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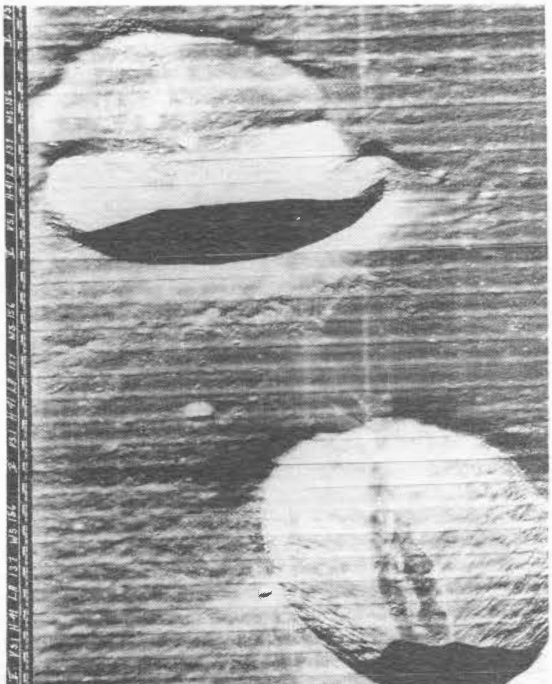

View of the famous lunar crater pair Messier (foreground) and W. H. Pickering or Messier A (background), an oblique photograph taken by Orbiter V on August 10, 1967. Orbiter is looking west (IAU sense) from an altitude of about 100 kilometers. Each crater has a major axis about 13 kms. long. Note the doubled west wall of Pickering and the two bands of debris on the floor of Messier. Messier and Pickering have been studied for their resemblances to each other, for their apparent changes in size and shape with changing solar lighting, and as the site of a conjectured lunar tunnel. This photograph is in the A.L.P.O. Lunar Photograph Library (67-H-1223).

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IN THIS ISSUE

OBSERVATIONAL RESULTS OF THE FIRST ONE AND ONE-HALF YEARS OF THE MOON BLINK PROJECTS

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(Paper read at the Fourteenth A.L.P.O. Convention at Tucson, Arizona, August 26-28, 1966.)

Introduction

The original and main purpose of the Moon Blink project was to develop, produce, and distribute a limited number of operational devices to detect color phenomena on the moon. Twelve instruments are now in operation in this country and two in England. In conjunction with this Moon Blink network, an experimental conference telephone confirmation network was established among observatories near the East Coast. This confirmation network sucessfully functioned during a Moon Blink-detected event on November 15, 1965. We (Cameron, 1965) appealed to the amateurs to turn more attention to the moon and upon request provided standard forms to be filled out and returned to Cameron, if an event was observed, as part of the Data Collection Center at NASA. It is this set of data that we are reporting on now.

Analyses of the Observations

We have received about two dozen reports of transient phenomena, of which eight were Moon Blink events. The lunar group of the British Astronomical Association, under the directorship of Patrick Moore, have constructed a Moon Blink device that is now in operation. They have observed some lunar phenomena, but their reports arrived too late to be incorporated in this paper.

Table I presents data pertinent to analyses which will be given here with respect to a number of hypotheses as to the cause of lunar transient phenomena. Explanations of those columns which are not self-explanatory are given in accompanying notes.

The first few observations subsequent to the Greenacre sighting late in 1963 occurred near sunrise (with respect to the lunar features), which suggested that the first incidence of sunlight excited escaped gases to luminescence. Column 6 of Table 1 lists the approximate distance of the observed feature from the terminator at the time of the event, with the sunrise terminator indicated by R, the sunset terminator by S. This distance is represented in Figure 1 for each of the seven features reported. In this figure R indicates sunrise; S, sunset. For easy reference, the type or nature of the event is given in a code which will be used throughout this discussion: RS = red spots, RG = red glows, RP = red patches, RB = red and blue bands, MB = Moon Blink, BR = brightening, SL = star-like images, FZ = fuzzy area, and VI = violet tinge. It is apparent that the phenomena are related neither to the sunrise terminator, nor even to low-angle illumination. The great majority of the phenomena occur at large distances from either terminator, as may be most strikingly seen in the Aristarchus observations.

An hypothesis, proposed by Green (1964) some time ago, involves tidal influences. Lunar tides are about 50 times greater than terrestrial tides and may be sufficiently strong to promote or induce degassing -- or even vulcanism. Green noted that higher terrestrial well-water levels and increased oil yields occurred at periods of low crustal tides (apogee). He searched the literature and found about 25 lunar phenomena with precise dates with which he could compare the moon's orbital position. If relaxation in lunar fractures occurred, resulting in closer spacing, thus squeezing out fluids, he expects that a significant number of the transient phenomena would be observed near maximum apogee, i.e., within the period of maximum orbital change. A corollary would be minimum degassing at times of maximum perigee, when the lunar orbit is most nearly circular. He found, among his 25 events, that 7 occurred near apogee and that 19 of the 25 fell within the period of maximum orbital change. Encouraged by his results, Green has predicted dates when events are most likely and least likely to occur for several years in the future.

Recently, Burley and Middlehurst (1966) have published a report on historical accounts of transient phenomena in which they analyzed about 160 events. Their results show a fairly strong correlation with perigee and a lesser one with apogee, suggesting a tidal effect. Their treatment considers the phase of the orbit and not its shape; thus, Green's hypothesis cannot be fully checked from their analysis. They do not itemize their observational data.

We represent our data in two ways -- for comparison with both Green's analysis and Burley and Middlehurst's presentation. Figure 2, analogous to those by Green, shows a plot of the moon's distance in earth radii as given by Woolston (1961), versus the day of the year, covering the period August, 1964, through December, 1965 (the 1966 item, number 25 in Table I, is not included). The lunar events (column 2) are depicted on this lunar orbital curve by <u>x</u>'s with their natures indicated in the aforementioned code. The phases of the moon are given symbolically. Comparing with Green's analysis (the number of events is similar), we find 6 events occurring near apogee (± 5 days), while 10 events fall within the period of maximum orbital change. Green found 7 and 19 for these respective events. Thus, while Green found 75 per cent of his historical phenomena occurring in the period of greater likelihood of degassing, only 40 per cent of ours do. His predictions call for maximum degassing near the 10th, 35th, 200th and 225th days of 1964 and the 150th and 178th days of 1965. None of our events falls near these dates. Many of our events fall within the predicted <u>minimum</u> degassing period. Our data do not strongly support his hypothesis.

Considering only the lunar anomalistic period -- as did Burley and Middlehurst -- the tidal relationship is represented as the phase of the (true) anomalistic period (perigee to perigee) in Figure 3, in which is plotted the number of events versus the lunar phase (column 8 of Table 1). The average anomalistic period is 27.6 days; therefore 0.1 of a period corresponds approximately to 3 days. Our peak at 0.1 periods is probably not significant, especially in view of a subsidiary maximum, at 0.8 periods, that is not one-half period apart from it. It is curious that the present phenomena do not conform to the trend of the historical ones. If our data is added to Burley and Middlehurst's data, it modifies their histogram, reducing their peak at perigee (0.0) somewhat, but does not eliminate it, nor the one at apogee (0.5). Clearly, the tidal effect needs further investigation, especially when the historical data is analyzed with respect to the shape of the orbit, which we expect to do subsequently.

Speiser (1965) suggests that the earth's magnetic tail may accelerate and focus solar particles on to the moon, producing energies sufficient to excite gases or surface materials to observable luminescence. If this is the dominating mechanism of excitation, it would be expected that the majority of observations would occur near Full Moon. Column 9, Table 1, gives the number of days from Full Moon for each event, which has been plotted in Figure 4a on a diagram (after Ness (1966)) showing the relative positions of the sun, earth, moon, magnetic tail, and its bow shock front. The date and nature of each event are also shown. About one-third of the observations fall within the bow shock limits. Two-thirds of the events occur well beyond any magnetic-tail influence. In graphical form, as Figure 4b, the association with Full Moon is not pronounced. However, if one selects, for example, the 14 color events, 50 per cent occur within the shock front (± 4.5 days). The other types of events actually show a negative correlation with Full Moon. We plan to pursue this investigation in connection with the historical data. It is possible that there may be a correlation between color phenomena and the position of the earth's magnetic tail.

Kopal (1964) has advocated still another mechanism to account for the lunar phenomena. He assumes that solar flare particles that arrive, unimpeded, at the lunar surface stimulate surface materials to luminesce. To investigate this possibility, we have recorded in column 10 of Table 1 the maximum magnetic disturbance index ($k_{p,max}$) recorded for the date of the lunar events, and in columns 11 and 12, respectively, the maximum solar flare activity for two days and for one day before the lunar event date. Solar particles require from 24-48 hours (averaging about 36 hours) to arrive within the earth-moon system. The k_p-index indicates the severity of effect or energy of the solar particles affecting the earth's atmosphere. Therefore, this index should indicate the arrival and energy of particles on the moon as well. On Kopal's hypothesis one would expect a correlation of lunar events with high values of k_p. We have given the maximum activity of any 3-hour interval as given in the CRPL publications (U. S. Bureau of Standards, 1966) (see also Lincoln (1966)). Figure 5a represents the data in column 10 ($k_{p, max}$) versus column 1 (serial number). We see that only one event occurred at a time of intense terrestrial ionospheric activity. This graph, however, does not indicate whether there were severe storms for which no lunar events were seen. Figure 5b is intended to illustrate this point; it gives $k_{p, max}$ for every day covering the period of these reports (except for the last observation in Table 1, number 25). Also shown are the occurrences of sudden commencements (SC) of magnetic storms, signalling the arrival of energetic solar particles on the earth. The numbers shown give an index of the activity of the most important flares for each day. If one wants to find what kind of flare gave rise to a particular k_p-activity on the graph,

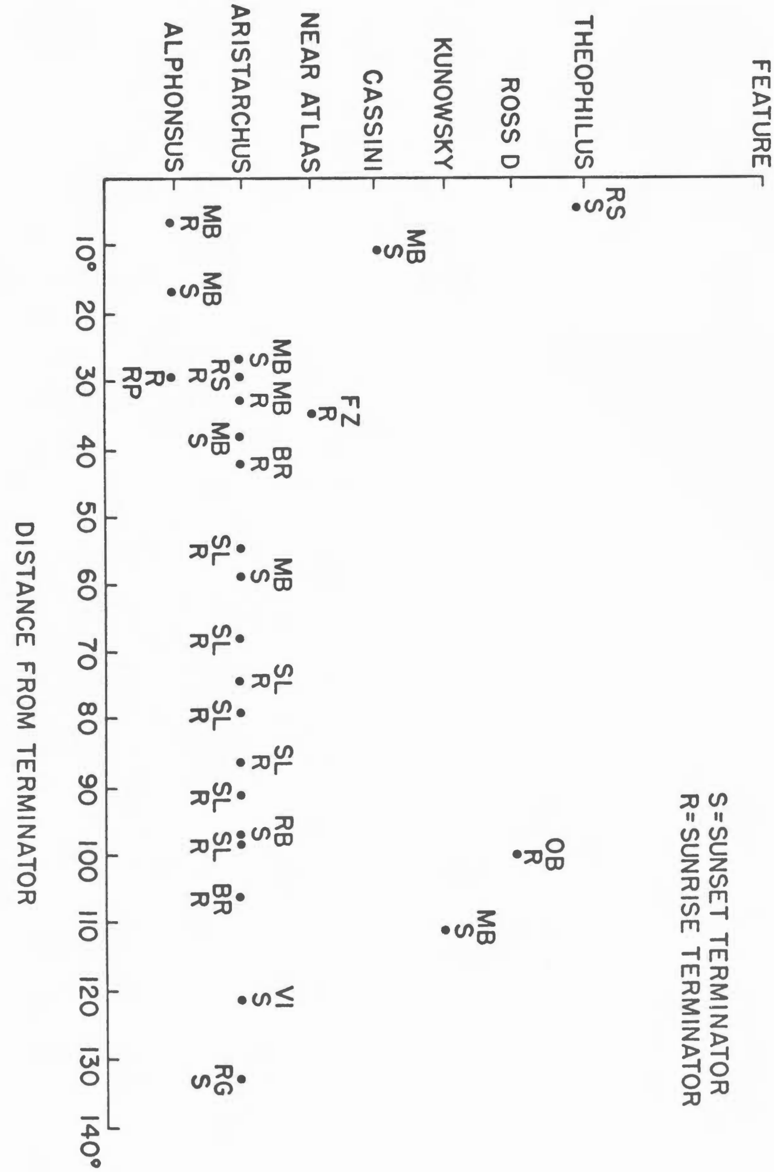

Figure 1. Relationship of the angular distances (in degrees) of the 25 reported lunar events (involving only 7 lunar features) from the sunrise (R) or sunset (S) terminator. Double letters give the code (explained in the text, and used for all the figures) for the nature of the event. The only features with multiple events were the craters Alphonsus and Aristarchus. Note that few events were observed at low-angle illumination (near the terminator); this point is strikingly evident among the Aristarchus events.

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he should look at the flare data for one or two days preceding the event in question. The lunar events are indicated by large open circles. One sees that there is almost a negative correlation with solar activity. The large majority of events occurred at times of quiet solar activity. The absence of correlation with solar flare activity is not unexpected, for some investigations show that there is insufficient energy in solar particles to activate luminescence on the moon (Nash (1966)).

Table I Observational data reported in Moon Blink project.

(1) NO.	(2) DAY OF YEAR	(3) DATE	(4) FEATURE	(5) NATURE OF PHENOMENON	(6) DISTANCE FROM TERMINATOR	(7) DAYS FROM PERI (P) OR APO (A)	(8) ANOMALISTIC PERIOD (P_A)	(9) DAYS FROM FULL MOON	(10) SOLAR $K_{p_{max}}$	(11) PHENOMENA Flare Imp. -2^d	(12) -1^d
1.	239	8/26/64	ARISTARCHUS	RED & BLUE BANDS	98^0(S)	P-7	.782	+3	3+	1-,	1
2.	264	9/20/64	ROSS D	OBSCURATION	100 (R)	A+6	.722	-1.5	1+	1-,	1
3.	264	9/20/64	ARISTARCHUS	RED SPOTS	29 (R)	A+6	(.722)	-1.5	1+	1-,	1
4.	266	9/22/64	KUNOWSKY	MOON-BLINK (RED)	112 (S)	P-5	.799	+0.5	8-	1-,	1-
5.	301	10/27/64	ALPHONSUS	MOON-BLINK (RED)	17 (S)	P+3	.122	+6	2+	1-,	1-
6.	354	12/19/64	ARISTARCHUS	BRIGHTENING	43 (R)	P	.989	0	3+	1-,	
7.	128	5/8/65	ALPHONSUS	MOON-BLINK (FLASHES)	7 (R)	P+3	.116	-7	4+	1-,	1-
8.	135	5/15/65	ARISTARCHUS	MOON-BLINK (PULSATIONS)	33 (R)	A-5	.363	0	2	,	1+
9.	183	7/2/65	ARISTARCHUS	STAR-LIKE FLASHES	99 (R)	P+2	.078	-11.5	2	1,	1-
10.	184	7/3/65	ARISTARCHUS	STAR-LIKE FLASHES	87 (R)	P+3	.113	-10.5	2+	1-,	1
11.	185	7/4/65	ARISTARCHUS	STAR-LIKE FLASHES	75 (R)	P+4	.149	-9.5	1+	1,	1-
12.	199	7/18/65	THEOPHILUS	RED SPOTS	4 (S)	A+4	.648	+5	4-	,	1-
13.	213	8/1/65	ARISTARCHUS	STAR-LIKE FLASHES	92 (R)	P+4	.135	-11	3-	,	1-
14.	214	8/2/65	ARISTARCHUS	STAR-LIKE FLASHES	80 (R)	P+5	.169	-10	3+	,	1-
15.	215	8/3/65	ARISTARCHUS	STAR-LIKE FLASHES	68 (R)	P+6	.204	-9	2+	1-,	1-
16.	216	8/4/65	ARISTARCHUS	STAR-LIKE FLASHES	55 (R)	A-6	.239	-8	3-	,	1+
17.	233	8/21/65	ARISTARCHUS	MOON-BLINK (PINK)	27 (S)	P-4	.836	+9	4	1-,	1+
18.	254	9/11/65	ARISTARCHUS	RED GLOWS	134 (S)	A+4	.620	0	2-	1+,	2
19.	289	10/16/65	CASSINI	MOON-BLINK (PULSATIONS)	11 (S)	P-4	.850	+6	1-	1,	1-
20.	291	10/18/65	ARISTARCHUS	MOON-BLINK	39 (S)	P-2	.915	+8	3	1-	1-
21.	303	10/30/65	NEAR ATLAS	FUZZY AREA	34 (R)	A-1	.423	-9	3	1-,	1-
22.	314	11/10/65	ARISTARCHUS	VIOLET TINGE	122 (S)	P-4	.832	+1	0+	1,	1
23.	319	11/15/65	ARISTARCHUS	MOON-BLINK PHOTO.,RADIO	59 (S)	P+1	.037	+6	2-	1-,	1
24.	330	11/26/65	ARISTARCHUS	BRIGHTENING, PHOTO.	107 (R)	A-4	.437	-13	2-	1-,	1-
25.	91	4/1/66	ALPHONSUS	RED PATCH	30 (R)	A-4	.906	-4	5	2,	2

Notes to Table I

Column (6), (S) = sun<u>set</u> terminator; (R) = sun<u>rise</u> terminator.

Column (7), - = before; + = after; P = perigee, A = apogee.

Column (8), gives the phase of the true anomalistic period (perigee to perigee).

Column (9), + = after; - = before.

Column (10), gives the maximum magnetic index for any 3-hour interval for the day of the lunar event. The range of k_p is from 0 to 9, in which 0 to 3+ is quiet, 4- to 6+ is moderate, and 7- to 9 is severe magnetic activity.

Column (11), gives the maximum importance of any solar flares occurring two days prior to the lunar event date.

Column (12), gives the maximum importance of any solar flares occurring one day before the lunar event date. Terrestrial magnetic storms are usually caused by flares of importance 2 or greater, but 1+ flares sometimes produce them. See references (9) and (10) for more detailed explanations.

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The preceding are only hypotheses that we have so far investigated. Other data pertinent to the observations are given in Table II. It was necessary that much of the information be abbreviated; hence explanatory notes are appended.

Interpretation

The observations discussed here are too meager for drawing indisputable conclusions,

Table 2. Additional data from reports of observations in Moon Blink project.

(1) NO.	(2) TIME(UT)	(3) (IAU) SELEN. COORD. (DEG.)	(4) (IAU) TERM. LONG. (DEG.)	(5) AGE (DAYS)	(6) ALT. (DEG.)	(7) SEEING[1]	(8) DURATION[2]	(9) OBSERVER[3]	(10) LOCATION[4]	(11) INSTRUMENT[5]	(12) SOURCE[6]	(13) REMARKS
1	0200-0300	47W23N	S51E	18	15	P	1H	GENREI	GRBTMD	L16360	TPDC	RED & BLUE BANDS, ATMOSPHERIC?
2	0455-0500	23E12N	R77W	14	30	F	5M	CROSS	WHICAL	L19250	AADC	AREA IS NEAR ROSS D
3		47W23N	R77W	14				CROCRW	WHICAL		ALPO	RED SPOTS IN ARISTARCHUS-HERODOTUS AREA
4	0325-0430	32W03N	S80E	16	75	G	1H+	GIHAJO	PTTOMD	L16400	MBDC	RED SPOTS
5	0518-0545	04W14S	S13E	22	40	G	27M	JOHAWE	PTTOMD	L16400	MBDC	RED SPOT ON CENTRAL PEAK
6	0313-0314	47W23N	R90W	15	50	V	01M	BUDFAR	BINGNY	R04120	ALPO	DURING ECLIPSE, BRIGHTENED FIVE TIMES
7	0547-0600	04W14S	R03E	07	15	V	13M	MCLARI	HUNALA	L16	MBDC	LIGHT FLASHES ON CENTRAL PEAK
8	0140-0225	47W23N	R80W	14	15	F	45M	JOMCWE	PTTOMD	L16240	MBDC	PULSATION OF IMAGE
9	0420-0550	47W23N	R52E	03	30	F	90M	EMALWL	AZUCAL	L08375	AADC	STAR-LIKE BRIGHT SPOT IN DARK OF MOON
10	0425-0546	47W23N	R40E	04	45	F	90M	EMGRWA*	COVCAL	L08	AADC	SIMILAR TO (9)
11	0353-0559	47W23N	R28E	05	30		2H+	EMGRWA*	COVCAL	L08375	AADC	SIMILAR TO (9), WITH PULSATIONS
12	0852-0901	26E11S	S22E	19	45	G	10M	CROARR	WHICAL	L19450	AADC	RUBY RED WITHIN PINK AREA ON CENTRAL PEAK
13	0500	47W23N	R45E	04	25	E		EMWLGR	AZUCAL	L08375	AADC	STAR-LIKE BRIGHTENING ON DARK PART OF MOON
14	0357-0414	47W23N	R33E	05	45	G	17M	BORNHT	MPKCAL	L10240	AADC	SIMILAR TO (13), 3 TIMES, CONFIRMED
15	0418-0424	47W23N	R21E	06	40	G	6M	BORNHT	MPKCAL	L10240	AADC	SIMILAR TO (13), CONFIRMED
16	0402-0404	47W23N	R08E	07	50	G	2M	BORNHT	MPKCAL	L10240	AADC	ALTITUDE IS THAT OF LAST OBSERVATION
17	0655-0805	47W23N	S20W	24	45	E	1H	GIJOSE	PTTOMD	L16400	MBDC	2 PINK PATCHES, ASTRONAUTS SAW AURORA
18	0400-0800	47W23N	S87E	15	80		4H	CRORAS	WHICAL	L19	TPDC	TIME IS FOR WHOLE OBSERVING PERIOD
19	0738-0910	05E40N	S16E	21	80	V	1.5H	MCLARI	HUNALA	L16125	MBDC	WASHBOWL SHOWED THE VARIATIONS PROF. AST. SAID ATMOSPHERIC
20	0730-0736	47W23N	S08W	23	60	G	6M	GEODER	HUNALA	L16125	MBDC	2 BLINKS 2MIN. DURATION AT 2 MIN. INTERVALS
21	2330-2350	51E48N	R17E	06	50	V	20M	FEHGAR	PARANJ	R02088	TPDC	FUZZY AREA WITH VARIATIONS NEAR ATLAS
22	0125-0530	47W23N	S75E	17	70	G	4H+	BARTLT	BALTMD	L04145	ALPO	2 TWENTY MIN. OBSERVING PERIODS, UNUSUAL VIOLET TINGE
23	0555-1000	47W23N	S12E	22	75	V	4H+	HANOJO	PTTOMD	L16400	MBDC	PHOTOS, RADIO DATA, PARTIAL VISUAL CONFIRMATION
24	0137-0206	47W23N	R60E	03	30	G	30M	BORNHT	MPKCAL	L10	AADC	PHOTOS, VISUAL CONFIRMATION
25	0300-0320	04W14S	R34W	10	45		20M	JENHAR	CESCAL	L12	AADC	RED PATCH ON CENTRAL PEAK-W. WALL, REP'T ON TAPE

*W=WELCH, A=ALBERT

Notes to Table II

1. Seeing is rated P = poor, F = fair, G = good, V = very good, E = excellent.
2. H = hours, M = minutes.
3. Usually there was more than one observer, necessitating abbreviations which are: Gen = Genatt, Rei = Reid, Gi = Gilheany, Ha = Hall, Jo = Johnson, We = Weresiuk, Bud = Budine, Far = Farrell, Mclari = McLarin, Mc = McClench, Em = Emmanuel, Gr = Gridley, Cro = Cross, Crw = Crowe, Arr = Arriola, Wl = Welch, Bornht = Bornhurst, Se = Segerstrom, Ras = Rasor, Geo = George, Der = Dervage, Feh = Fehring, Gar = Garris, Bartlt = Bartlett, No = Nordling, Jen = Jenner, and Har = Harris.
4. Location gives city and state, the latter having the conventional abbreviations; the city abbreviations are: Grbt = Greenbelt, Whi = Whittier, Ptto = Port Tobacco, Bing = Binghamton, Hun = Huntsville, Azu = Azusa, Cov = Covina, Mpk = Monterey Park, Para = Parasmus, Balt = Baltimore, and Ces = Coral Estates.
5. Type of telescope is denoted by L = reflector, R = refractor. The next two digits give the aperture in inches, and the last three digits give the maximum power used during the observations.
6. All reports were sent to Cameron at the NASA Lunar Transient Phenomena Data Collection Center, contributed directly (TPDC), through the Argus/Astronet network, (AADC), Association of Lunar and Planetary Observers (ALPO), or Moon Blink network (MBDC).

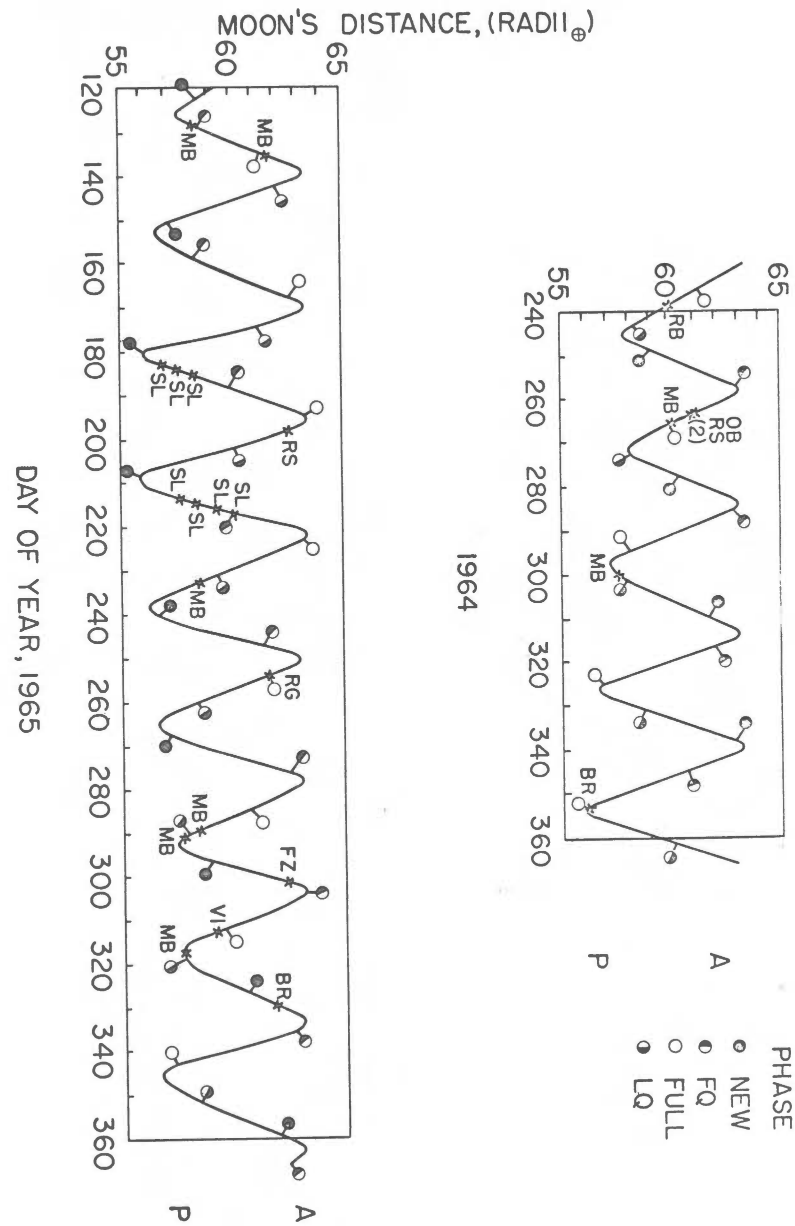

Figure 2. Relationship of the temporary lunar events to the lunar distance (in earth radii) for the interval covered by the reported phenomena (excepting the 1966 event). Events are indicated by crosses superimposed on the orbit. Phases of the moon are shown symbolically; apogee (A) and perigee (P) are indicated also. The phenomena occur almost equally often during predicted maximum and minimum degassing periods.

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but perhaps they give some indication as to the mechanisms that do and do not, in fact, operate on the moon. The tidal and magnetic-tail hypotheses need further and more thorough investigation. Our data suggest the possibility of the latter influence, whereas the historical surveys indicate an influence by the former. In particular, the relationship with the lunar orbit should be considered in analysis of the historical data. From our recent

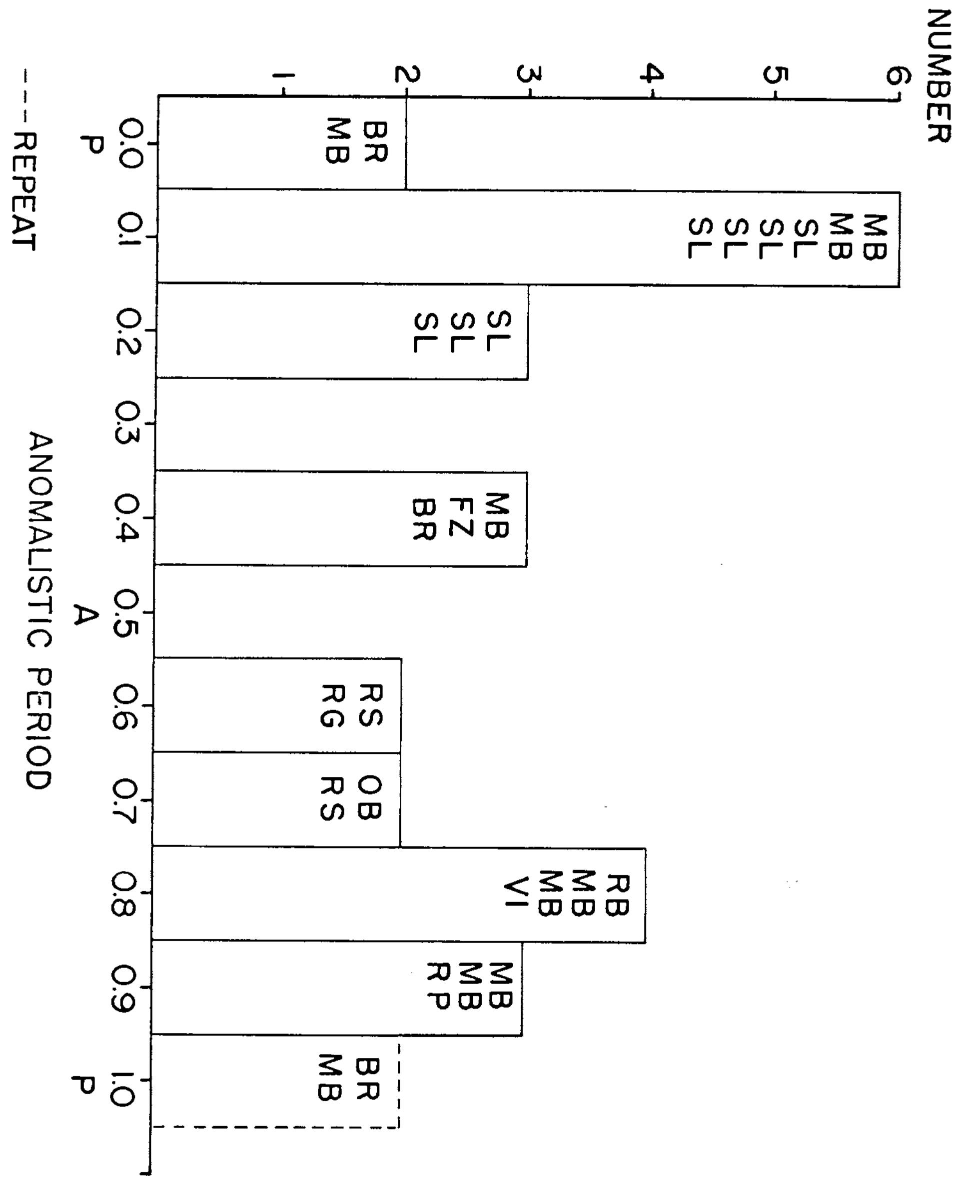

Figure 3. Histogram of the number of lunar events versus the phase in the true anomalistic period of the moon. Note that the two peaks are not one-half period apart; they are probably not significant. Perigee (P) and apogee (A) are indicated. The mean anomalistic period is 27.6 days.

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material, and from an incomplete consideration of the historical events, we think that the following possibilities should be considered: (i) some lunar phenomena are tidally induced or amplified; (ii) some events are the result of excitation from solar activity under the influence of the earth's magnetic tail; (iii) excessive ultraviolet light at times of severe solar activity may make lunar surface materials and/or gases fluoresce; and (iv) some lunar activity arises from internal sources whose visibility is independent of any external causes. This last possibility may receive support from the fact that our data show no strong correlation with any of the proposed mechanisms considered. The internal activity may be merely degassing, or it may also include mild vulcanism. Some of the historical reports in-

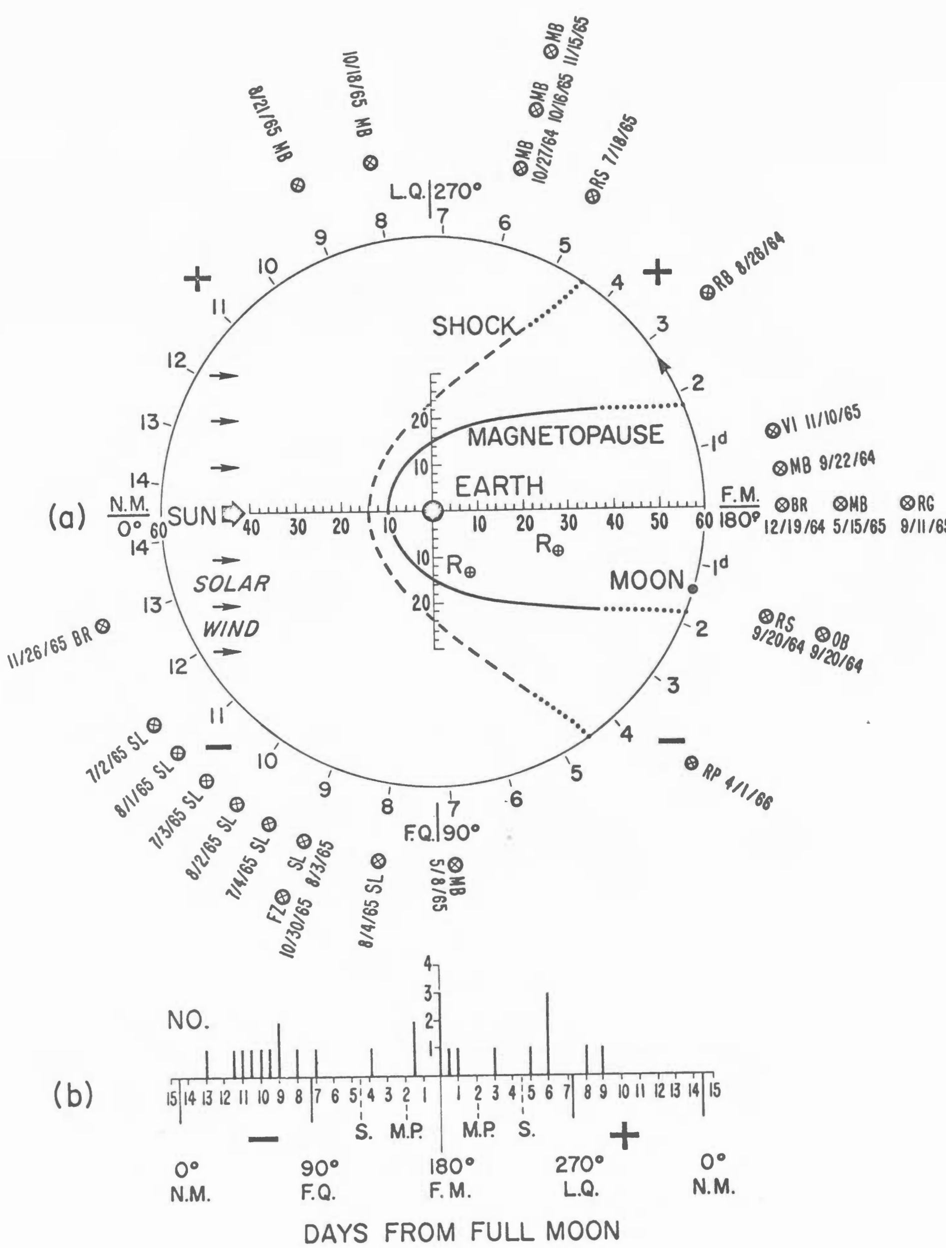

Figure 4. Relationship of the temporary lunar events to the moon's orbit and phases, the earth's magnetic tail and its bow shock-front, and the direction of the solar wind (after Ness, 1966). In (a), numbers around the periphery give the number of days before (-) and after (+) Full Moon; lunar events are indicated by crossed circles. The dates of the events are given, together with the double-letter code (explained in the text) describing the nature of the event. In (b), a graphical representation depicted in (a) is given, showing the number of events versus the number of days before (-) or after (+) Full Moon. Dotted lines indicate the approximate limits of the shock front (S) of the earth's magnetic tail and the magnetopause (MP). Approximately one-third of the reported transient lunar phenomena occurred within the limits of the shock front.

timate that on some occasions this vulcanism may have been more than mild. No authentic or unequivocal surface changes have been observed after recent temporary events; but those phenomena antedating the telescope, or made during its early development, may have produced surface changes that went undetected. Lava flows would probably be detectable in modern times because they usually produce material of a different color than the terrain over which they flow. The same may not be true if the volcanic product is an ash flow. The possibility of lunar ash flows was developed by O'Keefe and Cameron (1962). Aerial views of the Valley of Ten Thousand Smokes in Alaska (Muller and Coulter, 1957), created by an ash flow in 1912, do not show marked color differences between the ash flow and the surrounding terrain. If the lunar ash flow were a thin one, such as discussed by O'Keefe and Adams (1965), elevation differences and probably coloration differences would be difficult to detect from earth distances. Some of the descriptions of lunar events (e.g., Greenacre, 1964) are not inconsistent with the possibility of ash flows on the moon. The sparkle and motions reported could be interpreted as electrical discharges; these are common phenomena in ash flows (Perret, 1937). O'Keefe and Adler (1966) discuss this possibility in regard to lunar ash flows. This hypothesis is further encouraged by the revelation of the extreme flatness of the lunar terrain in the vicinities of Luna 9 and Surveyor I.

Summary

There are 12 Moon Blink devices in use throughout the United States and two in England with which color phenomena have been detected. A conference telephone network has been established for obtaining independent confirmation of lunar transient phenomena while they are in progress. One alert was successfully obtained in November, 1965. We have appealed to amateur astronomers to observe the moon often and to forward their observations of ephemeral phenomena to a collection center at the Goddard Space Flight Center. We have reported on 25 observations that were sent to us during the first 1½ years of operation of the Moon Blink project, one-third of which were detected by Moon Blink equipment. We find no strong correlations with any of the four suggested causes of the phenomena. The hypothetical causes examined are (i) sunrise or low-angle incidence of light causing escaped gases to fluoresce; (ii) tidal effect; (iii) influence of the earth's magnetic tail; and (iv) solar-flare particle excitation. There is some indication -- which requires further investigation -- that the earth's magnetic tail may stimulate temporary activity on the moon. The historical data, as examined by others, indicates the possibility of tidal effects operating on the moon; our data, although limited, do not support this hypothesis. From a consideration of our results, as well as those of others, we suspect that more than one type of phenomena, with more than one kind of origin, occurs on the moon, implying that its history has been more complex than might be expected on the basis of some of the existing theories of the evolution of the moon.

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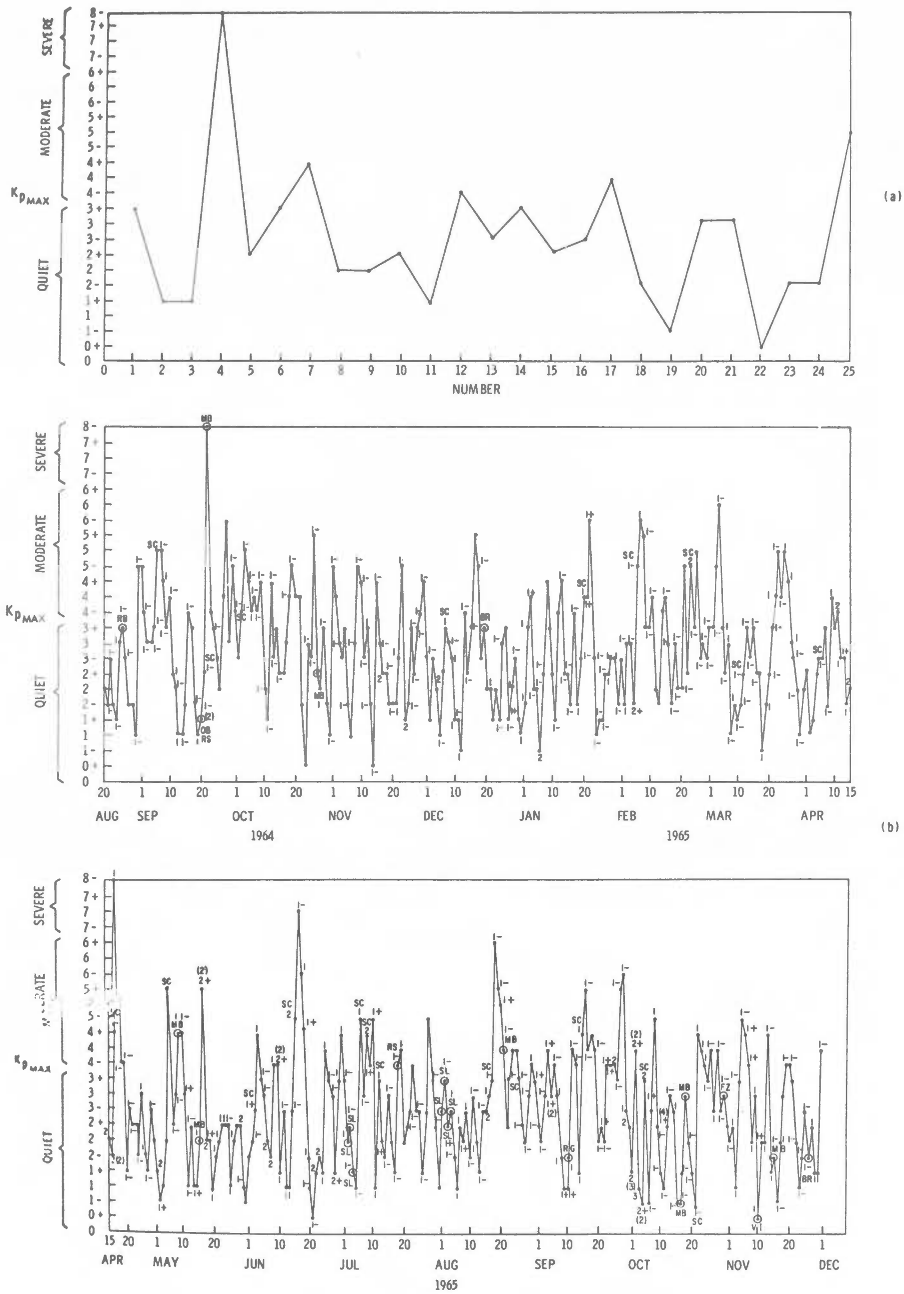

Figure 5. The magnetic index $k_{p,\ max}$ versus the chronological order of the lunar events (as given in Table I, column 1). In (a), the order of severity of solar activity, as indicated by the k_p index, is shown along the ordinate. Only one event occurred during severe solar activity. The index k_p gives an indication of the energy of solar particles originating in solar flare activity on their arrival in the earth-moon system. The data presented in (b) is similar to that in (a), but is shown for every day from August 20, 1964, to December 1, 1965 (the period of the lunar phenomena reported, excepting the 1966 event). The attached numbers give the "importance" of the flare of maximum activity on the day in question, when known. (When the flare of maximum importance was matched by other flares on the same day, the total number of such flares is given in parentheses.) If the flare activity causing a specific magnetic effect on the earth is sought, one must refer to the flare importance for a date from 1 to 2 days preceding the date under consi-

Figure 5. (Caption continued) - deration because of the average 36-hour travel time of the solar particles. The onset of terrestrial magnetic storms is indicated by sudden commencements (SC). Occurrences of temporary lunar events (large circles) are represented in the figure. It is apparent that most of the transient lunar events occurred at times of low solar activity and were unrelated to the arrival of energetic solar particles in the earth-moon system.

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We thank all the people who have contributed to the lunar observation program. Special thanks to to the coördinators of various groups who have collected observations and transmitted them to us. Those most responsible have been Walter Haas and John Westfall of ALPO and Dr. David Bender of Argus/Astronet.

TRANSIENT LUNAR PHENOMENA: SOME OBSCURE NINETEENTH CENTURY ACCOUNTS

By: Richard M. Baum, Chester, England

The purpose of this note is to direct attention to some hitherto neglected historical observations of apparently unusual events upon the face of the moon. Since reports of this nature inevitably provoke interest and speculation, the extracts are given in full. Observations of similar character have appeared in previous issues of this journal.[1,2,3]

Ptolemaeus: Possible Obscurations

Writing in The English Mechanic and World of Science of Friday, July 21, 1882[4], Herbert Ingalls refers to unspecified occasions when the interior of this formation appeared affected by what seemed to be an obscuring medium, thus.-

> "April 22nd, 1866. I obtained some good views of Ptolemaeus, which was on the terminator, and was much struck by the irregularities of its surface.... The surface of the plain (generally as smooth as water) appeared much diversified with numerous shallow depressions (I can't call them craters), which were generally very large. At the moment, I have an impression that this roughened appearance of the floor is by no means frequent, as I have generally seen the surface (even under very oblique light) perfectly smooth and unruffled, and it is only another of those instances which tend to strengthen a lurking idea always present in my mind of an obscuring medium on the lower levels of the moon. But further knowledge may alter these views."
>
> Champion Hill, London, S.E., July 14th, 1882

Messier and Messier A: Klein on Obscuration

The following extract from a paper by the nineteenth century German astronomer Hermann Klein is of considerable relevance to present day studies of the area. It clearly exhibits much of the uncertainty as to how the phenomena of these features should be interpreted.

> ". . . . On the other hand, in my observations I was constantly con-

tending with the uncertain appearances of both Messiers; I have hardly ever had a perfectly defined image of these in spite of years of observation, and I find from the remarks of Professor Pickering that this has repeatedly been his experience.

"It would be strange indeed if this rested simply upon chance; Pickering imagines some kind of fog. I will take the occasion here to mention an observation of my own, through which I arrived at a similar conclusion. I have said of this in my guide for the survey of the sky, the following: 'On the 1st of Nov. 1878, I found to my great surprise that the western ring mountain appeared shaped like a half moon, but the western edge was missing. There was an appearance there of something diffuse, the interior of the crater was like a half shadow. The eastern ring-mountain was sharply defined, complete, and the interior half filled with deep black shadow. On the following day also the western ring mountain was half-moon shaped, full of diffuse shadow. It was entirely impossible to see the western half-edge. I am convinced that a kind of fog lay in the interior of the crater at that time, and was spread out over the western half of the ring wall. Any other explanation of the invisibility does not seem to me admissible'."[5]

Lichtenberg: Reddish Tint

Mädler's description of this phenomenon is of course well known, as also is that of Barcroft. Unknown, or so it would appear, to most workers is an unspecified report, referring to an observation by Hermann Klein in 1882, in the old Selenographical Journal.-[6]

"The region near Lichtenberg. Neison was unable to detect the reddish tint seen by Mädler here, but in 1882 it is described by Klein as conspicuous."

Godin and Agrippa: Suspected Obscuration

At the meeting of the Liverpool Astronomical Society on April 9th, 1883, Mr. W. J. Ridd reported an unusual appearance near these formations as follows.-

"Mr. W. J. Ridd said he had often noticed appearances which could only be accounted for by the existence of a lunar haze. On April 24th, 1882, he had made a note of a strange appearance of shadows, and near Godin and Agrippa of shadows blurred and oscillating. Shadows in Aristoteles steady. The shadows in and around this region, and especially of the highlands west of Agrippa, were misty as though obscured by a fog, which gradually lifted to be again obscured, the intervals from obscuration to obscuration being about 10 minutes, the shadows never became quite clear during the whole time he was watching it. It seemed as though vapour or smoke was being ejected at intervals, and as the vapour cleared away the details became more distinct. Until again obscured by another puff. He had also detected something like the white markings in the M. Crisium mentioned in Webb. The Southern part of the Mare seemed to shew this distinctly, and, although the air was rather unsteady, he caught and held a white spot a little N.E. of beta in Neison's map, where no elevation is marked."[7]

Taruntius and Environs: Obscuration

The monthly meeting of the Liverpool Astronomical Society of April 9th, 1883 at Association Hall, Mount Pleasant, Liverpool appears to have yielded a further detailed account of possible obscuration on the lunar surface other than that described by Ridd.

"Mr. W. H. Davies said he should like to ask if the attention of members had been directed to the appearance of some obscuring medium, apparently a fog, which was noticeable about the middle of the lunar crescent on the 12th March (1883). He was examining the district S. of Mare Crisium with a 3-inch refractor under a power of 40, and was struck by a peculiar blurred appearance somewhat higher up. This was not the position where he had expected to see anything of the kind, and he at first attributed it to some dirt or scratches on the fieldlens of the eyė-piece, and it was not until he had tried other eye-pieces and altered the position of the field of view that he was satisfied it was not caused by any defect in the telescope. The position of this misty spot was to the N., of M. Foaecunditatis; it seemed to be of immense extent, indeed, taking M. Crisium as a standard of measurement, he had roughly estimated it to cover nearly 100,000 square miles of lunar surface.

"It was always difficult to trace the boundary of a lunar mist, but in this instance it was rendered still more so by the indistinctness which it seemed to him was peculiar to this part of the moon. The ring-plain Taruntius should, however, be very well defined, and it was here that the want of definition was most striking. The night was exceptionally clear and he kept Taruntius in view for about an hour. During that time he noticed unmistakeable variations in the sharpness of its shadows as though the density of the mist fluctuates under the influence of the morning sun.

"These appearances were not common, and when they occur, seldom last for more than an hour or two, so that there was never sufficient time to call the attention of a distant observer to the phenomenon..."[8]

South: Red Spot

Celestial Objects for Common Telescopes (6th ed., Espin) carries an Appendix to the Moon Section by Walter Goodacre. In this in the notes relating to South located in the second quadrant appears the following.-

> "In my map [Goodacre] I have also shown three smaller ones [craters]; at the N.W. end is a rugged plateau, on this Dr. W. H. Maw saw on 1913, June 15, when the plateau was on the terminator, a distinct small reddish spot, whcih became diffused into a patch as the terminator advanced."[9]

Orientation, we need scarcely remark, is here always in the classical sense with M. Crisium near the west limb. Whatever may be thought of these observations in general, however variously they may be considered, and despite their obvious imperfections and lack of support material, the inclination is to accept that something unusual was seen on each of these occasions. Communication then lacked the rapidity of the present, and in many ways the reports assume a degree of independence that renders them all the more authentic. Furthermore, the climate of opinion then was rather unfavorable to accepting the validity of such observations; hence the observer had to have some courage of his convictions.

The apparent obscurations in the vicinity of Agrippa, Godin, and Taruntius suggest the influence of atmospheric turbulence; yet the observers had experience and, as may be seen from the Davies report, some awareness of the factors that can easily deceive the novice. Bearing these points in mind, then, the publication of these accounts of long ago is not entirely unwarranted or devoid of interest.

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THE A.L.P.O. PAPER SESSION AT THE 1967 ASTRONOMICAL LEAGUE CONVENTION: AN INFORMAL REPORT

By: John E. Westfall, Session Chairman

The League Convention

The Astronomical League Convention for 1967 was held on the Georgetown University campus, Washington, D.C. from June 30 to July 4 (Friday-Tuesday). The host society, the National Capital Astronomers, with Bob Wright as General Chairman, was responsible for registering a record 442 persons.

Paper sessions fell on July 1, 3, and 4 and were given in the Science Building on campus. Paper sessions and chairmen were: General (3 sessions: R. P. Van Zandt, Joseph Schoebert, and Russell Maag), Junior (John Cotton, Jr.), Instruments and Accessories (Bob Wright), AAVSO (C. H. Hossfield), ALPO (John Westfall), and Observatories (Mabel Stearns).

The banquet and several tours were unusually well attended, with trips to suburban Goddard Space Flight Center, and, in-town, to Georgetown Observatory, the Smithsonian Institution, and the U. S. Naval Observatory. Fortunately, the Washington weather was only warm and sticky (as opposed to the normal hot and sticky), and the only reasonable grounds for weather complaints were caused by showers Sunday evening (ruining the P.A. system) and Tuesday evening (cancelling the famous fireworks display at the Washington Monument).

A.L.P.O. Exhibits

Arrangements for the excellent set of displays at this convention were handled by Dr. James Krebbs of the N.C.A. The A.L.P.O. portion of the exhibit is illustrated in Figures 6 and 7 of this report and was the responsibility of the writer, who furnished several moon models, government lunar maps, and displays portraying the A.L.P.O. Lunar Photograph Library and the Aristarchus-Herodotus Region Mapping Project. One highlight was an assembly of Orbiter IV photographs, covering the area from the lunar equator north through Aristarchus to Sinus Iridum in a total length of about eleven feet (seen at the right of Figure 7). In addition, Dr. James Q. Gant, of Washington, D.C., was kind enough to loan several items from his personal lunar collection.

Planetary exhibits were furnished by Walter Haas, who presented an extensive computer-generated table of Saturnicentric latitudes, and by Richard Wend (Jupiter Recorder) and Phillip Budine, who submitted Jovian photographs and drawings.

Also of interest to the lunar and planetary student were the excellent maps displayed by the U. S. Army Map Service. These consisted of four large, colored views of the planet Mars and two large-scale lunar maps (one of part of Oceanus Procellarum and the other, prepared from Orbiter photographs, of part of Mare Tranquillitatis). This material was kindly donated to the A.L.P.O. by A.M.S.

A.L.P.O. Paper Session

Held on Monday afternoon, July 3rd, the A.L.P.O. papers lasted about 3½ hours in all, with the writer as the Chairman. A show of hands indicated the presence of well over one hundred A.L.P.O. members. This impressive showing was the result of a full session of eleven papers on a variety of lunar and planetary topics, delivered by a group that included three A.L.P.O. Recorders and two ex-Recorders. The papers, in order of presentation, and their authors were:

1. "Dr. H. P. Wilkins: A Brief Review of His Work as an Astronomer." Dr. James Q. Gant.
2. "The Great Red Spot Region in 1966-67." Phillip W. Budine.

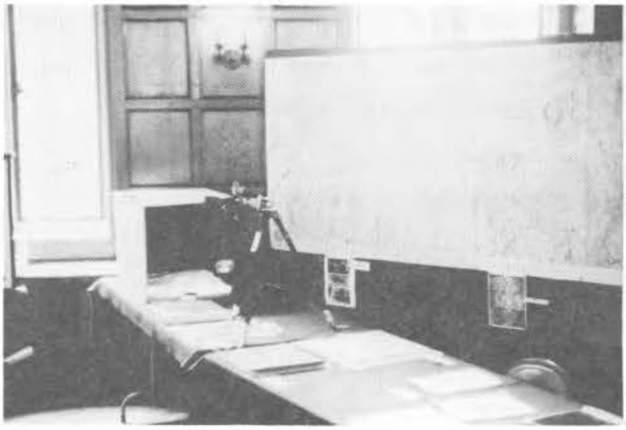

Figure 6. Part of the A.L.P.O. Exhibit at the 1967 Astronomical League Convention in Washington, D.C., June 30-July 4. At the far end of the table is a large-scale model of the Aristarchus-Herodotus Region, lit by a spotlight, with a small telescope in front of it to simulate the view from Earth. Three other lunar models are on the table near the tripod, while the front table holds the table of Saturnicentric latitudes described in the text. The display panel to the rear supports an assembly of ten U. S. Air Force lunar charts, with Lunar Orbiter photographs below it. Figures 6-8 taken and contributed by John E. Westfall.

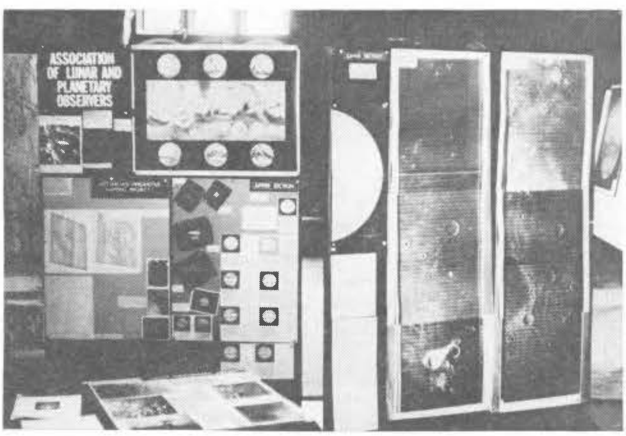

Figure 7. The remainder of the A.L.P.O. Exhibit. On the table is a panel with examples of photographs from the A.L.P.O. Lunar Photograph Library. The left-hand panel contains a Jupiter Section Exhibit prepared by Richard Wend and Phillip Budine, as well as a display for the Aristarchus-Herodotus Region Mapping Project, and a USAF Mars chart. The right-hand panel holds an assembly of large-scale Orbiter-IV photographs of the area from near Flamsteed to Aristarchus (left half) and from Aristarchus to Mare Frigoris (right half).

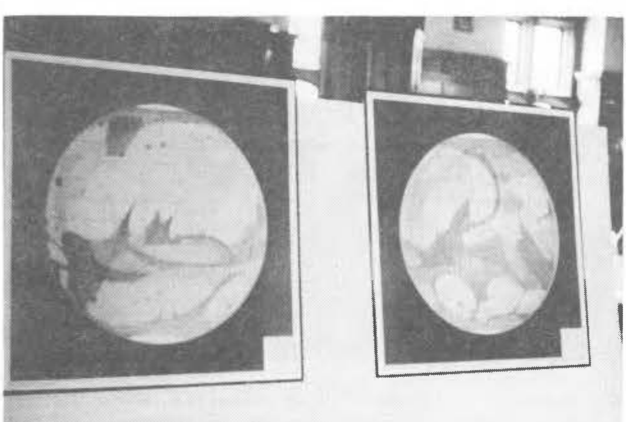

Figure 8. Part of the U. S. Army Map Service Exhibit, located near the A.L.P.O. Exhibit. Two of the four large, colored views of Mars are shown here. The left one is centered at C.M. 0° and the right, at C.M. 270°. As is customary on U. S. government-produced lunar and planetary charts, north is at the top. The four Mars maps, and also two lunar maps, were donated to the A.L.P.O. by the Army Map Service.

3. "Jupiter Observations with a Three-Inch." Joanne Farrell (read by Richard de Luca).

4. "On Comet 1966b." John E. Bortle (read by Richard Hodgson).

5. "Observational Evidence for Auroral Activity on Venus." Joel Levine.

6. "A New Era in the Study of the Planet Mercury." Richard Hodgson.

7. "The Scientific Value of Planetary Photographs with 6-12 inch Telescopes." William R. Winckler.

8. "Magnitude Variations of Saturn's Satellites." Rev. Kenneth J. Delano.

9. "The Moon and Mars." Carlos E. Rost.

10. "The Far Side and the Shape of the Moon." Michael S. Podanoffsky (read by John E. Westfall).

11. "Headaches in Lunar Mapping." John E. Westfall.

(All of the above papers will be published in The Proceedings of the 1967 Astronomical League Convention, available for $3.00 from Mr. G. R. Wright, 202 Piping Rock Drive, Silver Spring, Maryland 20904.)

Finally, after the lengthy paper session, an exhausted group of ALPOers met in front of the A.L.P.O. Exhibit for a gabfest and the renewal of acquantanceships made at earlier conventions.

Figure 9. Buildings on Georgetown University campus, site of League Convention, 6/30-7/4/67. All photographs on this page by Carlos E. Rost, Puerto Rico.

Figure 10. League Convention Chairman Bob Wright and Russell Maag (left) at north entrance to Copley Lounge, Georgetown University.

Figure 11. Georgetown University Observatory.

Figure 12. Astronomical League Convention delegates entering Smithsonian Institution, Washington, D.C.

Figure 13. League Convention visitors and their buses at Goddard Space Flight Center. This photograph and Figure 14 by Mr. Carlos E. Rost, Santurce, Puerto Rico.

Figure 14. Liquid nitrogen tank outside building at Goddard Space Flight Center. Materials for satellites and rockets are thoroughly tested in special chambers, including simulated flight conditions.

SIMPLIFIED SELENOGRAPHIC COLONGITUDE TABLES

By: Laren Dart

Many applications of selenographic colongitude do not require a high degree of accuracy. The accompanying Tables I and II on pages 162 and 163 respectively were set up to facilitate work on ALPO's search for steep lunar slopes, and should be suitable for finding the colongitude for any other lunar observation, drawing, or photograph.

From Table I, find the amount that the terminator has moved since 0 hrs. UT on the date of observation, and add to the colongitude shown for 0 hrs. UT on that date in Table II. For example, take an observation made at 9^h32^m UT, August 12, 1968:

Colongitude at 0^h UT, August 12, 1968 = 128°.07
Increase in colongitude during 9^h32^m = 04°.85
Colongitude at time of observation = 132°.92

The result will be sufficient where the colongitude is not needed to an accuracy of more than 0.1 degrees and should indeed be so rounded off.

A.L.P.O. COMETS SECTION NEWS, FALL 1967*

By: Dennis Milon, A.L.P.O. Comets Recorder

"Comet Discoveries and Observational Selection" is the title of a paper by comet hunter Edgar Everhart in the August Astronomical Journal. Many practical ideas useful to comet seekers are explained -- Everhart finds that 81 per cent of retrograde, and 70 per cent of direct motion comets are first observable in the morning sky. He also concludes that there is a yet-to-be-discovered comet somewhere in the sky 50 per cent of the time! A complete summary of this important article is now being prepared for The Strolling Astronomer by John E. Bortle.

Analysis of ALPO observations is currently being worked on by ALPO members Gordon Solberg and R. B. Minton in Las Cruces, New Mexico, Mike McCants in Austin, Texas, and Dave Meisel in Charlottesville, Virginia. Although some of the recent comets may be reported on first, extensive work is being done on Ikeya-Seki (coma diameters and tail activity) and Comet Kilston (magnitudes). The large amount of observations of these comets permits more information to be gleaned, but it takes longer.

Our last naked-eye comet was well observed from the Southern Hemisphere. The last sighting of Mitchell-Gerber-Jones 1967f was reported by Vic Matchett of Brisbane, Australia.

*Written on September 22, 1967.

TABLE I

CONVERSION OF TIME TO DEGREES OF SELENOGRAPHIC COLONGITUDE

(based on a mean difference of $12^{o}.2$/day)

U.T. of Observation

	00h	01h	02h	03h	04h	05h	06h	07h
00m	00.00	00.51	01.02	01.52	02.03	02.54	03.05	03.56
06m	00.05	00.56	01.07	01.58	02.08	02.59	03.10	03.61
12m	00.10	00.61	01.12	01.63	02.14	02.64	03.15	03.66
18m	00.15	00.66	01.17	01.68	02.19	02.69	03.20	03.71
24m	00.20	00.71	01.22	01.73	02.24	02.74	03.25	03.76
30m	00.25	00.76	01.27	01.78	02.29	02.80	03.30	03.81
36m	00.30	00.81	01.32	01.83	02.34	02.85	03.36	03.86
42m	00.36	00.86	01.37	01.88	02.39	02.90	03.41	03.91
48m	00.41	00.92	01.42	01.93	02.44	02.95	03.46	03.96
54m	00.46	00.97	01.47	01.98	02.49	03.00	03.51	04.02

U.T. of Observation

	08h	09h	10h	11h	12h	13h	14h	15h
00m	04.07	04.58	05.08	05.59	06.10	06.61	07.12	07.62
06m	04.12	04.63	05.13	05.64	06.15	06.66	07.17	07.68
12m	04.17	04.68	05.18	05.69	06.20	06.71	07.22	07.73
18m	04.22	04.73	05.24	05.74	06.25	06.76	07.27	07.78
24m	04.27	04.78	05.29	05.80	06.30	06.81	07.32	07.83
30m	04.32	04.83	05.34	05.85	06.35	06.86	07.37	07.88
36m	04.37	04.88	05.39	05.90	06.40	06.91	07.42	07.93
42m	04.42	04.93	05.44	05.95	06.46	06.96	07.47	07.98
48m	04.47	04.98	05.49	06.00	06.51	07.02	07.52	08.03
54m	04.52	05.03	05.54	06.05	06.56	07.07	07.57	08.08

U.T. of Observation

	16h	17h	18h	19h	20h	21h	22h	23h
00m	08.13	08.64	09.15	09.66	10.17	10.68	11.18	11.69
06m	08.18	08.69	09.20	09.71	10.22	10.73	11.23	11.74
12m	08.24	08.74	09.25	09.76	10.27	10.78	11.28	11.79
18m	08.29	08.79	09.30	09.81	10.32	10.83	11.34	11.84
24m	08.34	08.84	09.35	09.86	10.37	10.88	11.39	11.90
30m	08.39	08.90	09.40	09.91	10.42	10.93	11.44	11.95
36m	08.44	08.95	09.46	09.96	10.47	10.98	11.49	12.00
42m	08.49	09.00	09.51	10.01	10.52	11.03	11.54	12.05
48m	08.54	09.05	09.56	10.06	10.57	11.08	11.59	12.10
54m	08.59	09.10	09.61	10.12	10.62	11.13	11.64	12.15

Table to show increase in colongitude in degrees as a function of time. Prepared and contributed by Mr. Laren Dart. Values for intermediate times can be found by interpolation. Since daily increase in colongitude varies slightly from its mean value of 12.2 degrees per day, the accuracy of the table is limited to about 0.1 degrees. For observations after 12^h, U.T., it will be a little more accurate to take the interval before 0^h, U.T. on the next date and then to subtract.

TABLE II

***** SELENOGRAPHIC COLONGITUDE OF THE SUN *****

1968 - 0 HOURS U.T.

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1	276.41	293.36	286.18	303.84	309.79	328.41	335.04	353.92	12.56	18.59	36.28	41.43
2	288.60	305.55	298.38	316.05	322.02	340.64	347.27	6.13	24.75	30.76	48.44	53.49
3	300.79	317.74	310.58	328.26	334.25	352.87	359.50	18.35	36.94	42.94	60.59	65.62
4	312.97	329.92	322.77	340.46	346.46	5.09	11.72	30.55	49.13	55.10	72.74	77.76
5	325.15	342.09	334.96	352.67	358.68	17.30	23.93	42.75	61.31	67.27	84.88	89.89
6	337.32	354.26	347.15	4.86	10.89	29.51	36.14	54.94	73.48	79.43	97.03	102.02
7	349.48	6.42	359.33	17.05	23.09	41.71	48.34	67.13	85.66	91.59	103.17	114.16
8	1.64	18.58	11.50	29.23	35.28	53.91	60.53	79.32	97.84	103.75	121.32	126.29
9	13.80	30.73	23.67	41.41	47.47	66.10	72.73	91.50	110.01	115.91	133.47	138.43
10	25.94	42.88	35.84	53.58	59.66	78.29	84.91	103.69	122.19	128.08	145.62	150.57
11	38.09	55.02	48.00	65.75	71.84	90.47	97.10	115.88	134.37	140.25	157.78	162.72
12	50.22	67.16	60.15	77.92	84.01	102.66	109.30	128.07	146.56	152.42	169.94	174.87
13	62.36	79.30	72.30	90.08	96.19	114.85	121.49	140.26	158.75	164.59	182.11	187.03
14	74.49	91.43	84.45	102.24	108.37	127.04	133.69	152.46	170.95	176.77	192.28	199.19
15	86.61	103.57	96.60	114.41	120.55	139.24	145.89	164.67	183.15	188.96	206.46	211.36
16	98.74	115.70	108.74	126.58	132.74	151.45	158.10	167.88	195.35	201.15	218.64	223.54
17	110.87	127.84	120.90	138.75	144.93	163.66	170.32	189.10	207.57	213.35	230.83	235.72
18	123.00	139.98	133.05	150.94	157.13	175.88	182.54	201.32	219.78	225.55	243.02	247.91
19	135.13	152.13	145.21	163.12	169.34	188.10	194.77	213.55	232.00	237.76	255.22	260.10
20	147.27	164.28	157.38	175.32	181.55	200.33	207.00	225.78	244.23	249.97	267.42	272.29
21	159.41	176.45	169.55	187.52	193.77	212.57	219.24	238.02	256.46	262.18	279.62	284.48
22	171.56	188.62	181.74	199.73	206.00	224.81	231.48	250.26	268.69	274.40	291.82	296.67
23	183.71	200.80	193.93	211.95	218.23	237.05	243.73	262.50	280.91	286.61	304.01	308.85
24	195.88	212.98	206.12	224.17	230.47	249.30	255.97	274.74	293.14	298.82	316.20	321.03
25	208.05	225.17	218.33	236.40	242.71	261.55	268.22	286.99	305.37	311.03	328.39	333.20
26	220.23	237.37	230.53	248.63	254.95	273.80	280.48	299.23	317.59	323.23	340.56	345.37
27	232.41	249.57	242.75	260.86	267.19	286.06	292.73	311.46	329.80	335.42	352.73	357.53
28	244.60	261.77	254.96	273.10	279.44	298.31	304.97	323.70	342.01	347.61	4.89	9.67
29	256.79	273.97	267.18	285.33	291.69	310.55	317.22	335.92	354.21	359.79	17.05	21.83
30	268.98	.00	279.40	297.56	303.93	328.80	329.46	348.14	6.40	11.96	29.20	33.98
31	281.17	.00	291.62	.00	316.17	.00	341.69	00.35	.00	24.13	.00	46.11

Table of values of the sun's selenographic colongitude in degrees at 0^h, U.T. on each date in 1968. (Disregard values of .00 on nonexistent dates.) Prepared and contributed by Laren Dart. Table II is a computer print-out, but the values are taken from the 1968 A.E.N.A.

On August 24.4, 1967 UT the comet was close to the limit of his 12-inch reflector. Its position was $12^h35^m.4$, $-33°54'$. Matchett searched again on August 26th, but without success. From the time of this comet's discovery in July, Mr. Matchett carried on a continuing series of ring micrometer measures for position. He reduced his data by using star positions in the Smithsonian Astrophysical Observatory Star Catalog, and obtained quite accurate coördinates. Such ring micrometer positions are extremely valuable to orbit computers (such as ALPO'er Mike McCants) immediately after a discovery, and before precise photographic positions are available. In the case of 1967f, it was over a month before photographic positions were published on IAU Circulars!

A photometric graph will be drawn for Comet 1967f after all the Australian observations have been reduced.

That famous Periodic Comet Encke was seen on its 1967 return low in the morning sky. On August 25th, 1967 UT Karl Simmons found it near Pollux with his 8-inch reflector. Observing from Jacksonville, Florida, he used AAVSO charts and estimated the magnitude at dimmer than 10.5. The comet was very diffuse and quite difficult to see, only 10° up in strong moonlight. (Simmons entered the University of Arizona at Tucson this fall.) John Bortle observed Encke on September 2nd and 3rd with a 6-inch, f/4 reflector. It was then 15° above the horizon. For magnitude comparisons he used an AAVSO T Cancri chart field (about 5° distant), and obtained $8.7 \pm .2$ on both mornings. He described Encke as about 1' across. In October, Encke will be in the evening sky in Scorpius at a predicted magnitude of 11.7.

ALPO observers can keep up with faint periodic comets by obtaining the BAA Handbook and the IAU Circulars.

The faint Periodic Comet Reinmuth 2 1967e was also searched for, but unsuccessfully, by John Bortle. Using the 22-inch reflector at Stamford Observatory on September 5.1, 1967 UT, he reported that "I could see fifteenth magnitude stars, and two thirteenth magnitude galaxies were prominent. Thus I must assume the comet was at least a magnitude fainter than the predicted 14."

We have recently had correspondence with the well-known comet observer Dr. Max Beyer, who is at Hamburg Observatory in Bergedorf, Germany. Dr. Beyer will be receiving A.L.P.O. Comets Section observations. Observers who read German may wish to see his many papers in Astronomische Nachrichten. (This is one of the oldest astronomy periodicals in continuous publication.) For the past 34 years he has published many analyses of his visual magnitude estimates of comets. His technique is to measure the magnitudes of the comparison stars with a Graff visual photometer. He notes that total magnitudes of more than 20 globular clusters and nebulae, observed in the same manner as comets, are in good agreement with photoelectric results.

Dr. Beyer has problems with street lights and trees in Bergedorf. He writes: "In Bergedorf we had no possibility to observe the sun-grazing Comet Ikeya-Seki 1965f. Our observatory is surrounded by large forests, which hinder all the observations in altitudes lower than 20° above the horizon. There it is not possible to observe fainter comets in lower positions with our larger instruments. In such cases, brighter comets only can be observed with small telescopes from the roofs of our houses. Several attempts to convince the administration that cutting off the trees would better our observational conditions were in vain." Dr. Beyer, who is 72, was in a serious auto accident early in 1967, but recovered safely.

Another active comet observer, Rev. Leo Boethin, Abra, Philippines, has also been laid up, after being thrown by a horse. Rev. Boethin has made a great many observations of all comets within reach of his 8-inch reflector during the past two years. One particularly fine view he remembers is of Comet Rudnicki: "The most beautiful sight of a comet in my 8-inch reflector was Comet Rudnicki in December 1966. Because of the brilliant and clear sky here at that time, the outlying areas appeared quite large. Even faint streamers going out from the central part were clearly visible. I really enjoyed that comet."

The A.L.P.O. Comets Section now has a mailing list of about 75. Details on this announcement service will be in the article "Observing Comets" in this issue or the next one.

Postscript by Editor. Mr. Milon and I would be glad to hear from our readers how they like articles of this kind, covering current news items in the Comets Section and also a few more personal notes. It is evident that our Comets Recorder has developed a truly international observing-group.

THE MAGNITUDE OF COMET IKEYA-SEKI 1965f

By: Dennis Milon, A.L.P.O. Comets Recorder, and
Gordon Solberg and R. B. Minton, New Mexico State University Observatory

From the many observations contributed to the ALPO Comets Section, we have selected a number to construct a photometric graph for Comet Ikeya-Seki. By assigning numerical values to a comet we can characterize it among other comets. Certain values in a comet's photometric formula are found to be similar for comets having the same physical appearance. Also, from such a study, we can speculate on possible solar-caused changes in a comet.

From an observer's standpoint, we can state that this study of Ikeya-Seki coma magnitudes shows that visual magnitude estimates of comets can be made quite precisely and with close agreement among different observers.

Total or Coma Magnitude

Selection of observations. Since there were so many observations it was possible to select only those made by the same methods. This procedure reduces the scatter considerably. Generally only observations reported to the nearest tenth of a magnitude and based on star magnitudes obtained from a catalogue were used; but a few twilight observations of less precision have been included. It is not possible to analyze all comets in this manner because of variations in observing techniques. However, it is obvious that the resulting photometric graph will be more accurate if all observers estimate between brighter and fainter stars and then find magnitudes in the same catalogue.

Methods of graphing comet magnitudes. In studying comets, we must understand what will affect a comet's magnitude as it is seen from the earth. We assume that comets differ from each other in their intrinsic brightness. In our photometric formula for describing brightness, we assume that comets both reflect sunlight and give off light of their own. Their brightness varies inversely as the square of the distance from the earth and also in a more complicated manner as a function of solar distance. This latter point indicates that a comet's light is not simply reflected sunlight.

The following formula is used to represent a comet's brightness:

$H = H_0 + 5 \log \Delta + 2.5\, n \log r$, where

H = observed magnitude,

H_0 = a constant termed absolute magnitude, which is the magnitude at one astronomical unit from the sun and from the earth,
Δ = distance from the earth,
r = distance from the sun,
n = a factor that varies among comets, averaging about 4. If we had only reflected sunlight from a comet, n would be 2.

The heliocentric magnitude is found by subtracting $5 \log \Delta$ from the observed magnitude. If we plot heliocentric magnitude against log r, we obtain a straight line with a slope of $n/2.5$. In the case of Ikeya-Seki, H_0 was determined by a least squares solution in a computer; but it can also be found graphically from the point where the line of heliocentric magnitude intercepts $r = 1$.

Solar-caused effects. After removing the brightness change caused by the varying distance from the earth, we note that any observed change in our graph of brightness must be inherent in the comet. (This assumes that there are no observing errors caused by moonlight, low altitude, etc.) Ikeya-Seki was observed to be very quiescent (except at perihelion), and no attempt has been made to correlate brightness changes with solar events.

ALPO Observations

A total of 114 magnitude estimates by 14 observers was used in compiling the coma magnitude graph. The observers are:

Leo Boethin -- Abra, Philippines.
John Bortle -- Mount Vernon, New York.
Darrell Conger -- Elizabeth, West Virginia.
William H. Glenn -- New York, N. Y.
Alika Herring -- Mauna Kea, Hawaii.

Craig Johnson -- Boulder, Colorado.
Michael McCants -- Houston, Texas.
David Meisel -- Charlottesville, Virginia.
Dennis Milon -- Tucson, Arizona.
R. B. Minton -- El Paso, Texas.
Elmer Reese -- Las Cruces, New Mexico.
Karl Simmons -- Jacksonville, Florida.
Gordon Solberg -- Las Cruces, New Mexico.
Wayne Wooten -- De Funiak Springs, Florida.

Explanation of Coma Magnitude Graph.

After initial selection of observations, a correction for aperture was applied so that all magnitudes are for an aperture of 2.67 inches. This correction has been determined by N. T. Bobrovnikoff of the Ohio State University, who found that on the average a comet is estimated to be 0.17 magnitudes fainter per inch of increasing aperture. His findings were based on a study of 4447 observations of 45 comets.

To obtain the heliocentric magnitudes used in the graphs, the value $5 \log \Delta$ was subtracted from the aperture-corrected magnitudes. The r values are from IAU Circulars 1928, 1930, and 1946.

The data were placed on punched cards by Gordon Solberg of the New Mexico State University Observatory at Las Cruces. The cards were fed to the University's Control Data 3300 Computer to obtain the least squares line best fitting the observations. We have plotted log r instead of r on our graph in order to have a straight line result, rather than a curve.

Least squares solutions give the following:

Preperihelion: $m = 6.10 + 8.21 \log r$, $n = 3.28$ (59 estimates).
Postperihelion: $m = 6.34 + 8.15 \log r$, $n = 3.26$ (55 estimates).

Referring to the previous discussion on comet magnitudes, we see that the above equations are derived from:

$H = H_o + 5 \log \Delta + 2.5\, n \log r.$

From the graph we have:

$H - 5 \log \Delta = H_o + 2.5n \log r$, or
$m = H_o + 2.5\, n \log r$; thus

$n = \text{slope}/2.5 = 8.21/2.5 = 3.28.$

It should be noted that all values used in these equations must be rounded to the nearest tenth, since this amount is the reported accuracy of the magnitude estimates.

Both the absolute magnitude and the value of n indicate that Comet Ikeya-Seki was an average comet with regard to its photometric behavior. In fact, an absolute magnitude of 6 is used by orbit computers as a first approximation for new comets in assumed parabolic orbits. With n equal to 3.3, Ikeya-Seki is precisely at the average which Bobrovnikoff found for the dependence of cometary brightness upon solar distance. In other words, the brightness of the average comet changes with the 3.3 power of r.

Comparison with Other Comets of the Same Family

There are several other comets which have similar orbital elements to Ikeya-Seki, and thus form a family of comets. This list below is by Michael P. Candy, Director of the Comets Section of the British Astronomical Association, as published in the BAA Journal, February, 1966, page 132.

Comet	Absolute magnitude
1668	6.0
1843 I	4.9
1880 I	7.1 - 8.9
1882 II	0.8
1887 I	6.3

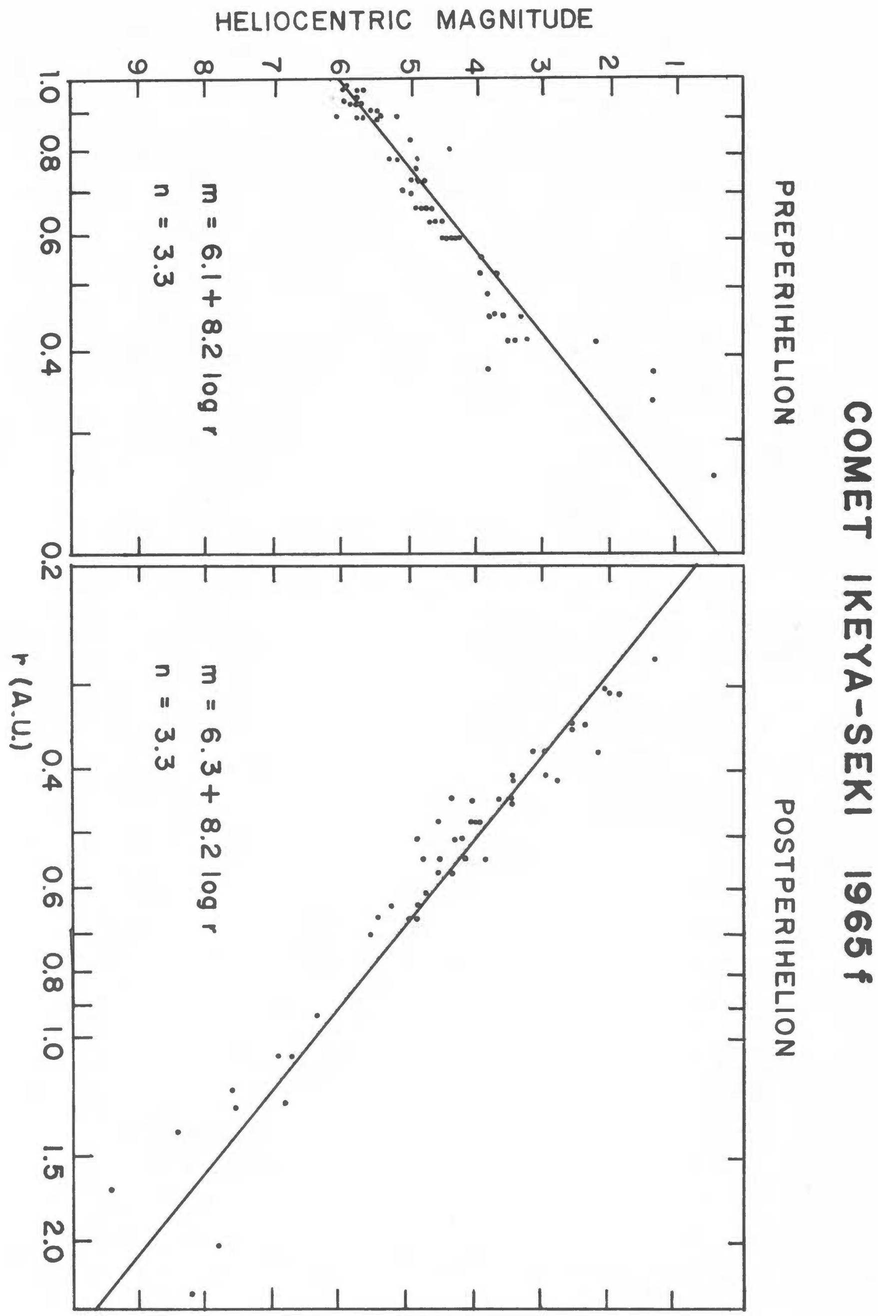

Figure 15. Photometric graph prepared from visual magnitude estimates of coma brightness of Comet Ikeya-Seki 1965f by A.L.P.O. members. Heliocentric magnitude is the brightness after correcting for the varying distance from the earth, as discussed in the text. The distance from the sun, or r, is on a log scale. The absolute magnitude is indicated as lying where the least squares line intersects r = 1. This graph was drawn by R. B. Minton. The dots represent the individual observations.

Comet	Absolute magnitude
1945 VII	10.8
1963 V	5.5 ALPO
1965 f	6.2 ALPO

In this list only 1963 V (Pereyra) and Ikeya-Seki have been corrected to Bobrovnikoff's standard of 2.67 inches. From ALPO observations Comet Pereyra 1963e had $m = 5.5 + 11 \log r$, $n = 4.4$ (Str. A., July-August, 1964, p. 160).

In comparing absolute magnitudes of various comets, the effect of the solar cycle must not be overlooked; it may be that a correction is needed before predicting the disintegration of periodic comets from studies of absolute magnitudes.

Difficulties of observation. For a study of a comet's total or coma magnitude, it is reasonable to ask what effect the comet's changing appearance has on magnitude estimates. The difficulty arises when a comet develops a large tail. It is then impossible to determine a total magnitude over this extended area. A magnitude estimate of a comet with a tail several degrees long is really the surface brightness of a given part. Therefore, our study of Ikeya-Seki's total magnitude is restricted to estimates of the coma.

Tail Brightness

From visual descriptions of the appearance after perihelion, we can say that the rate of fading of the tail of Ikeya-Seki was about one magnitude per week.

Oct. 30, 1965. UT. Delano. Tail brighter than central Milky Way regions.
Oct. 31. Meisel. Maximum tail surface brightness equal to -1.7 per square degree.
Nov. 1. Meisel. Average tail surface brightness equal to -0.7 per square degree.
Nov. 1. Bortle. Tail surface brightness about 3° from the head is equal to a star of magnitude $2\frac{1}{2}$, while an area 3° from the tip of the tail is about $4\frac{1}{2}$.
Nov. 2. Delano. Brightest part of the tail (near Gamma Crateris) equaled Alpha Crateris (magnitude 4.2) when placed out of focus in a 7X50 monocular.
Nov. 2. Simmons. Magnitude of tail 3.8.
Nov. 2. Bortle. With extra-focal images in 7X50's, an area 8° from the head was between magnitude 3.0 and 3.5; an area 16° from the head was magnitude 4.5. The tail's southern edge was brighter.
Nov. 3. Johnson. A 3' by 3' square area of tail at 2°-10° from the head was about as bright as a 4th magnitude star to the naked eye.
Nov. 4. Simmons. Magnitude of middle of tail 4.1 in 7X50's. Last 4° of tail about 5th magnitude. By comparing the magnitude of Alpha Crateris as seen through the bright spine of the tail with stars of magnitudes 5.2 and 3.3, he estimated that Alpha was dimmed 0.3 of a magnitude by the tail (from a normal magnitude of 4.2).
Nov. 5. Bortle. At 2°-3° from the head the surface brightness is about 2.9, at 9° from the head, about 3.8; at 15°, about 4.5. He noted, "The tail has not faded much more than .5 magnitudes since Oct. 28, yet the coma has faded almost two magnitudes."
Nov. 20. Conger. The tail is easily visible to the naked eye, while the coma is not.
Nov. 20. Solberg. Tail visible to naked eye.
Nov. 22. Boethin. Total magnitude 5.5 in 20X60 binoculars.
Nov. 29. Milon. About 10° of tail visible to naked eye at magnitude 5.
Dec. 4. Milon. About 7° of tail seen with naked eye.

Magnitude of the Nucleus

The graph drawn by R. B. Minton compares rate of change for coma and nucleus magnitudes. The lines marked with 5.0 log r show a theoretical object with an "n" value of 2, which shines only by reflected sunlight.

The preperihelion line is based on 28 estimates. A least squares solution computed by Gordon Solberg gives $m = 10.17 + 16.21 \log r$, $n = 6.5$. For the postperihelion line 13 observations were used, giving $m = 8.05 + 6.29 \log r$, $n = 2.5$.

A comparison of the rates of brightening of the coma and nucleus reveals that the nucleus brightened twice as fast, since $n = 6.5$ for the nucleus and 3.3 for the coma. The nucleus more closely matched a simple reflecting body after perihelion, but faded slightly faster.

Apparently what was reported as a nucleus was actually a very small condensation in

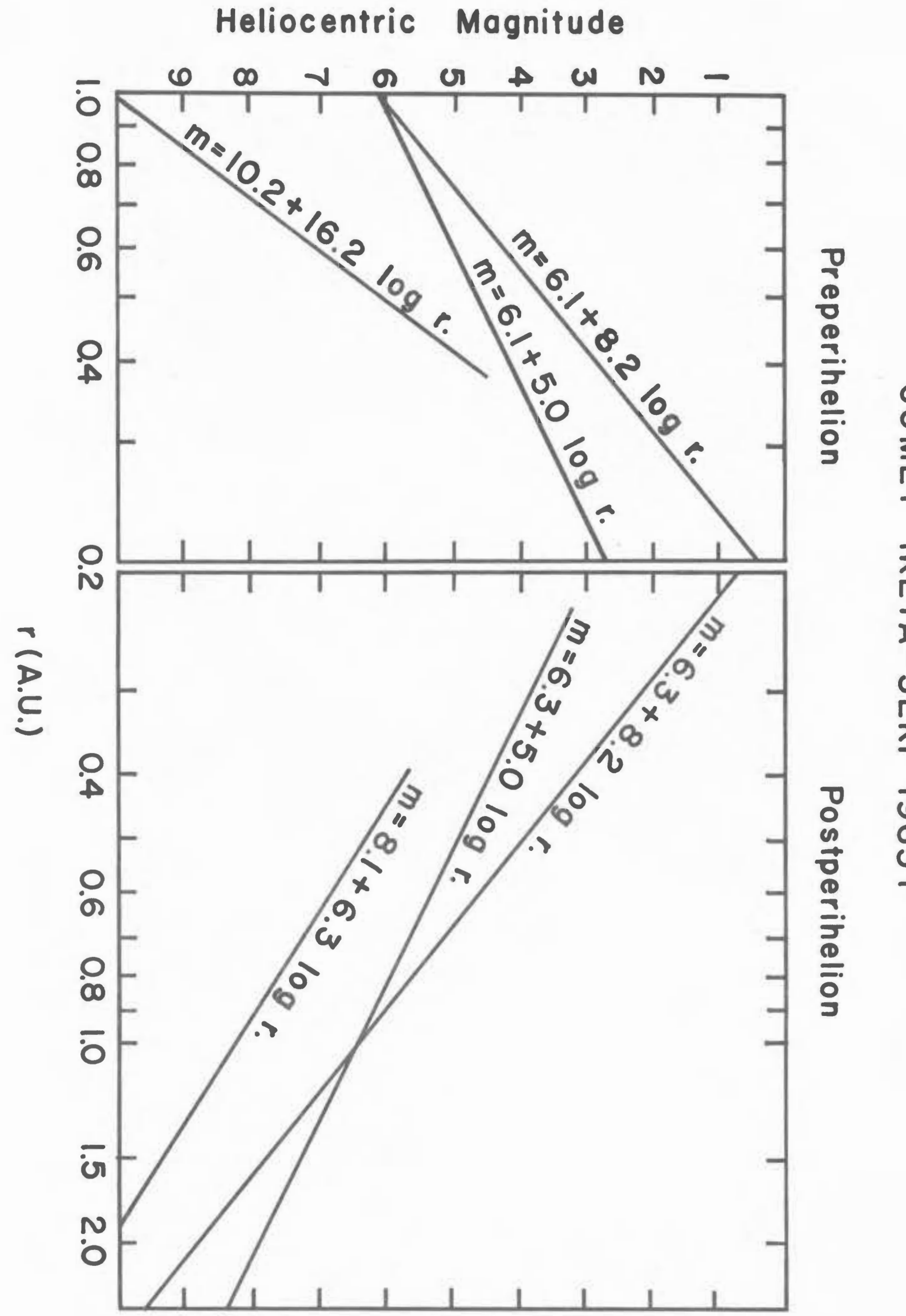

Figure 16. Lines to show change of brightness with distance from the sun for: top, computed least squares line from ALPO visual estimates of coma of Comet Ikeya- Seki; middle, a simple reflecting body; bottom, computed least squares line from ALPO visual estimates of nucleus of Comet Ikeya-Seki. The steeper line for the nucleus before perihelion indicates a more rapid brightening at that time. Graph prepared by R. B. Minton.

the coma center. Since the nucleus was well observed to dim more rapidly (after perihelion) than a simple reflecting body, it was probably smaller than the telescope resolving capability. Also, light from the coma contributed to nucleus brightness estimates.

The nucleus magnitudes used in the graph were corrected for geocentric distance only. Since the nucleus was actually masked by the central condensation after the first week of October, it might be argued that the observed magnitudes should also be corrected for aperture. When this was done, the corrected magnitude was never changed by more than 0.4 magnitudes (after October 7), a small value considering the amount of scatter in the nucleus magnitude data. Earlier, when the actual nucleus was seen in the larger telescopes, the aperture correction yielded unrealistically bright magnitudes. Accordingly, magnitudes were corrected for changing geocentric distance only, since this procedure was more meaningful when the comet was faint, and was not significantly in error after the comet brightened.

Agreement Among Observers

Coma magnitude estimates have been compared for the 27 dates on which estimates were made by more than one observer. For the magnitudes uncorrected for aperture, the average difference from the mean magnitudes for individual dates is ± 0.2 magnitudes. For aperture corrected estimates it is also ± 0.2. This similarity is not unexpected since most observers used similar equipment on the same dates.

Appendix 1

Because of the difficulty of finding comparison stars at the same altitude as the comet, Walter Haas tried a new procedure. He compared the naked eye images of bright stars to the appearance of the comet in his $12\frac{1}{2}$-inch reflector. Both naked eye images and the telescopic ones were put out of focus. At the same time when an estimate of the comet was made in this manner, he also made an estimate by comparing the naked eye view of comet and stars.

This process gave a check on the new method. In order to determine a correction factor between the comet and stars, Haas observed stars out of focus in his $12\frac{1}{2}$-inch and estimated their magnitude compared to other stars viewed with the naked eye. These factors were: Oct. 13, 4.5 magnitudes; Oct. 13, 5.6; Oct. 15, 5.3; Oct. 19, 4.0. The average is 4.9. The following is a comparison of magnitudes found by the two methods on Comet Ikeya-Seki.

	Telescope-eye	eye
Nov. 2, 1965	6.0	3.9
4	6.5	4.5
6	6.4	5.0

Haas concludes that much less of the comet was seen in the telescope than in the naked eye view of the comet's head. Between November 2 and November 6 the difference in the methods descreased as the comet was seen in a progressively darker sky. [The difference must also in part represent differential atmospheric extinction since the comet was much closer to the horizon than were the comparison stars employed. --Editor.]

Appendix 2

A sample of ALPO magnitude estimates on one date may be instructive. On September 26th, U.T. four observers across the United States made magnitude estimates with binoculars, obtaining: Bortle, 6.5; Milon, 6.2; Minton, 6.3; Solberg, 6.3. On this date Ikeya-Seki was a good object for binocular estimates; for most of the light was in a coma 4'-5' across, avoiding confusion with a bright tail. A drawing on the 26th by David McLean is shown in Figure 18.

From southeast of Tucson, Arizona, the comet was 15° up when Milon made his observation with tripod-mounted 7X35 binoculars having about a 12 degree field. First, the comet was plotted precisely in the Atlas Eclipticalis. As stars of similar magnitude to the comet were found, a letter was put down for each. The magnitudes of these lettered stars were later found in the Yale Catalog and the Skalnate Pleso Catalog. The results were:

3/10 from 6.4 to 6.0 = 6.3
4/10 from 6.5 to 5.5 = 6.1
3/10 from 6.3 to 5.5 = 6.1
3/10 from 6.4 to 5.7 = 6.2
4/10 from 6.4 to 6.1 = 6.3

(text continues at bottom of page 172).

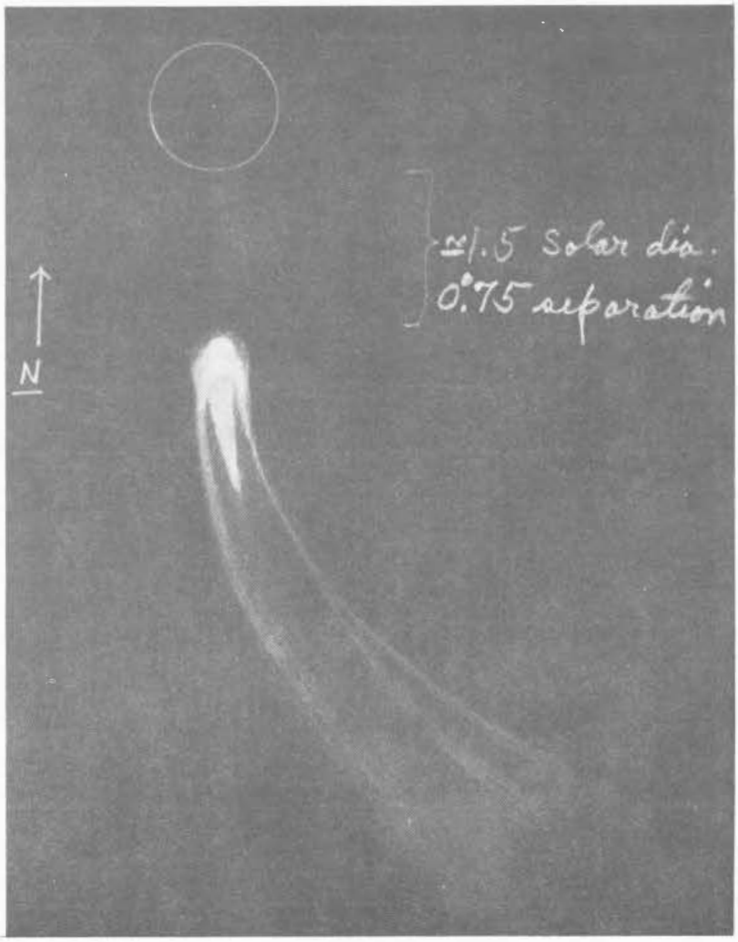

Figure 17. Daytime sketch of Comet Ikeya-Seki near the sun by C. F. Capen at Flagstaff, Arizona, on October 20, 1965, $21^{h}.5$–$22^{h}.5$, U.T. 7x50 binoculars and 8-inch reflector. Only six hours before perihelion. Mr. Capen noted: "The magnitude must have been brighter than -10. . . . Bright silvery nucleus. The flowing sparkling had nearly ceased. The head had changed from the pointed appearance of $19^{h}10^{m}$, U.T. to a more normal round head and nucleus. Visible tail length to the naked eye was about 4°. The comet was observed in a clear sky until $1^{h}0^{m}$, U.T. on October 21."

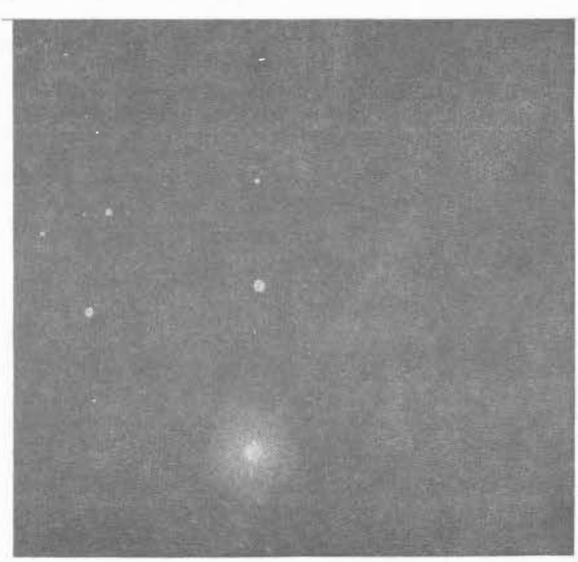

Figure 18. Sketch of Comet Ikeya-Seki by David McLean on September 26, 1965, 11^{h} U.T. from location southeast of Tucson. In a 6-inch reflector the tail was 20' long and very thin; the coma diameter was 5'; and the coma condensation was almost stellar and brighter than a nearby 8.7 magnitude star, according to Dennis Milon. The total magnitude was estimated at 6.2 in 7x35's by Milon, who observed with McLean. West direction in sky at top, south to the right.

COMET IKEYA-SEKI 1965f

1965 UT Date	Observer	Instrument	Observed Magnitude
	Preperihelion		
Sept 22.5	Milon	7" 40X Refr	7.7
23.5	Minton	7X50	7.0
24.5	Minton	7X50	6.4
24.5	Solberg	8X30	6.2
24.5	Milon	7X35	6.5
25.5	Milon	7X35	6.3
26.5	Bortle	10X50	6.5
26.5	Minton	7X50	6.3
26.5	Solberg	8X30	6.3
26.5	Milon	7X35	6.2
27.4	Bortle	5" 18X Refr	6.5
27.5	Minton	7X50	6.1
27.5	Solberg	8X30	5.8
28.4	Bortle	10X50	6.2
28.4	McCants	8" 40X Refl	7.0
28.4	McCants	8X50	6.5
28.5	Reese	8X30	5.8
28.5	Minton	7X50	6.1
28.5	Solberg	8X30	5.5
30.5	Solberg	8X30	5.2
Oct 1.5	Minton	7X50	4.7
2.4	Bortle	10X50	5.5
2.5	Solberg	8X30	5.0
2.5	Minton	7X50	5.4
3.4	Bortle	10X50	5.1
4.4	Bortle	10X50	4.9
4.5	Milon	7X35	4.9
4.5	Minton	7X50	5.0
5.5	Bortle	10X50	4.8
5.5	Solberg	8X30	5.0
5.5	Reese	8X30	4.9
6.5	Milon	7X35	4.6
6.5	Johnson	7X50	4.9
6.5	Minton	7X50	4.7
6.5	Solberg	8X30	4.7
7.5	Johnson	7X50	4.7
7.5	Solberg	8X30	4.5
7.5	Reese	8X30	4.4
8.4	Simmons	7X50	4.2
8.5	McCants	6X30	4.2
8.5	Solberg	8X30	4.0
8.5	Johnson	7X50	4.4
8.5	Milon	7X35	4.2
9.4	Simmons	7X50	3.8
10.5	Solberg	8X30	3.6
10.5	Johnson	7X50	3.6
11.5	Solberg	8X30	3.5
12.5	Johnson	7X50	3.1
12.5	Reese	8X30	3.4
12.5	Solberg	8X30	3.3
12.5	Minton	7X50	3.6
13.5	Bortle	10X50	3.0
13.5	Johnson	7X50	2.0
13.5	Solberg	8X30	3.0
13.5	Minton	7X50	3.3
14.5	Johnson	7X50	1.0
14.5	Minton	7X50	3.5

1965-66 UT Date	Observer	Instrument	Observed Magnitude
	Preperihelion		
Oct 15.5	Johnson	7X50	1.0
17.5	McCants	8" 40X Refl	1.0
	Postperihelion		
Oct 24.5	Simmons	7X50	-0.5
25.5	Solberg	eye	1.0
26.5	Reese	8X30	1.8
26.5	Solberg	8X30	1.8
26.5	Minton	7X50	1.8
27.5	Solberg	8X30	2.3
27.5	Minton	eye	2.0
27.5	Johnson	7X50	2.5
28.5	Wooten	6" 35X Refl	2.8
28.5	Reese	8X30	2.8
28.5	Solberg	8X50	3.1
29.4	Bortle	5" 18X Refr	3.4
29.4	Simmons	7X50	3.4
29.5	Solberg	8X50	3.4
29.5	Johnson	7X50	2.7
30.4	Glenn	7X50	3.6
30.4	Bortle	5" 18X Refr	3.9
30.5	Meisel	8X40	4.2
30.5	McCants	8X50	4.0
30.5	Solberg	8X50	3.4
31.4	Glenn	7X50	4.0
31.4	Bortle	10X50	3.9
31.4	Meisel	8X40	4.4
31.5	Solberg	8X50	3.9
Nov 1.4	Meisel	8X40	4.7
1.4	Bortle	10X50	4.2
1.5	Solberg	8X50	4.2
2.4	Delano	7X50	4.2
2.4	Bortle	10X50	4.7
2.4	Simmons	7X50	4.1
2.4	Conger	7X50	3.8
2.5	Solberg	8X50	4.5
3.4	Conger	7X50	4.3
3.4	Simmons	7X50	4.5
4.4	Simmons	7X50	4.6
4.5	Solberg	8X50	4.7
5.4	Bortle	10X50	4.8
5.5	Solberg	8X50	5.2
6.4	Bortle	10X50	4.8
6.4	Glenn	7X50	4.9
6.5	Solberg	8X50	5.4
7.5	Solberg	8X50	5.5
15.4	Bortle	10X50	6.3
20.4	Conger	7X50	6.7
20.5	Solberg	8X30	6.8
21.8	Boethin	20X60	5.5
22.8	Boethin	20X60	5.7
23.8	Boethin	20X60	6.0
26.5	Solberg	8X30	7.5
28.4	Bortle	5" 18X Refr	7.3
29.4	Bortle	10X50	7.5
Dec 3	Boethin	20X60	8.5
19	Solberg	20X120	10.0
Jan 9	Herring	12" 75X Refl	10.0
31	Herring	12" 75X Refl	11.0

Figure 19. Table of original, selected, uncorrected A.L.P.O. visual estimates of magnitude of coma (often called total magnitude) of Comet Ikeya-Seki 1965f. Data tabulated by Dennis Milon and prepared for publication by R. B. Minton. See also discussion in text of article "The Magnitude of Comet Ikeya-Seki 1965f".

Figure 20. Drawing of Comet Ikeya-Seki 1965f by John E. Bortle, Mount Vernon, New York on October 5, 1965 with a 5-inch refractor at 70X. The central condensation had grown larger, and the tail broader (compare to Figure 18). Coma tear-shaped. The tail length was observed to be 18', and the central condensation was magnitude 8.1.

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The average is 6.2. If a simple average were not taken, an observer might be inclined to call the average 6.3, because those estimates giving 6.3 used stars closer together in magnitude.

John Bortle called the comet equal to a 6.5 star as listed in the Catalog of Bright Stars (Yale). R. B. Minton identified a star

COMET IKEYA-SEKI 1965f

Preperihelion			
1965 UT Date	Observer	Instrument	Observed Magnitude
Sept 23	Herring	12"	11
24	Herring	12"	11
24	Solberg	6"	10
26	Milon	6"	8.7
26	Minton	4"	12
27	Solberg	6"	10
27	Minton	4"	11
28	Minton	4"	9.0
30	Solberg	6"	9.0
Oct 1	Minton	4"	9.5
2	Solberg	6"	7.5
2	Bortle	5"	9.1
2	Minton	4"	9.5
4	Minton	4"	8.5
5	Bortle	5"	8.1
5	Solberg	6"	7.0
5	Minton	4"	8.5
6	Solberg	6"	7.0
6	Minton	4"	7.6
7	Solberg	6"	5.3
7	Minton	4"	7.6

Preperihelion			
1965 UT Date	Observer	Instrument	Observed Magnitude
Oct 9	Minton	4"	5.5
11	Solberg	8X30	3.8
12	Johnson	7X50	3.1
12	Minton	4"	4.5
13	Bortle	5"	4.5
13	Minton	4"	4.5
14	Minton	4"	4.2
Postperihelion			
Oct 26	Minton	4"	6.5
31	Solberg	6"	7.0
Nov 2	Solberg	8X30	7.0
3	Simmons	7X50	5.8
3	Johnson	7X50	6.5
4	Simmons	7X50	5.2
5	Delano	7X50	5.0
20	Solberg	6"	10
21	Boethin	3"	8.0
22	Boethin	3"	7.5
23	Boethin	3"	8.5
24	Boethin	3"	8.5
Dec 19	Solberg	5"	11

Figure 21. Table of original, selected, uncorrected A.L.P.O. visual estimates of magnitude of nucleus of Comet Ikeya-Seki 1965f. Data tabulated by Dennis Milon and prepared for publication by R. B. Minton. See also discussion in text of article "The Magnitude of Comet Ikeya-Seki 1965f".

on the Skalnate Pleso atlas which the Recorder later found to be 6.3 in the Atlas Coeli Catalogue. Gordon Solberg used 6.06 and 5.44 comparison stars listed in the same catalog.

Postscript by Editor. We congratulate Messrs. Milon, Solberg, and Minton for an excellently planned and laudably executed program of analysis of data on Ikeya-Seki. Surely they have here done the best work of this kind yet carried out by the A.L.P.O. Comets Section.

In accord with Recorder Milon's wishes, we present the raw data on both coma and nucleus in Figures 19 and 21 respectively. Students of comets may thus have the opportunity to carry out their own analysis of the observations.

BOOK REVIEWS

1968 Celestial Calendar and Handbook, by Chas. F. Johnson, Jr. Published by Chas. F. Johnson, Jr., 48 Roberts St., Watertown, Conn. 06795. Price $1.00

Reviewed by J. Russell Smith

The Celestial Calendar and Handbook is an annual publication with which many of our readers are already acquainted. However, the 1968 issue has a number of changes which help to make the booklet more useful. The calendar pages are grouped together, and the charts of Jupiter's satellites are placed after the calendar section. The calendar pages are now printed on colored paper, making them easier to find. The author suggests that one might attach a paper clip to the current calendar page which would help him to open the book at the correct place. As in previous issues, the book is in a neat, long-wearing, spiral binding. The front of the book has an excellent photo of M 51 (NGC 5194), the spiral nebula in Canes Venatici; and the outside back cover has a labeled sketch of Jupiter's belts and zones. This diagram is quite helpful for the observers of the Giant Planet. There is also a moon map on page 2 which serves as a rough guide to some of the major features.

The booklet is packed full of useful information which makes it a valuable reference for the observer. Look at the wealth of information indicated by these topics: time signals by radio, the calendar pages, charts for Jupiter's satellites, elongations and conjunctions of Titan, major satellites of Jupiter and Saturn, eclipses and planets, the "Big Four" asteroids, principal meteor showers, physical data for the sun, moon, and planets, finding charts for Uranus and Neptune, the moon, occultations, the brightest stars, variable stars, double and multiple stars, clusters, nebulae, and galaxies.

Once you see this booklet, I believe that you will agree with me that the price of $1.00 is very reasonable for such a handy and useful book for the telescope user.

Beyond The Observatory, by Harlow Shapley. New York. Charles Scribner's Sons, 1967. 222 pp. Index and Bibliography. Price $4.50.

Reviewed by Samuel Gordon, Science Editor, Washington Daily News.

Dr. Harlow Shapley's newest book, Beyond The Observatory, consists of 11 informal essays (some developed from earlier lectures) on subjects ranging from stars and galaxies to human cortex -- all of which, the author points out, are descended from hydrogen atoms, and all of which assumed their present forms through cosmic evolution. (Here Dr. Shapley wisely refuses to go out on a limb. From where came the original hydrogen, and what is the future of the metagalaxy? "We ask the questions and get no reply," he writes.)

The essays are: "Ten Revelations" (achievements of 20th Century science); "Breathing The Future and The Past" (romance of the argon atom); "Life Among The Dwarfs" (small stars and giant planets); "Six Notes on Planets and Life" (some interesting characteristics of the solar planets); "Life and Hope in The Psychozoic Area" (cosmic evolution); "Thirty Deductions From a Glimmer of Star Light" (what a point of star light reveals); "Out of The Whirlwind" (the Book of Job as a doctoral oral); "Apologies to a Comet" (remarks on the unhappy condition of mankind); "The Five Beasts of My Own Apocalypse" (human problems and remedies); "On The Prolonging of Civilization" (is there a way to save humanity?); and "The Scientist Outside The Laboratory" (how the scientist can help).

In "Life Among The Dwarfs," Dr. Shapley discusses the "Lilliputian" stars -- small in mass and radiation -- and the hypothetical "Brobdingnagian" planets. Both types of objects, Shapley believes, are sufficiently self-warming to permit "protoplasmic experiments."

Of particular interest to ALPO members is the essay on "Six Notes on Planets and Life". Here Shapley presents his belief that the terrestrial planets are merely the "cores" of their former selves, most of their original masses, composed primarily of hydrogen, having been lost to space when the Solar System was young.

Dr. Shapley looks upon the material universe and, on the whole, finds it good. In the complex of space, time, matter, and natural logic (a term he substitutes here for cosmic evolution), the galaxies are doing well and apparently will continue to do so -- although the newly discovered quasars may overturn a theoretical applecart or two.

But what of Man and his future? Man, that hapless creature who faces a "battery of eliminators" primarily within himself? How can he avoid Armageddon? "I wish," Dr. Shapley writes, "we had as clear fundamental entities in the complex realm of human behavior as we have in the natural world of natural science. Are there not societal fundamentals comparable to space, time, energy? Perhaps they exist and the more philosophical of us will some day reason them out of the complex motives of individual and group behavior."

Pending the "reasoning out," Shapley presents this creed: some respect for property, but much respect for human life; much humility and much charity; a little self-esteem, but unbounded altruism, reverence for the phenomena of existence and for the processes of growth in knowledge and in spirit. Naming the five Beasts of his own Apocalypse -- Poverty, Ignorance, Disease, Suspicion, and Enslavement, Dr. Shapley gives his remedies: Material Welfare, Knowledge, Health, Sanity, and Freedom.

Man, Shapley writes, must act to control men. The greatest opportunity currently lies in the realm of worldwide social planning and devices that will make it possible for civilized Man to live and create on a confused planet. Here the scientist has indeed a vital role to play outside the laboratory, Dr. Shapley concludes.

THE LONG BEACH CONVENTION OF THE A.L.P.O.

By: Richard E. Wend

The fifteenth annual convention of the A.L.P.O. was held on August 16-19, 1967 in Long Beach, California. Once again, it was a joint convention with the Western Amateur Astronomers; only the business meetings were separate. The four day meeting provided time for visiting old and new acquaintances, looking at the solar prominences through George Carroll's magnificent birefringent monochromator, and other pleasant occupations in addition to the seven paper sessions. The exhibit area featured lunar and planetary displays by amateurs and huge enlargements of Orbiter photographs. Delegates had a choice of field trips to Stony Ridge Observatory, Ford Observatory, Mt. Wilson Observatory, and the Mt. Wilson Optical Shop in Pasadena.

Dr. Clyde Tombaugh, scheduled to give a Morrison lecture on "Interpretations of Recent Observations of Mars", was unable to attend the convention due to the sudden death of his father. In his place, Dr. Littleton lectured on "Comets", speculating on the origins and mechanics of these bodies. Dr. Armand Deutsch also gave a Morrison lecture, discussing the problem of why so little of the Solar System's angular momentum resides in the sun. He pointed out that if the solar interior rotates at a faster rate than the outer portion, the amount of angular momentum in the sun would be larger than we now calculate. The third Morrison lecture was delivered by Leslie Peltier, who took the title for his talk from his recent book "Starlight Nights". He reminisced about his nearly fifty years as an amateur observer which has included the discovery or co-discovery of twelve comets and around a half dozen novae.

In the paper sessions, Richard Hodgson proposed in "A New Era in the Study of the Planet Mercury" that the discrepancy between the new (radar) rotation period of Mercury and the old one based on visual observations of surface markings might be explained by the fact that the most reliable visual observations of Mercury can only be made during favorable apparitions. Even multiples of the two periods may have misled visual observers. In the absence of Mr. Hodgson, this paper was read by Tom Cragg, who expressed his personal opinion that perhaps the radar measures were incorrect.

Some of the ALPO papers from this convention will be published in full in future issues of The Strolling Astronomer.

Tom Pope and Elmer Reese presented a paper entitled "Rotation of Ultraviolet Markings on Venus". Measures of thirteen pairs of photographs of Venus indicated a retrograde rotation with a mean sidereal period of 4.7 days. Intervals covered by the photographic pairs varied from 1.9 to 4.7 hours.

After a splendid banquet, the noted Dr. Robert S. Richardson spoke on "Mercury and Venus: The Locked Planets", referring to their rotation periods as determined by radar.

Papers on Mars included "Martian Cloud Formations" by Charles F. Capen, in which he discussed recurrent cloud positions, and other types of clouds and haze. Mr. Capen also spoke on "Colorimetry of Mars", warning of psychological effects that tend to modify adjacent colors. Virginia Capen read a paper on "Martian Polar Exploration", explaining the differences between the north and south caps, and speculating about the dark peripheral band just beyond the caps. Joel Goodman discussed "Recent Considerations of Martian Topography". He presented evidence for considering the maria as elevated areas as well as evidence for considering them to be depressions. "Frost heaving" was offered as an alternative to vegetation for explaining the changing dark markings.

Concerning Jupiter, Paul Mackal considered the problem "Why does Jupiter's Equatorial Zone Darken?" A graph of the rotation periods of the changing currents in the area (over a long period of time) provides clues that often predict the Equatorial Zone darkening. From England, Alan W. Heath sent three papers: "Summary of Observations of Jupiter, 1966-1967", "An Investigation Into the Variability of Jupiter's Satellites with Colour Filters", and "Colour Filter Observations of Jupiter, 1966-1967." In Mr. Heath's absence, the papers were read by Stanley Shartle, Tom Cave, and Phil Wyman. Richard E. Wend summed up in "Jupiter in 1967" with slides of drawings and photographs of Jupiter. Particular attention was given to the Red Spot and Hollow.

"Tentative Verification of Saturn's Ring D" by Joel Goodman told how microdensitometer tracings of an over-exposed image of the ring system (during the recent edge-on presentation) using the 30" telescope of Allegheny Observatory showed a faint extension of the known ring system. Rev. Kenneth Delano discussed "Magnitude Variations of Saturn's Satellites". Based on his observations with a $12\frac{1}{2}$" telescope, he found a magnitude range of 2.0 for Dione, and somewhat smaller ranges for several other moons.

R. B. Minton read a paper on "Sungrazing Comets", speculating about a single parent comet for this group. Walter Haas presented a "Preliminary Report on a Computer Program for Calculating Meteor Radiants". A sheaf of the paperwork output from the computer was placed in the exhibit area for inspection.

The moon was well represented at the convention. Joe Bruman postulated "Ice on the Moon", resulting from the impact of large bodies of ice. He was followed by Ronald Oriti, who spoke on "Meteoric Impact on the Moon". The much noted lack of maria on the far side was compared with the presence of some quite large far side craters. Walter J. Krumm presented "Visual Observations of the Lunar Libration Clouds and an Observing Ephemeris." He is the Recorder of a new A.L.P.O. Section studying these clouds. The ephemeris goes through May of 1968.

Figure 22. Some exhibits in meeting hall at W.A.A.-A.L.P.O. Convention in Long Beach. Mr. George Carroll's solar telescope is shown a little right of center. Figures 22-25 are photographs taken and contributed by F. Jack Eastman, Jr. of Manhattan Beach, Calif.

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In the matter of Lunar Transient Phenomena, Charles Ricker discussed "Moon-Blink Survey, ALPO-BAA Coöperation", Wallace Calkins offered "Finally, a Workable Astronet Communication System", and Bill Kohlenberger described "Observational Problems Concerned in Lunar Transient Phenomena." Daniel H. Harris read two papers: "A Visual Spectroscope-Graph for Lunar Transient Phenomena" and "A Theoretical Model of the Ross D Transient Albedo Change", suggesting a fumarole as the cause. Jack Eastman described "The Observation of Lunar Transient Phenomena", including spectral photography. Clark Harris told of many "Confirmed Visual Sightings of Lunar Transient Phenomena", sometimes twenty or thirty a night. Walter Haas read a paper written by Clark Chapman entitled "Lunar Transient Phenomena, a New Fad", which was sharply critical of the mis-use of the scientific concept of independent confirmation, and pointed out that unobjective enthusiasm could do the reputation of the serious amateur great harm.

Grace Fox described "Rewards from Adult Evening Classes in Astronomy". Fifteen additional papers were presented that were not directly concerned with lunar and planetary matters; they are not mentioned here due to lack of space.

Figure 23. (Below.) Stony Ridge Observatory. Operated by the Stony Ridge Observatory Society.

Figure 24. Another portion of the exhibits in the meeting hall. On the left is a telescope on a spherical flotation mount, designed and described by Mr. Norman James.

Figure 25. Presentation of the G. Bruce Blair Award to Mr. Leslie Peltier (right) by Mr. Thomas Cave, General Chairman. The award is given annually by the Western Amateur Astronomers for outstanding service to amateur astronomy.

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At the ALPO business meeting we learned that the much-discussed ALPO Observing Manual has been submitted to three different publishers, so far without acceptance. It was reported that the average published book has been submitted to seven publishers. Ed Casey of Las Cruces gave a report on next year's convention of the ALPO, the WAA, and the Southwest Region of the Astronomical League. The host society will be the Astronomical Society of Las Cruces. This will be on August 21-24, 1968 at the New Mexico State University Campus at Las Cruces. In addition to the University Observatory with its 24" telescope, there is the White Sands Missile Range and the snow white dunes of the White Sands National Monument. Plan now to attend!! It was decided that there would be no concurrent paper sessions, and that ALPO papers would be intermingled with WAA and AL papers. Delegates voted to have an ALPO paper session at the National Convention of the Astronomical League in Chicago during the Labor Day weekend next year, if so invited by the League. It was also voted to suggest a later date for the projected 1969 Nationwide Amateur Convention at Denver. Denver sponsors announced August 1-3 as the dates, and predicted a thousand delegates.

Patrick Moore proposed (by mail) an international amateur group similar to the IAU. It was the decision of the delegates not to go into this proposal at present. One member pointed out that the IAU delegates are generally reimbursed for travel expenses, a privilege amateurs do not enjoy.

ANNOUNCEMENTS

Southwestern Astronomical Conference '68. All readers are cordially invited to attend a meeting on August 21-24, 1968 of the A.L.P.O., the Western Amateur Astronomers, and the Southwest Region of the Astronomical League. The site is the campus of the New Mexico State University, and the host is the Astronomical Society of Las Cruces (of which the Editor is now President). The General Chairman is Mr. E. R. Casey, P. O. Box 921, Las Cruces, New Mexico 88001. Many more details are given in the blue brochure enclosed in this issue. Further information will appear in future issues and later brochures. Qualified A.L.P.O. members are heartily invited to plan to contribute papers and exhibits to the Southwestern Astronomical Conference '68.

Plan now to attend and to bring your friends!

Sustaining Members and Sponsors. As of November 11, 1967, we have in these special groups:

Sustaining Members - Sky Publishing Corporation, Charles F. Capen, Craig L. Johnson, Geoffrey Gaherty, Jr., Dale P. Cruikshank, Charles L. Ricker, Alan McClure, Elmer J. Reese, Carl A. Anderson, Gordon D. Hall, Michael McCants, William K. Hartmann, Ralph Scott, A. W. Mount, Charles B. Owens, Joseph P. Vitous, John E. Wilder, Clark R. Chapman, A. K. Parizek, B. Traucki, Charles H. Giffen, Frederick W. Jaeger, P. K. Sartory, Nicholas Waitkus, Patrick S. Mc Intosh, Lyle T. Johnson, the Chicago Astronomical Society, H. W. Kelsey, Phillip Wyman, Harry Grimsley, Daniel H. Harris, Fred M. Garland, and the Junior Texas Astronomical Society.

Sponsors - Dr. Dinsmore Alter, William O. Roberts, David P. Barcroft, Grace A. Fox, Philip and Virginia Glaser, John E. Westfall, Joel W. Goodman, the National Amateur Astronomers, Inc., James Q. Gant, Jr., Ken Thomson, Reverend Kenneth J. Delano, Richard E. Wend, and Phillip W. Budine.

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

New A.L.P.O. Lunar Recorder. Our Lunar Section staff has been increased by the addition of:

H. W. Kelsey
3439 Mono Drive
Riverside, Calif. 92506

Mr. Kelsey's contributions to the A.L.P.O. and to the Lunar Section have been mentioned often in recent issues. While our work is nothing if not informal and flexible, it is our thought that Mr. Kelsey will be Lunar Recorder Ricker's assistant and will analyze the observations in the A.L.P.O. Lunar Transient Phenomena patrol. However, correspondence and observations about L.T.P.'s should continue to be submitted to Mr. Charles Ricker. Mr. Kelsey will also prepare the quarterly reports which we are sending to Mr. Patrick Moore. Section Reports on certain lunar projects in this journal will be the joint efforts of Messrs. Kelsey and Ricker, and the latter will continue to direct the Lunar Steep Places program. A.L.P.O. members are invited to correspond with our different Lunar Recorders and to participate in the various Lunar Section projects.

New Book in A.L.P.O. Library. The Librarian, Mrs. Walter Haas, acknowledges with thanks the gift of a new book donated to our library by Mr. Greg Redfern of Garden Grove, Calif. The book is Radio Astronomy and How to Build Your Own Telescope, by John Heywood.

New Addresses for Section Recorders. Reverend Richard Hodgson, the Mercury Recorder, now receives his mail at: Westford, Vermont 05494.

Larry C. Bornhurst, the Assistant Saturn Recorder, now has this address: Mount Wilson Observatory, Mount Wilson, Calif. 91023. For the first time our two Saturn Recorders are in really close physical proximity!

Geological Maps of the Moon. The U.S. Geological Survey in coöperation with NASA and ACIC has prepared special charts of ten regions of the moon. The charts show distribution and relative age of lunar geological units and major structural features with approximate contours and shaded relief. Scale 1:1,000,000. The price is $1.00 each. There are also available three special maps and text showing physiographic divisions, lunar rays, and photogeology of the lunar surface. Scale 1:3,800,000. Price $1.50 per set. These items may be ordered from the Distribution Section, U.S. Geological Survey, 1200 South Eads St., Arlington, Va. 22202.

New Address for A.L.P.O. Headquarters. Our efforts to have a stable address for our members and correspondence appear to be doomed to continuous frustration! All box-numbers in the University Park Postoffice were recently changed. Our address is now:
Box 3AZ - University Park - New Mexico 88001

A SUGGESTION CONCERNING THE CONTINUOUS OBSERVATION OF LUNAR TRANSIENT PHENOMENA

(For the Attention of All Lunar Observers)

By: Péter Hédervári, Vice-President of International Lunar Society

During the last few years the so-called lunar transient phenomena (LTP) have come into prominence in researches on the Moon. However, the true nature of these changes on the Moon's surface is rather problematical as yet. According to some investigations, the greatest concentration of LTP's is at or near perigee and apogee (see: Barbara M. Middlehurst: The Observatory, Vol. 86, No. 995, pp. 239-242). For the scientific recognition of the LTP's and for the explanation of their true nature, it is necessary to observe the lunar surface as nearly continuously as possible.

Not long ago the NASA Goddard Space Flight Center established a research-service to investigate the LTP (see: John E. Westfall: The Strolling Astronomer, Vol. 18, Nos. 9-10, pp. 187-189). To observe the LTP is now a new program for the members of the ALPO (see: Charles L. Ricker: The Strolling Astronomer, Vol. 19, Nos. 9-10, pp. 167-169).

For the continuous observation of the lunar surface a world-wide network of lunar observers is needed. Therefore, I should very much like to ask all lunar observers, who presently are not members of the ALPO and/or the International Lunar Society (ILS) and who till the present time were not participants in this research-program, but who are interested in LTP's, to undertake observations of the Moon for the aim of better knowledge of the LTP. To take a part in this very interesting scientific program and thus to get connected with the coöperative researches of NASA and ALPO would be very useful for everyone who is interested in selenology.

The suggested form of the reports of the observations can be found on page 189 of The Strolling Astronomer, Vol. 18, Nos. 9-10. The results of the observations must be sent to the Editor of The Strolling Astronomer (W. H. Haas, Box 3AZ, University Park, New Mexico, 88001, USA) or to Mr. Charles L. Ricker, ALPO Lunar Recorder, 403 W. Park St., Marquette, Michigan, 49855, USA. I am convinced that the ILS would also be very glad to publish short summaries of the results of the observations in its own periodical, The Journal of the ILS. These summaries should be sent to the chief Editor, Mr. Ronald E. Ellis (1, Haystoun Close, Eastburne, Sussex, England). The results will be published in these two periodicals, together with the names and addresses of the observers. I should like to strengthen an excellent coöperation and friendship by means of these observations among all the lunar observers of the world and among NASA, ALPO, ILS, and other astronomical-planetological organizations.

The research regarding observations of the LTP has very great scientific value, and the coöperation among the observers will surely be very profitable.

I have asked Professor W. H. Haas, Mr. Patrick Moore, and Mr. Ronald E. Ellis to be so kind as to publish the present suggestion for all lunar observers simultaneously in the following periodicals: The Strolling Astronomer, The Planetarium, and The Journal of the International Lunar Society respectively.

Some very interesting observations concerning certain visible changes on the lunar surface were collected and published by Professor Haas (see: The Strolling Astronomer, Vol. 18, Nos. 3-4, pp. 72-75). I think that for such observations a telescope of at least an aperture of 6", that is, about 15 centimeters, is necessary. Let us suppose that the diameter of a transient lunar spot is about 1500 meters, that is, 0".80. To perceive such a patch, an astronomical telescope with an aperture of 6" is needed. It may be noted that the true diameter of lunar spots observed earlier by Dr. H. P. Wilkins, and of other spots observed by Drs. Barr and Greenacre, respectively, may have been about 2-3 kilometers.

OBSERVATIONS AND COMMENTS

A Possible Lunar Transient Phenomenon Seen in the Southwest Rim Craterlet of Aristarchus. This observation was made by Reverend Kenneth J. Delano at Fall River, Massachusetts on September 17, 1967 (U.T. date) with a 12.5-inch reflector at 400X, seeing 5 (scale of 0 to 10, with 10 best) and transparency 5 (estimated equivalent limiting stellar magnitude). The colongitude was 67°.0. Mr. Delano writes: "When Aristarchus was first examined (using the moon-blink technique) at 2^h5^m, U.T., the rim-top craterlet adjacent to Aristarchus' major inner dark ray appeared almost comparable to Aristarchus' central peak in brightness through a Wratten No. 25 red filter, but was no brighter than the lower central wall and upper west rim of Aristarchus when a blue filter was used (Wratten No. 48). The inner west slope of this S.W. rim craterlet seemed to display a bright red coloration.

"The redness became increasingly less noticeable until 2^h12^m, when the craterlet was no longer brighter in red light than those other brighter parts of Aristarchus' wall. However, at 2^h17^m, U.T., I got the impression that it had flared up as a brighter red again for a minute's duration (until 2^h18^m), after which it quickly returned to normal. At 2^h21^m observations ceased because heavy haze was beginning to move in, making further observation unreliable."

Reverend Delano uses west in the new, astronautical sense, according to which Grimaldi is near the west limb of the moon. Lunar Recorder Ricker urges that this observation by Mr. Delano is very similar to one by Mr. Carl Anderson discussed in Str. A., Vol. 20, Nos. 7-8, pp. 135-137. However, the moon was much higher in the sky during Mr. Delano's observation.

Some Suggested Favorable Dates for Lunar Transient Phenomena. Dr. William B. Chapman, NASA, Manned Spacecraft Center, Houston draws attention to some favorable near-future dates for observing Lunar Transient Phenomena. While this material may not be new to participants in Mr. Ricker's LTP patrol, the Editor considers its general interest high enough to justify quoting much of Dr. Chapman's letter of October 31, 1967: "Your attention is called to some favorable dates for lunar transient events which may occur during months when the lunar orbit is more eccentric than usual. In addition to the close perigee favorable dates around November 2 and 30, an analysis of computer derived tides shows that many lunar features will have local tidal patterns favorable for events during November 4-12, and December 3-11, 1967. On these dates, in Greenwich Universal Time, some active features will have near sunrise terminator lighting conditions:

Nov. 7-10 and Dec. 6-9; Mare Crisium area, and Messier-Pickering.

Nov. 10-12 and Dec. 9-11; Plato-Eudoxus area, Alphonsus, and Eratosthenes.

"Although tidal amplitudes will be small at Aristarchus, tidal phases will be favorable for events during sunset terminator lighting conditions on November 30 and December 28. Also, since it is more active than any other feature, Aristarchus will be worth watching throughout the dates listed for other features, even though it will be in the dark. This will apply to November 4-6 and December 3-5, and especially during these latter three dates because tides will be almost identical to those during the Aristarchus events of June 14-16, 1866, and December 22, 1835. [If the reader is unfamiliar with these old events, so also is the Editor.]

"Regardless of the causes of lunar events, once an event occurs, a repetition in 26 to 28 days is very likely. It is hoped that this information will be useful to your efforts for obtaining permanent records of lunar events."

We are much indebted to Dr. Chapman for this informative discussion. Those interested in lunar tides as a cause of Lunar Transient Phenomena should read his paper "Tidal Influences at the Lunar Crater Aristarchus" in Journal of Geophysical Research, Vol. 72, No. 24. This subject was also considered by Mrs. Cameron and Mr. Gilheany in the lead article in this issue. The Editor would strongly urge our lunar observers to make special efforts to observe the lunar regions cited above on the dates given. Both positive and negative results should be reported promptly to Charles L. Ricker, 403 W. Park St., Marquette, Michigan 49855.

Total Lunar Eclipse of October 18, 1967. Observations have been received from three persons only: R. B. Minton at Las Cruces, New Mexico with an 8-inch reflector; Ken Thomson at Houston, Texas with a 6-inch reflector; and Walter Schoendorf at San Jose, California with a 2.4-inch refractor. One might have hoped for a far greater response after this eclipse had been mentioned under "Prospects" in our preceding issue.

The principal program of both Thomson and Schoendorf was timing umbral contacts for selected craters. Mr. Thomson was having some eye trouble and experienced much difficulty in identifying features; Ashley Godeaux recorded times for him. Thomson observed both outer tangency and inner tangency for each crater, while Schoendorf's times were for the centers of the objects.

If we form residuals as the mean of Thomson's two times minus Schoendorf's time for eight craters which they both observed at umbral immersion, the average value is +1 min., 22 secs. The extreme values are -15 secs. and +2 mins., 0 secs. Thomson's later observed times may mean that Schoendorf saw an effectively larger umbra in a smaller telescope, or it may be "personal equation."

In color sketches at 9^h24^m and 9^h48^m, U.T. Walter Schoendorf shows much blue within the umbra.

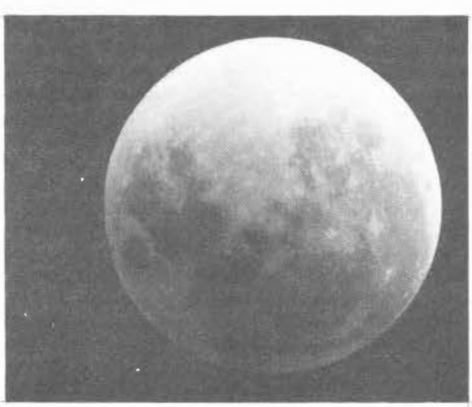

Figure 26. Photograph of totally eclipsed moon by R. B. Minton on October 18, 1967 at 10^h11^m, U.T. 8-inch, F:8 reflector. 30 secs. exposure on Royal-Pan. Developed for 8 minutes in D-11. Printed on F1 Kodabromide. Mid-totality at 10^h15^m, U.T. The brighter southern part of the moon was less deeply immersed in the umbral shadow.

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