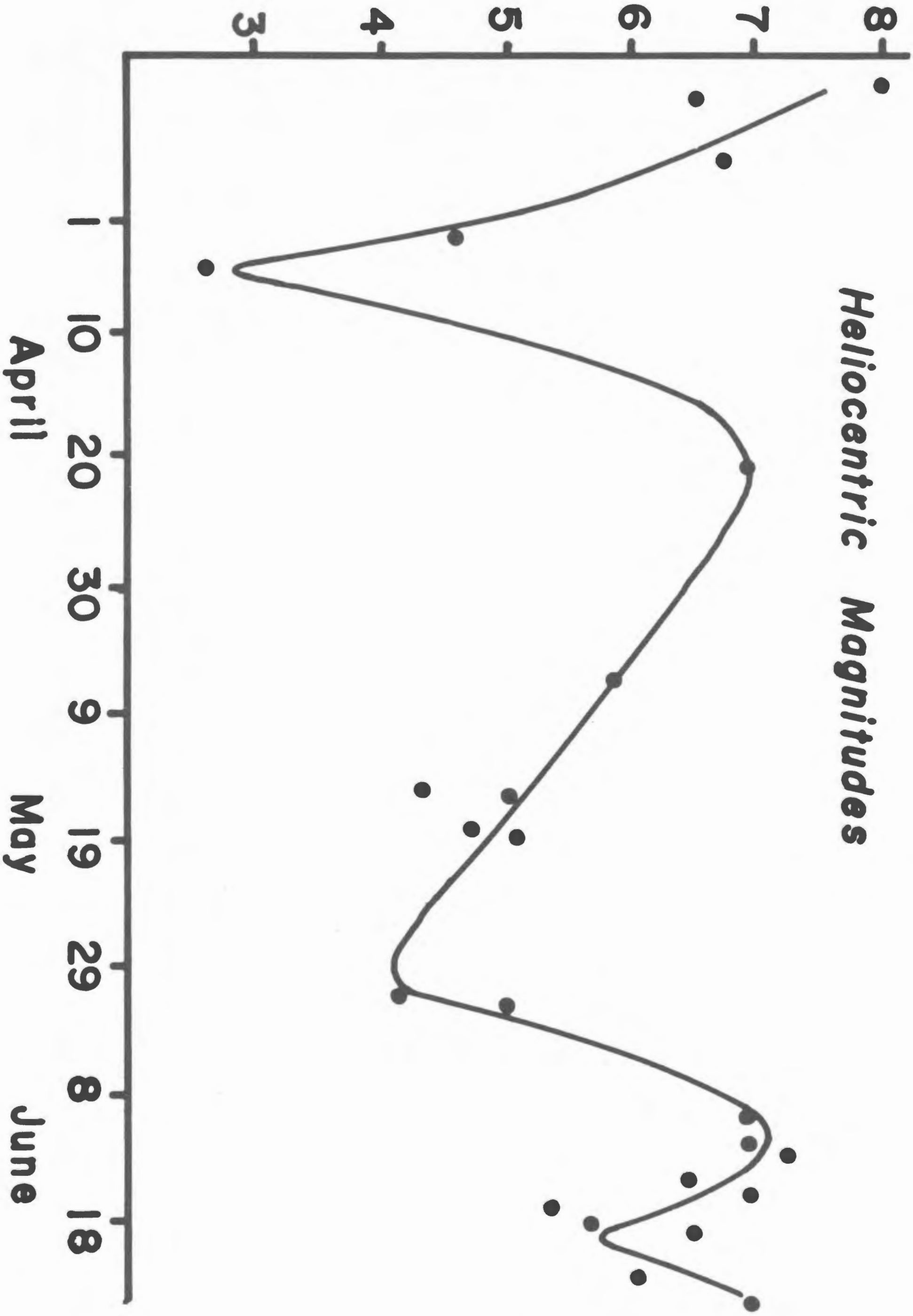

FIGURE 18. The observed corrected visual magnitude of Comet Alcock as if situated at one A.U. from both the sun and the earth plotted against date in 1963. Note the increases in brightness on April 4, May 29, and June 18. Chart compiled by David Meisel and drawn by Steve Larson.

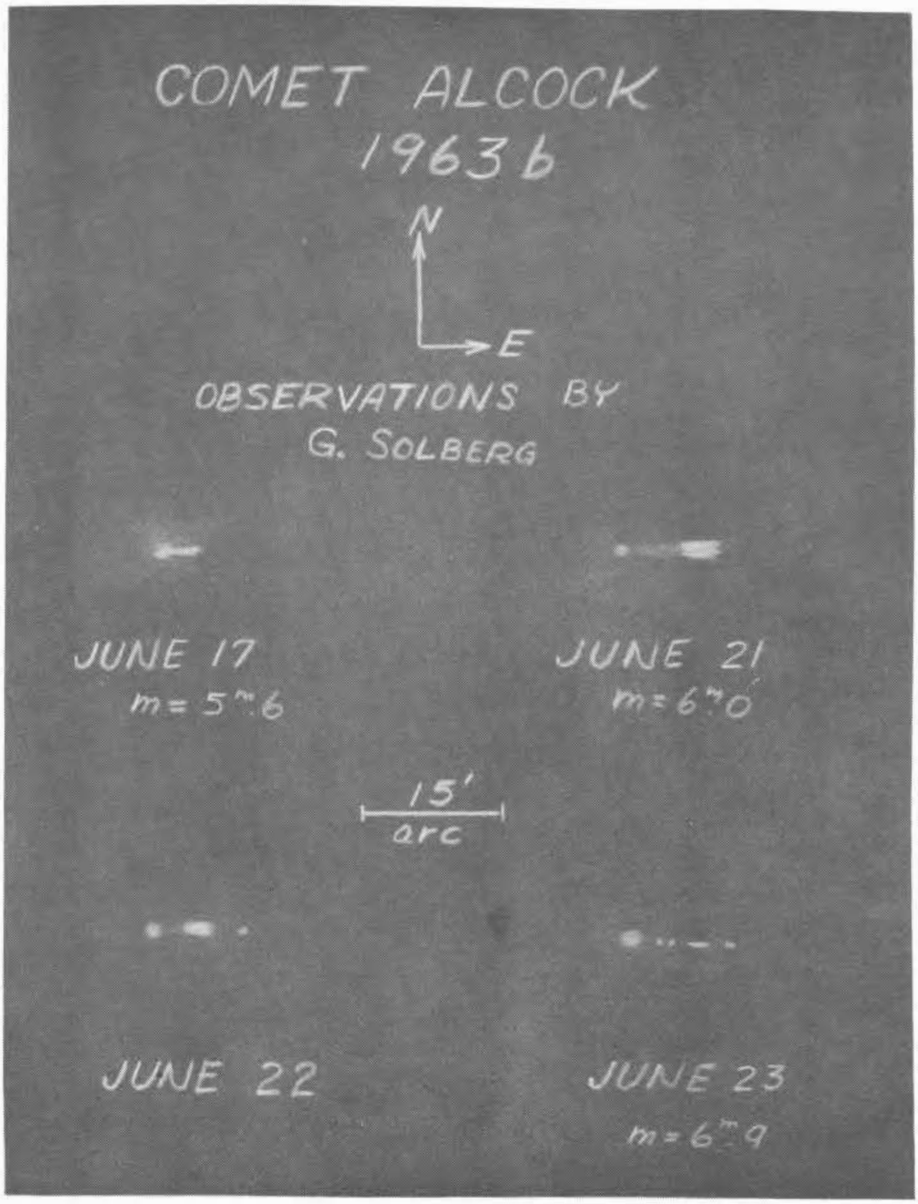

FIGURE 19. Divisions within the coma of Comet Alcock observed by Gordon Solberg from Las Cruces, New Mexico in June, 1963 with a 6-inch reflector. Redrawn for publication here by Steve Larson.

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to the predictions.

The suspected division of Comet Alcock announced by Waterfield in I.A.U. Circular 1836 was confirmed by Gordon Solberg. Waterfield observed the central condensation of the coma to be circular on June 11, 1963. The evolution of the division into separate fragments is shown in Figure 19; evening twilight prevented carrying the observations further.

A.L.P.O. LUNAR MAPPING PROJECT PROGRESS REPORT

By: Patrick S. McIntosh, A.L.P.O. Lunar Recorder

After almost two years the Selected Areas Mapping Program can produce a provisional chart of the Aristarchus-Herodotus region. During this time 14 observers have submitted 75 observations of this region. Figure 20 presents a compilation of the best of these observations, aided by photographs from the Kuiper Photographic Lunar Atlas and photographs taken by C. F. Capen and Patrick S. McIntosh. This chart should be interpreted as only a provisional chart in view of the small number of observers who have contributed to the mapping program. The chart could be improved somewhat by more careful measurements of the photographs at hand, and so it is provisional in the sense that most positions are still subject to improvement. The major outlines are accurate, but fine detail may still be in error. This chart is intended to present only the positions of features and makes only a crude indication of the three-dimensional character of these features. Careful comparison of this chart to a good photograph or a direct view of the region will help in the interpretation of the outlines.

The program of mapping this area will continue in the hope that this report will stimulate more participation. There is a need, first of all, for more observations and, secondly, for more observers. It is unwise to include observed detail in a master chart if only one person has reported this detail. There is a need for much more overlap of observations of the same object by different observers.

There is also a need for observations spread over a wider range of solar illumination. Figure 22 gives the distribution of the observations in colongitude. The clustering of observations near sunrise on the region is rather striking. There is still a vast amount of detail visible at other colongitudes. There should be observations by at least four observers for each five degrees of colongitude. This requirement is satisfied for only the colongitudes from 50 degrees to 65 degrees (morning lighting).

Figure 21 is a copy of the outline chart which shows certain areas in serious need of further observation. The areas of greatest controversy are numbered. Area 1 is the region of the most frequently reported red colorations in 1963 and 1964. Jamieson and McIntosh have observed this area in some detail, and both have reported unusual detail. This area is at times one of the brightest spots in Aristarchus. The principal feature has been described as a craterlet with crevasses and terraces extending out on either side of it, but McIntosh believes that this is not an ordinary craterlet. It gives the impression of being asymmetric. There appears to be some minor band structure associated with this feature as well. (Refer to Str. A., Vol. 17, Nos. 11-12, pp. 241-2, 1963 for an observation of Area 1 by Jamieson.)

Area 2 contains some dusky patches on the dark floor of Herodotus. The number of individual patches and their shape have varied markedly from one observer to the next. Some observers have reported a minute craterpit in the midst of the largest patch. Brettman has reported a delicate rille crossing this same patch when the seeing was extraordinary and the solar illumination very low. Often these patches are seen as very low mounds.

Area 3 contains a faint band on the wall of Aristarchus which has not been reported as looking the same by all observers. At the base of this band there may be a landslip onto the floor of the crater and some darker coloration under a high sun.

Area 4 near the "Cobra Head" contains two low hills and a possible craterlet nestled near the west (IAU sense) side of the larger of the two hills. It is this bright, crater-like feature that is of principal interest.

Area 5 contains part of the rim of Aristarchus, a portion of the

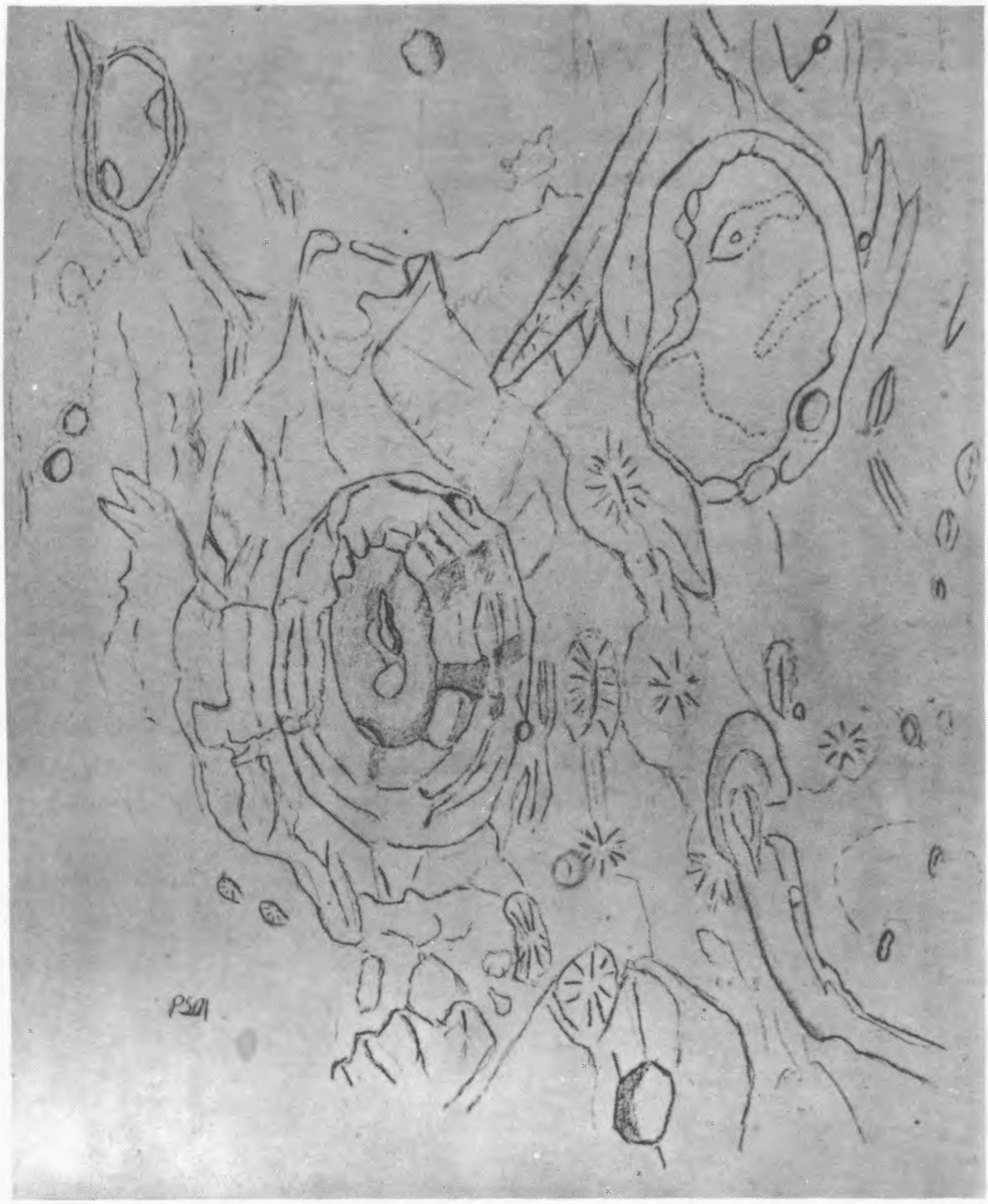

FIGURE 20. A.L.P.O. provisional master chart of Aristarchus-Herodotus region. Prepared by Patrick S. McIntosh from 75 observations by 14 observers during 1963-5 in Selected Areas Mapping Program, and also from photographs. See text of article by Mr. McIntosh. Lunar south at top, lunar west (IAU) at right.

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western outer slope of Aristarchus, and a hill. On the rim of the crater a very bright object has been seen, appearing at times as a tiny craterlet with a bit of shadow in it and at other times containing no shadow and then looking like an abutment where the rim suddenly drops to a lower level. Schneller has reported a rille near the hill.

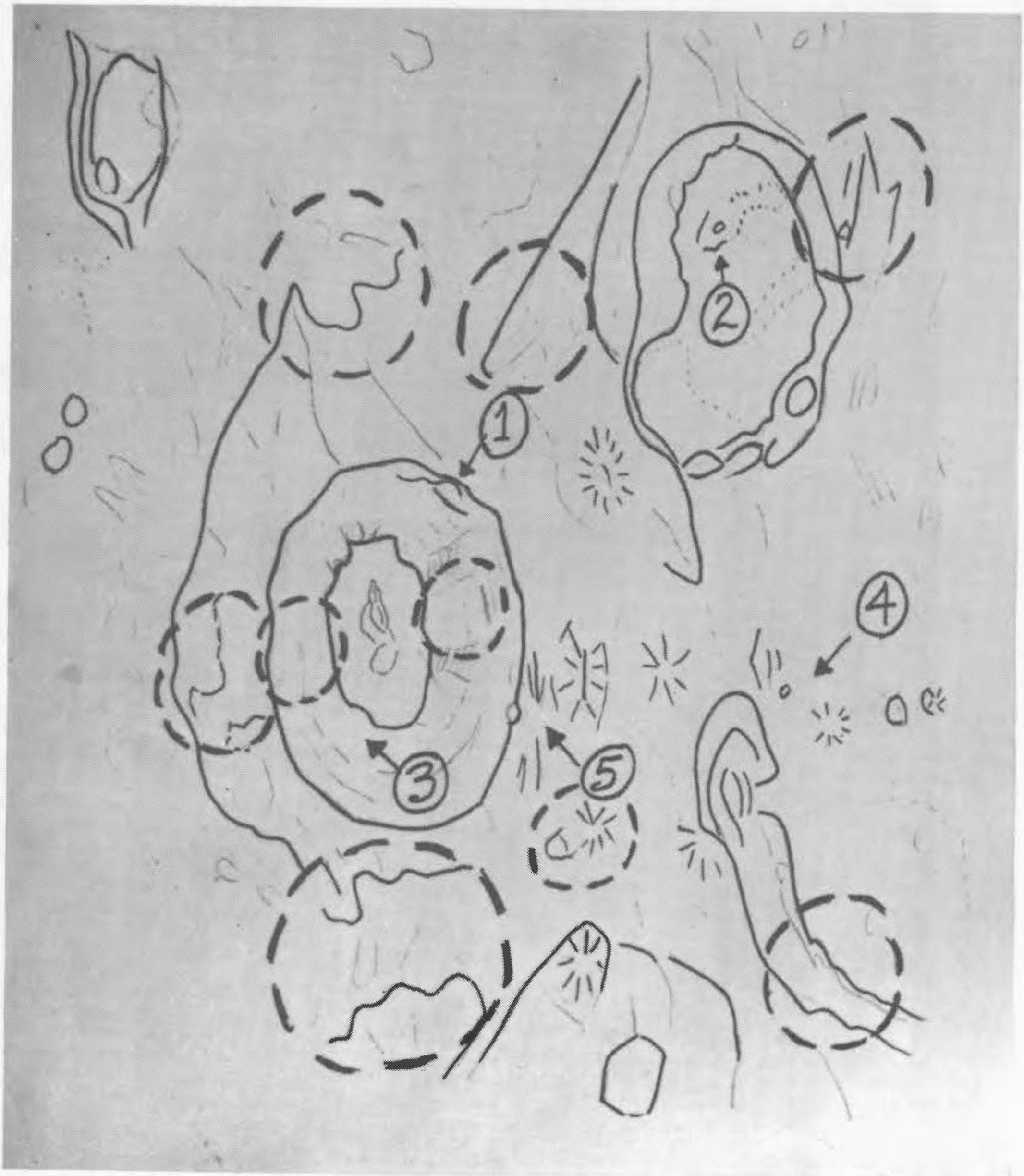

FIGURE 21. Certain areas requiring further study indicated on an outline chart of the Aristarchus-Herodotus region. The numbers are explained in the accompanying text by Mr. McIntosh. South at top, west (IAU) at right.

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The other areas marked by dashed circles really contain much detail of interest, but they either have not been observed at all or else have been observed by only one or two observers. These areas are by no means the only areas needing additional study. They are just intended for a guide in the immediate future. As one becomes accustomed to observing a particular region

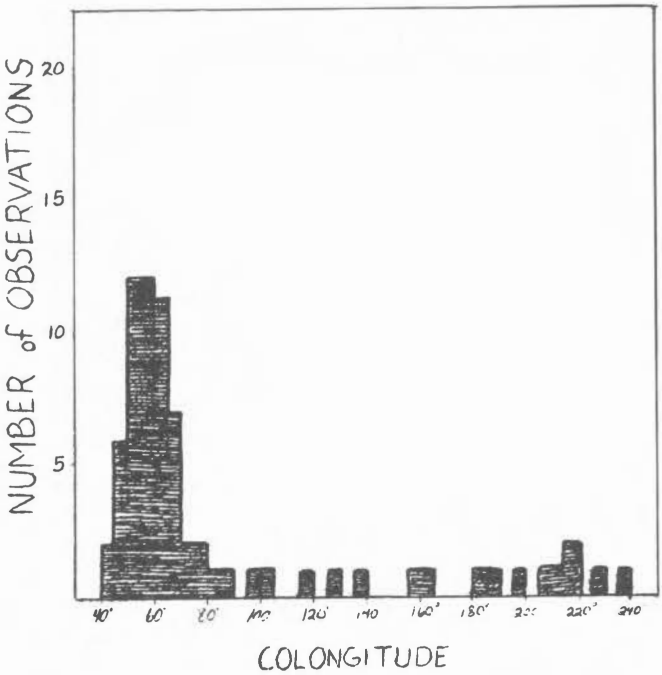

FIGURE 22. Histogram to show frequency of A.L.P.O. observations of Aristarchus-Herodotus region by intervals of colongitude. Chart prepared by Patrick McIntosh. See also text. The great majority of the observations are under early morning lighting.

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of the moon, one finds that in order to record new detail one must concentrate on very small regions at a time. Each of these areas marked on the outline chart (Figure 21) represents areas typical of what the eye can examine carefully at one time.

Updated outline charts are available from Patrick S. McIntosh at the Sacramento Peak Observatory, Sunspot, New Mexico, 88349. In the future it is suggested that all observers make pencil tracings of the outline chart to take to the telescope. In this way even the major outlines can be changed to match the observed appearance of the moon. Good seeing conditions should allow most observers to improve this outline chart by a substantial amount. Let us hope that this report will bring more observers to our ranks and more observations of definite value.

Participating Observers

Larry C. Anthenien	San Jose, California	6-in. reflec.	1	observation(s)
Orville Brettman	Elgin. Illinois	5-in. refrac.	3	"
C. F. Capen	Table Mountain Obser.	16-in. reflec.	1	"
Rev.Kenneth J. Delano	New Bedford, Mass.	8, 12½-in. reflecs.	9	"
Jean Dragesco	Le Vésinet, France	10½-in.reflec.	2	"
Frederico L. Funari	São Paulo, Brazil	8½-in.reflec.	1	"
Harry D. Jamieson	Muncie, Indiana	10-in. reflec.	15	"
Adolfo Lecuona	East Orange, N.Jersey	4½-in. reflec.	1	"
Patrick S. McIntosh	Sunspot, N. Mex.	4-in refrac., 6-in. reflec.	12	"
José Olivarez	Edinburg, Texas	17-in reflec.	2	"

George W. Rippen	Madison, Wisconsin	6-in. reflec.	2 observations
Kenneth Schneller	Cleveland, Ohio	8-in. reflec.	4 "
William A. Snyder	Pittsburgh, Penn.	4-in. reflec.	3 "
John E. Westfall	Mount Rainier, Md.	4-in. refrac.	16 "

LUNAR TRAINING PROGRAM INSTRUCTION SHEETS

By: Clark R. Chapman, A.L.P.O. Lunar Training Program Recorder

Some instruction sheets have been prepared which describe the Lunar Training Program. Such subjects are covered as: training the eye, initial training, how to draw a crater, and answers to frequently-asked questions. The instruction sheets are available on request; write to: Clark R. Chapman, 94 Harper Rd., Buffalo, N.Y. 14226, and include a stamped self-addressed envelope. Standard crater outline forms are available for several regions: (1) Cassini, (2) Posidonius (improved version of this form became available in the Fall of 1964), (3) Aristarchus-Herodotus region, (4) Hesiodus and the IAU-western part of Pitatus, Thebit, (5) the area of impact of Ranger VII, and (6) the Guericke-Parry-Bonpland-Fra Mauro region (improved version of this form became available in the Fall of 1964). Please specify which forms are desired, and enclose an additional stamp (two stamps for more than 5 forms) to cover mailing. For 25 cents (coin or stamps) the Recorder will furnish a photograph illustrating four steps in the process of drawing a crater (this originally appeared as an illustration to the article,"The Art of Lunar Drawing", Str. A., March-April, 1963.)

Walter Haas has noted an error on page 5 of the L.T.P. instruction sheets. The selenographic colongitude minus the selenographic longitude* of a lunar feature, as there mentioned, gives very nearly the angle of the sun above the horizon from the lunar point in question only near the lunar equator. A better formula for the altitude angle H of the sun as seen from a point with longitude and latitude coordinates (A,B) when the colongitude is C is: $\sin H = \cos B \sin (C - A)$. It should be noted that the process of computing lunar altitudes involves corrections for librations and for shadow-foreshortenings and requires a good knowledge of trigonometry. Before attempting projects such as this, beginners ought to spend some time following the suggested training program. The intention, in the training sheets, was merely to indicate that the selenographical colongitude of the sun is more useful than just to give an estimate of the moon's phase.

Postscript by Editor. The new Lunar Training Program sheets are very strongly recommended to all beginning lunar observers among our readers. Indeed, more experienced lunar observers may also learn much from these instructions. The Editor has even given some thought to their possible publication in full in this journal; however, they more properly belong in the future A.L.P.O. Observing Manual and should not be duplicated here. If you are watching the moon now, you will scarcely want to wait for the Manual - write Mr. Chapman for this truly helpful material at once.

ALPHONSUS AGAIN!

By: E. D. Hall and Lyle T. Johnson

On the morning of October 27, 1964, Lyle T. Johnson[1], Professor E. D. Hall, and Joseph Weresiuk observed an ephemeral color phenomenon at the base of the central peak of the lunar crater Alphonsus. The phenomenon was first detected with the aid of the "Moon Blink" detection equipment developed for NASA by Trident Engineering Associates, Inc. This equipment and the program being formulated for its utilization were announced at the National

*Evidently intended to be positive toward the I.A.U. lunar west.

Amateur Astronomers Convention in Denver last August.[2]

Johnson, Hall, and Weresiuk were observing with the Johnsonian 16-inch reflector[1] at Port Tobacco, Maryland, and were utilizing the Trident Moon Blink apparatus. Alphonsus was first observed between $5^h 10^m$ and $5^h 15^m$ U.T., and appeared completely normal (E.S.T. 12:10 - 12:15 A.M.). Returning to Alphonsus at $5^h 18^m$, U.T., Mr. Johnson detected a definite "blink" on the Alphonsus central peak. Professor Hall and Mr. Weresiuk immediately confirmed the blink. During the period from $5^h 18^m$ to $5^h 30^m$ the blink was observed with the Trident equipment. The entire Ptolemaic region was surveyed for other signs of unusual activity, but none were noted. The rotating filter wheel was stopped, and Alphonsus was viewed briefly through alternate red and blue filters. Since it was difficult to determine the nature of the small spot by this method, it was decided to make a direct visual observation as quickly as possible.

By $5^h 38^m$ the filter wheel, image converter tube, and Barlow Lens had been removed and a 400X eyepiece put on the telescope. When viewed with this eyepiece, a small pinkish-red spot at the base of the sunlit portion of the central peak was observed. This observation was confirmed independently by all present and continued until $5^h 45^m$, U.T. Since the active area was so small, it most probably would have been overlooked had not the "Moon Blink" apparatus been used.

The sunlit wall of the small crater Lyot, on the floor of Ptolemaeus, which was brighter than the sunlit slope of the Alphonsus central peak, showed very narrow blue and red chromatic bands at opposite edges due to atmospheric dispersion. These were later computed to be no more than one-half mile wide. Both the red Lyot band and the Alphonsus pink region were on the side of their respective bright areas, away from the terminator. The Alphonsus patch, however, was definitely wider. Because of this difference in the size and nature of these colored regions, and because a blink was not observed in Alphonsus between $5^h 10^m$ and $5^h 15^m$ when the moon was lower in the sky, atmospheric dispersion as the cause of the Alphonsus blink was ruled out. The moon had also been observed on the previous night; and although it was lower in the sky at that time, no blink activity was noted.

There was a frequent brief doubling of the image due to seeing, but this effect was in no way confused with the blink.

The sky was clear and the seeing was 5-6 (on a scale of 0 to 10, with 10 best) with periods up to 7. The moon rose at $3^h 5^m$, U.T. and had been up for two hours and 13 minutes at the time of the first blink observation. The colongitude was $167\overset{\circ}{.}1$ at $5^h 18^m$, when the blink was first recorded.

By $6^h 10^m$, U.T. the image converter tube and filter wheel had been put back on the telescope since no traces of color in the Alphonsus region had been visible for nearly 25 minutes. Alphonsus appeared quite normal, none of the three observers detecting any further blink. Professor Hall and Mr. Weresiuk continued observing until $8^h 30^m$ without noting anything unusual. The Alphonsus region was kept under surveillance the following evening; no unusual activity was observed.

The following is quoted from a letter to J. J. Gilheany, Moon Blink Project Director, by James C. Greenacre, ACIC, Lowell Observatory, Flagstaff, Arizona:

> "You may be interested in an observation I made on the ridge that runs south and connects with the central peak of Alphonsus. With optimum seeing I could see that the ridge at the base of the peak was fissured or cracked open. Also, there was at least one small crater within the breach and very close to the base of the peak. As far as I can determine this is the spot where Johnson observed the blink.
>
> "If these red spots are the result of gaseous emissions then this spot has everything in its favor as far as topography is concerned".

E. D. Hall is an Associate Professor of Physics at the United States Naval Academy, and Mr. Weresiuk is a science and mathematics teacher at Annapolis High School.

References

1. Lyle T. Johnson, "Improving Image Contrast in Reflecting Telescopes", The Strolling Astronomer, Vol. 18, pp. 142-146, 1964.

2. A revised text of Mr. J. J. Gilheany's Denver paper is scheduled for publication in our next issue.

Note by Editor. It is worth noting that the observation here reported is at almost the same solar lighting (167°.1) as the first of Mr. N. A. Kozyrev's famous spectrograms of Alphonsus on November 3, 1958 (168°.1). In that spectrogram the central peak of Alphonsus was deficient in violet light, and at the same time this peak visually looked dim and reddish. Perhaps the best popular account of the Kozyrev observations is on pp. 184-186 of Sky and Telescope for February. 1959. The activity on October 27, 1964 was surely of shorter duration (30 minutes or less) and lesser conspicuousness than on November 3, 1958. Nevertheless, a systematic patrol of the central peak of Alphonsus near colongitudes 167°-168° might well be rewarding (perhaps at other lightings also). Such searches could be made in 1965 near the following Universal Times: April 22 at 18^h, May 22 at 5^h, June 20 at 16^h, and July 20 at 3^h.

1965 CONVENTION OF ASTRONOMICAL LEAGUE AND ASSOCIATION OF LUNAR AND PLANETARY OBSERVERS

The Milwaukee (Wis.) Astronomical Society and the Racine (Wis.) Astronomical Society will be hosts to the nationwide amateur astronomers' convention which will be held in Milwaukee on July 2, 3, 4 and 5, 1965. Participating organizations are the Astronomical League and the Association of Lunar and Planetary Observers.

The tantative program is as follows:

Friday, July 2:	Early registration
	Evening: Buffet dinner
	Evening: Bus trip to Milwaukee and Racine Observatories
Saturday, July 3:	7:30 to 9:00 a.m. - Registration
	9:00 a.m. - Meeting begins
	10:00 to 12:00 a.m.- Presentation of papers
	12:30 to 1:30 p.m.- Luncheon
	2:00 to 4:00 p.m.- Presentation of papers
	4:30 p.m. - Bus trip to Yerkes Observatory at Williams Bay, Wis. Cook-out and an opportunity to see and, if sky is clear, to look through this famous, and world's largest, refractor.
Sunday, July 4:	9:00 a.m. to 12 noon - Presentation of papers
	12:30 p.m. - Group photograph
	12:30 p.m. to 2:30 p.m.- Lunch
	2:30 to 4:30 p.m. - See the nationally renowned "In Old Milwaukee" Schlitz Circus Parade.
	6:30 p.m. - Convention Banquet
Monday, July 5:	9:00 a.m. - Final Meeting
	12:00 noon - Luncheon
	Evening - Star parties at the Milwaukee and Racine Observatories.

Advance registration will facilitate getting into the early meetings. Advance registrations, as well as inquiries on reservations and vacation information, should be sent to Mr. William B. Albrecht, 200 W. Hampton Ave., Milwaukee, Wis. 53225. Hotel reservations, including payment when enclosed with registrations, will be forwarded to the Hotel Schroeder. All meetings will be held at the Hotel Schroeder, one of Milwaukee's finest. Accommodations will be available to satisfy the needs of everyone. Room reservations should be made as early as possible and directly with the hotel. Rate and reservation cards have been mailed to all Societies.

Members are urged to submit papers of interest, with the time limit set at ten minutes. Abstracts or papers must be submitted in advance with the final date set at June 1. Because papers accepted for presentation will be printed, it will be necessary to provide a duplicate copy for our editors, after the presentation. Papers should be sent to Mr. Phil R. Glaser, 200 Albert St., Waukesha, Wis.

Display space for homemade instruments will be available at the Milwaukee Astronomical Society's Observatory. Exhibit awards will be made at the banquet.

This will be a wonderful opportunity to visit Milwaukee and its environs on the beautiful shore of cool Lake Michigan. The famous annual "In Old Milwaukee" Schlitz Circus Parade on the 4th of July has been and will again be a great and unusual attraction.

ANNOUNCEMENTS

New A.L.P.O. Address: This Association and its publication now have a new post office box number. The complete address, with zip code, is:

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University Park
New Mexico 88070

The new box number is the result of the erection of a new Post Office Building at New Mexico State University; the reassigned Box 26 would have been inconveniently small. While helpful mnemonics like ALPO and MOON were not available for the new box, the Editor hopes that the choice of the first and last letters of the English alphabet may assist memory. The new address should be used in all future correspondence.

In Memoriam. We have learned with regret of the passing of Mr.Chalmers B. Myers of Romoland, California. Better known as "Chief" to his many friends among West Coast amateurs, he had been a leader in the Western Amateur Astronomers and had served on its Board of Representatives. He had belonged to the A.L.P.O. since 1953. We extend our sympathies to his immediate family and friends.

New Address for A.L.P.O. Staff Members. Mr. J. Russell Smith should now be addressed at: 1446 George St., Eagle Pass, Texas 78852. He is our book review Editor. Lunar Recorder Harry D. Jamieson is now at: 923 W. Main St., Muncie, Indiana 47305.

"Ranger VII Photographs of the Moon. Part I: Camera A Series". Many of our readers will certainly wish to acquire the unique and excellent book with this title. It is available from the Superintendent of Documents, Government Printing Office, Washington, D.C.20402. The price is $6.50 per copy. The text includes material on the Ranger VII mission, the television system, the trajectory, and film recording and processing. Of chief interest, however, are the 199 photographs secured by the A camera, the widest angle camera, during the last 17 minutes of the Ranger VII flight. Every lunar student will want a copy for his personal library.

Sustaining Members and Sponsors. As of March 6, 1965, we have these persons in the special classes of membership:

Sponsors - William Roberts, David P. Barcroft, Philip and Virginia Glaser, Charles H. Giffen, John E. Westfall, Joel W. Goodman, The National Amateur Astronomers, Inc., James Q. Gant, Jr., David and Carolyn Meisel, Clark R. Chapman, Ken Thomson, Kenneth J. Delano.

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Sponsors pay $25 per year; Sustaining Members, $10. The balance above the regular rate is used to support the work and activities of the A.L.P.O.

Study of Overlapping Lunar Craters. Mr. Jeffrey B. Lynn, 1655 Pacific Highway, San Diego, California 92101 requests correspondence from lunar observers who would like to assist in discovering and detecting cases where a larger lunar crater overlaps a smaller one. The study can be carried on either with a telescope (preferably not too small) or with the photographs in such a set as Kuiper's *Photographic Lunar Atlas*. Mr. Lynn is mimeographing some forms for use in this project. He thinks that most of the work could be accomplished by half a dozen devoted observers in three or four lunations. The results of a study of this kind may have some bearing on theories of the origin of lunar craters.

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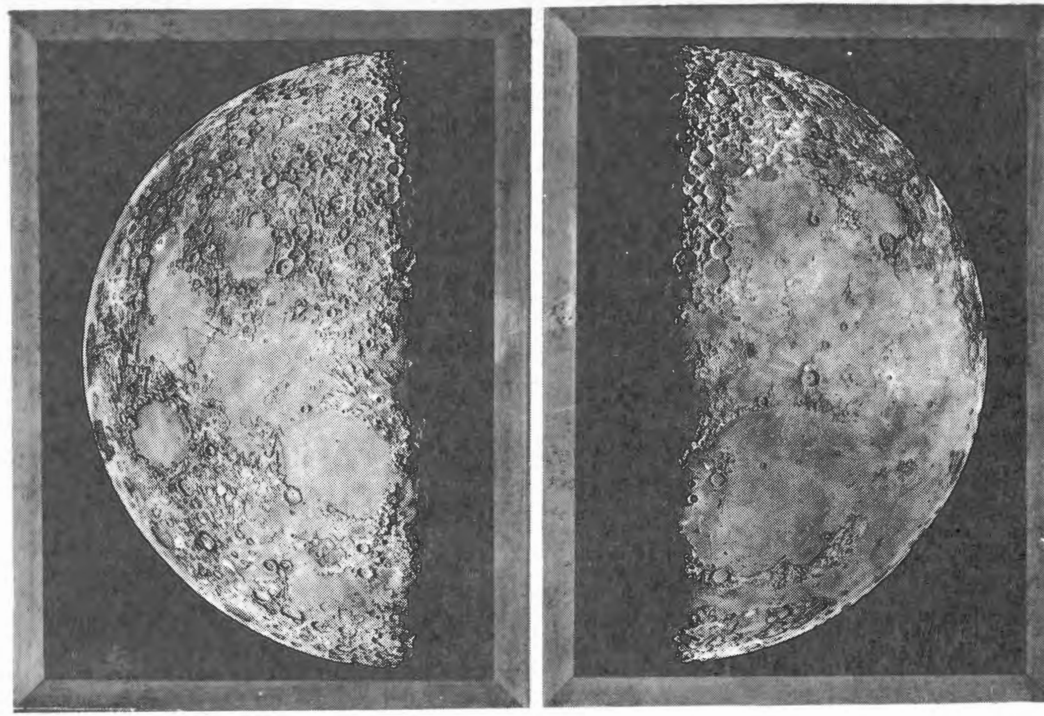

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