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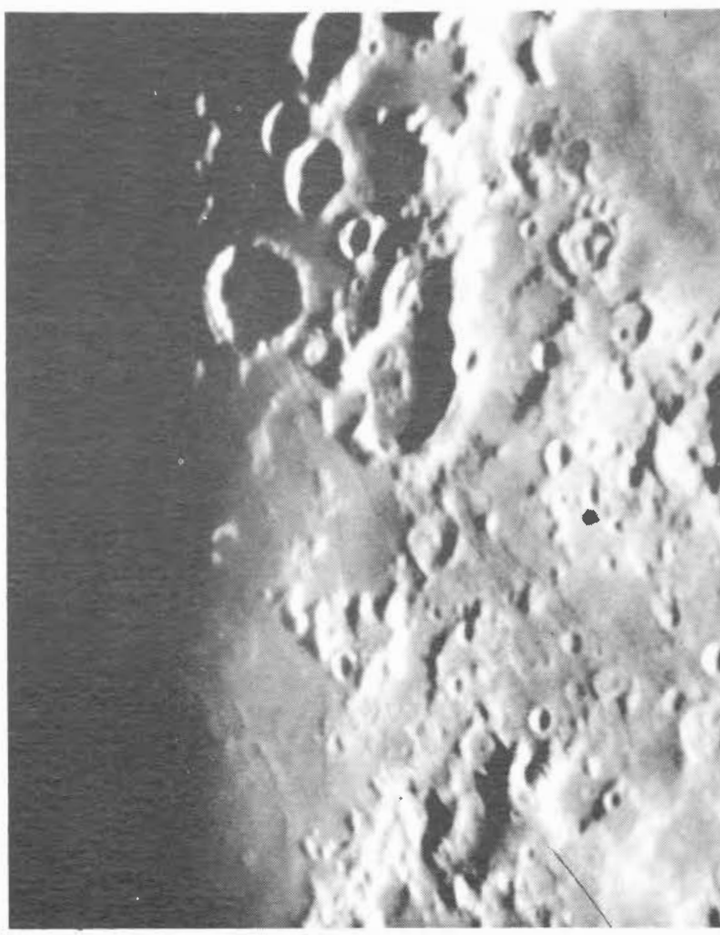

Photograph of Gutenberg, adjacent rilles, and west shore (IAU sense) of Mare Fecunditatis on the moon. Taken by Dennis Milon with a 4-inch Zeiss refractor at F: 262 on October 24, 1964 at 10 hrs., 19 mins., Universal Time. Colongitude 133.2 degrees (sunset view). Exposure 3 seconds. Eyepiece projection with a 6 mm. orthoscopic eyepiece and a Voigtlander F 3.5 105-mm. F.L. camera lens. Lunar south at top, lunar west (IAU) at right.

THE STROLLING ASTRONOMER

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ASSOCIATION OF LUNAR & PLANETARY OBSERVERS
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IN THIS ISSUE

JUPITER IN 1963-64: ROTATION PERIODS

By: Elmer J. Reese, 1963-4 A.L.P.O. Assistant Jupiter Recorder

The outstanding highlight of the apparition was the existence of two distinct currents in the northern part of the Equatorial Zone: one current being normal; the other, abnormally slow. The Equatorial Zone was extremely active in all longitudes, and dark enough to blend with the North Equatorial belt and the north component of the South Equatorial Belt to produce a huge dark band across the planet extending from zenographic latitude +19° to -11°. During the early months of the apparition this huge band was not so orange in color as it had been during the previous apparition; however, some of the warm color returned to the southern portions near the middle of September, 1963. The Red Spot was a well-defined dark orange ellipse throughout the apparition.

Some data pertinent to the apparition follow:

Date of Opposition: 1963, October 8.
Dates of Quadrature: 1963, July 11; 1964, January 2.
Declination of Jupiter: 4°N. (at opposition).
Equatorial Diameter: 49.8 seconds (at opposition).
Zenocentric Declination of Earth: + 2.°9 (at opposition).

This report is based on 4,638 visual central meridian transit observations submitted by 28 observers. Fifty-five percent of these transits (2,539) form usable drifts for 140 Jovian spots distributed in 14 different atmospheric currents. The contributing observers are listed below by name and number of transits submitted, along with station of observation and principal telescope employed.

Brasch, K.R.	Rosemere, Quebec, Canada	8-in. refl.	43t.
Budine, P.W.	Binghamton, N.Y.	4-in. refr.	445
Chalmers, James	Dunfermline, Fife, Scotland	8-in. refl.	42
Chapman, C.R.	Tucson, Arizona	12-in. refl.	35
Dey, W.E.	Ottawa, Ontario, Canada	6-in. refl.	45
Dragesco, J.	Le Vesinet, France	10-in. refl.	33
Farrell, Mrs. J.	Binghamton, N.Y.	4-in. refr.	139
Gaherty, G.	Montreal, Canada	8-in. refl.	39
Glaser, P.R.	Waukesha, Wisconsin	8-in. refl.	3
Goodman, J.W.	San Francisco, Calif.	10-in. refl.	24
Gordon, R.W.	Pen Argyl, Penna.	6-in. refl.	27
Haas, W.H.	Las Cruces, New Mexico	12½-in. refl.	375
Herring, A.K.	Hawaii	12½-in. refl.	8
Hodgson, R.G.	Lanesville, Mass.	12½-in. refl.	3
Howie, F.G.	Dunfermline, Fife, Scotland	8-in. refl.	96
Jamieson, H.D.	Muncie, Indiana	10-in. refl.	183
Kolman, R.S.	Chicago, Illinois	6-in. refl.	70
Low, J.	St. Lambert, Quebec, Canada	8-in. refl.	12
Mackal, P.K.	Mequon, Wisconsin	6-in. refl.	123
Olivarez, J.	Mission, Texas	8-in. refl.	3
Osypowski, T.	Milwaukee, Wisconsin	12½-in. refl.	8
Reese, E.J.	Research Center, NMSU.	16-in. refl.	2592
Ricker, C.L.	Marquette, Michigan	8-in. refl.	140
Roberts, W.O.	Alameda, California	4-in. refr.	40
Rost, C.E.	Santurce, Puerto Rico	6-in. refl.	38
Smith, J.R.	Eagle Pass, Texas	16-in. refl.	3
Wedge, G.	Montreal, Canada	6-in. refl.	63
Williams, D.B.	Normal, Illinois	9-in. refr.	6

The distribution of transit observations by months is as follows:

1963,	May	44	1963,	September	800	1964,	January	470
	June	264		October	905		February	98
	July	304		November	613		March	44
	August	546		December	550			

In the tables which follow, the first column gives an identifying number or letter to each object. The second column indicates whether the object was dark (D) or bright (W) and whether the preceding end (p), center (c), or following end (f) was being observed. The third column gives the first and last dates of observation; the fourth column, the longitudes on those dates. The fifth column gives the longitude at opposition, October 8, 1963. The seventh column indicates the number of degrees in longitude that the marking drifted in 30 days, negative when the longitude decreased with time. The eighth column shows the rotation period in hours, minutes and seconds.

S. S. Temperate Belt, System II

No.	Mark	Limiting Dates	Limiting L.	L.	Transits	Drift	Period
1	Dc	Jan 21 - Feb 28	54° - 33°	---	4	-16°.6	9:55:18
2	Dc	Dec 18 - Jan 23	24 - 353	---	3	-25.8	9:55:05
				Mean rotation period:			9:55:11

S. Temperate Current (S. edge STB, STeZ), System II

No.	Mark	Limiting Dates	Limiting L.	L.	Transits	Drift	Period
D	Wp	Jun 3 - Mar 6	165° - 342°	83°	56	-19°.8	9:55:14
2	Wc	Jun 3 - Mar 6	174 - 352	93	81	-19.7	9:55:14
E	Wf	Jun 3 - Mar 6	184 - 2	103	62	-19.7	9:55:14
4	Df	Jul 19 - Dec 15	188 - 72	125	13	-23.3	9:55:09
5	Wc	Aug 12 - Nov 24	180 - 102	138	7	-22.5	9:55:10
6	Dc	Aug 12 - Jan 2	183 - 97	149	9	-18.0	9:55:16
F	Wp	Jun 21 - Mar 14	245 - 91	184	66	-16.7	9:55:18
8	Wc	Jun 21 - Mar 14	254 - 101	192	100	-16.6	9:55:18
A	Wf	Jun 21 - Mar 14	264 - 111	201	83	-16.6	9:55:18
10	Wp	Jun 21 - Sep 6	284 - 237	---	5	-18.3	9:55:16
B	Wp	Jun 6 - Mar 22	43 - 208	318	56	-20.2	9:55:13
12	Wc	Jun 6 - Mar 22	52 - 218	328	93	-20.1	9:55:13
C	Wf	Jun 6 - Mar 22	61 - 227	338	67	-20.1	9:55:13
14	Wc	Sep 18 - Nov 4	39 - 10	26	5	-18.5	9:55:15
15	Wf	Sep 18 - Nov 9	45 - 15	33	5	-17.3	9:55:17
				Mean rotation period:			9:55:15

The mean rotation period of the S. Temperate Current was the longest on record since 1939-40. B. M. Peek has suggested that the S. Temperate Current completely disappeared in 1940 with the S.S. Temperate Current extending its influence northward into S. Temperate latitudes (The Planet Jupiter, page 113). The fact that the rotation periods of objects in S. Temperate latitudes have gradually increased from $9^h 55^m 07^s$ to $9^h 55^m 18^s$ during the past twenty years does not seem to favor such an interpretation.

The oval FA was extremely bright and white during the apparition. The center of BC was in conjunction with the center of the Red Spot on July 25, 1963 at longitude (II) 16°. The Red Spot and DE were in conjunction on January 31, 1964 at 17°.

The drift of BC in decreasing longitude was sharply retarded on about July 21, 1963 and accelerated again around August 13 after having fallen behind by about five degrees from its extrapolated drift prior to July 21. After August 13 the drift was essentially linear until the end of the apparition. Feature DE was sharply retarded on December 18 and accelerated on December 25. In effect the center of DE, which had been drifting in decreasing longitude at the rate of 0°.66 per day, remained stationary for one week and thereby fell back 5 degrees. It is tempting to speculate that these changes in rotational velocity resulted from some interaction between the bright ovals and the Red Spot. The deceleration of BC occurred just before the center of that oval was in conjunction with the center of the Red Spot, while the deceleration of DE took place when the preceding end of that oval was nearing conjunction with the following end of the Red Spot.

After 25 years of prominence in the atmosphere of Jupiter, the three S. Temperate Ovals are showing no sign of decadence. A few years ago it seemed that the ovals might disappear by contracting into nothing; however, the length of the ovals has been quite stable in recent years. The rotation periods of the three ovals during the apparition of 1963-64 and between the oppositions of 1962 and 1963 are summarized below.

Oval	Period During Apparition	Period Between Oppositions
BC	$9^h\ 55^m\ 13.^s1$	$9^h\ 55^m\ 13.^s0$
DE	9 55 13.6	9 55 12.2
FA	9 55 17.8	9 55 15.3
Mean	$9^h\ 55^m\ 14.^s8$	$9^h\ 55^m\ 13.^s5$

Middle STB, System II

No.	Mark	Limiting Dates	Limiting L.	L.	Transits	Drift	Period
1	Df	Sep 17 - Oct 13	59° - 37°	41°	4	-25.°4	9:55:06
2	Dp	Sep 17 - Oct 28	81 - 55	68	3	-19.0	9:55:15
3	Df	Oct 27 - Dec 2	286 - 257	--	7	-24.2	9:55:08
				Mean rotation period:			9:55:10

Red Spot, System II

Mark	Limiting Dates	Limiting L.	L.	Transits	Drift	Period
p. end	Jun 2 - Mar 11	2° - 5°	3°	100	+0.°31	9:55:41
center	Jun 2 - Mar 11	15 - 17	15	133	+0.21	9:55:41
f. end	Jun 2 - Mar 11	27 - 30	28	93	+0.31	9:55:41
			Mean rotation period:			9:55:41.0

The mean System II longitudes of the center of the Red Spot during twelve-day intervals in 1963-64 follow:

Central Date	Mean Longitude	Average Deviation	Transits
Jun. 10, 1963	14.°5	0.°5	2
Jun. 22	14.5	1.5	2
Jul. 4	15.8	1.8	4
Jul. 16	14.8	0.8	6
Jul. 28	16.8	1.3	4
Aug. 9	16.7	1.0	3
Aug. 21	16.0	1.6	5
Sep. 2	16.6	2.0	5
Sep. 14	14.1	0.8	11
Sep. 26	14.8	0.9	9
Oct. 8	15.6	1.0	12
Oct. 20	16.1	1.3	15
Nov. 1	15.6	1.4	8
Nov. 13	15.9	1.0	11
Nov. 25	16.8	1.2	6
Dec. 7	16.7	1.7	11
Dec. 19	16.7	1.1	7
Dec. 31, 1963	15.7	0.9	10
Jan. 12, 1964	17.2	1.3	4
Jan. 24	16.0	0.7	3
Feb. 5	17.0	0.0	4
Feb. 17	17.0	---	1
Feb. 29	17.3	0.3	3
Mar. 12	17.5	---	1

The mean longitudes listed above are based on visual central meridian transits. Measures of a number of photographs of Jupiter by Glaser and Osypowski give a mean longitude for the center of the Red Spot of 15.°9 for the twelve-day interval centered on September 26, and 17.°9 for the interval centered on October 8. It will be noticed that the measured values are a little higher than the values obtained from visual transits. Evidence is accumulating that visual transits yield longitudes that are systematically too low by about 1°.2. Bradford A. Smith and Clyde W. Tombaugh made visual inspections of 33 photographic plates of Jupiter showing the Red Spot on the central meridian (Observations of the Red Spot on Jupiter, NMSU Research Center, TN-557-63-2). Each plate, which contained 62 images taken at 30-second intervals, was inspected to determine on which image the Red Spot appeared to be exactly on the central meridian. Both Smith and Tombaugh found that the Red Spot appeared to transit about 4 minutes earlier when each plate was viewed normally than when it was reversed so that the direction of rotation was from left to right. It was assumed that the true transit time was the average of the times chosen for the direct and reversed presentations. This represents early estimations in transit time (for direct images) which would yield longitudes too low by about 1°.2. By way of confirmation, the writer has found that visual transits made with a 16-inch Gregorian reflector yield longitudes which are about 3 degrees higher than transits made with a 16-inch Newtonian reflector. It might be well if another systematic correction can be applied to all visual central meridian transits -- a correction for phase exaggeration. The correction at any phase angle (i) is approximately 0°.11 (i). The phase angle is considered to be positive before, and negative after, opposition.

The average rotation period of the Red Spot was $9^h\ 55^m\ 40^s.9$ between the oppositions of 1962 and 1963.

During the early months of the apparition, especially in June, 1963, there was much ragged dusky material in the STrZ and SEBZ preceding the Red Spot. Much of this dusky material had cleared out of the SEBZ by mid-September; however, the STrZ remained quite dusky with a bluish or lavender-gray hue until early in 1964 when both the STrZ and the SEBZ became much brighter and whiter. The Red Spot appeared to be deeply imbedded in the STB during July and August. This effect was enhanced by dusky matter in the southern part of the STrZ which blended into the STB and increased its apparent northward extension. As this dark matter contracted southward into the STB during October, dark streaks developed which connected the preceding and following tips of the Red Spot to the STB. These appendages were reminiscent of features observed in 1926 and 1927.

S. Component S. Equatorial Belt, System II

No.	Mark	Limiting Dates	Limiting L.	L.	Transits	Drift	Period
1	Dc	Oct 2 - Nov 6	158° - 154°	157°	3	- 3°.4	9:55:36
2	Dc	Jul 24 - Oct 14	179 - 180	180	11	+ 0.4	9:55:41
3	Dc	Aug 28 - Oct 2	194 - 194	---	4	0.0	9:55:41
4	Dc	Oct 5 - Nov 6	273 - 274	273	4	+ 1.0	9:55:42
5	Dc	Aug 28 - Oct 13	322 - 325	325	5	+ 2.0	9:55:43
				Mean rotation period:			9:55:41

S. edge SEB_n, N. part SEBZ, System II

No.	Mark	Limiting Dates	Limiting L.	L.	Transits	Drift	Period
1	Dc	Dec 25 - Jan 18	20° - 287°	---	5	-116°.3	9:53:02
2	Dc	Oct 14 - Jan 11	319 - 23	---	8	- 99.8	9:53:25
3	Wc	Jul 22 - Feb 1	246 - 338	347°	27	- 97.1	9:53:28
4	Dc	Sep 17 - Feb 11	66 - 333	1	19	- 92.5	9:53:34
5	Dc	Nov 20 - Feb 16	265 - 335	---	7	- 98.9	9:53:26
6	Wc	Nov 11 - Jan 19	347 - 121	---	5	- 98.3	9:53:27
				Mean rotation period: (without No. 1)			9:53:28

A number of small, very bright nodules and thin dark projections were observed along the south edge of the SEB_n. One bright spot, No. 3, persisted throughout much of the apparition. An extrapolation of its drift would place No. 3 very near the first white spot observed at the beginning of an outbreak of activity in the SEB in early June, 1964.

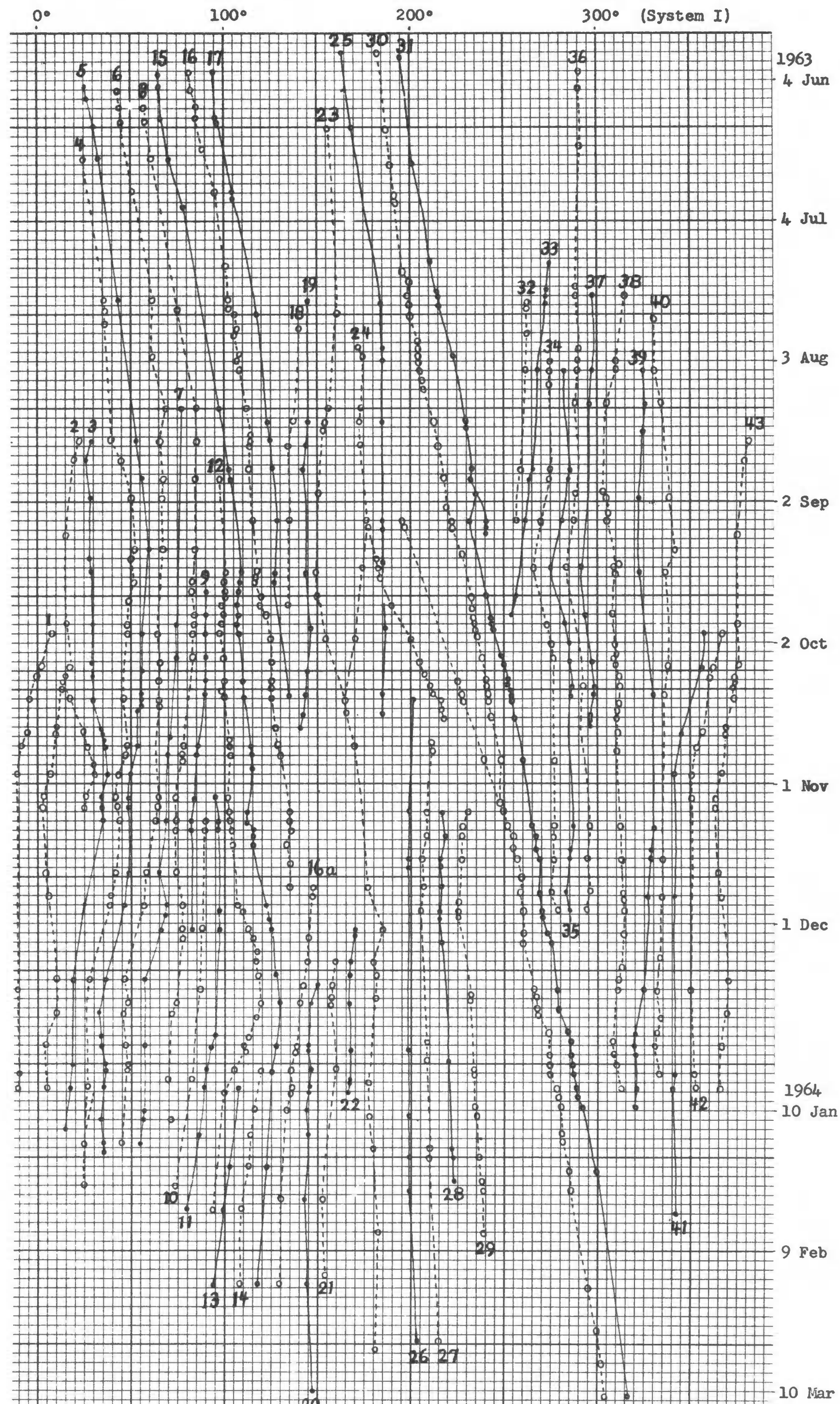

FIGURE 1. Drift chart of the North Equatorial Current during the 1963-4 apparition of Jupiter. Longitudes in System I are plotted against dates. The chart shows the drift of dark features (solid circles) and bright areas (open circles) on the south edge of the North Equatorial Belt (NEB) and the northern part of the Equatorial Zone (EZ). Prepared by Elmer J. Reese. See also text of lead article in this issue.

Bright Oval in SEBZ closely following Red Spot, System II

No.	Mark	Limiting Dates	Limiting L.	L.	Transits	Drift	Period
1	Wc	May 26 - Feb 2	32° - 32°	32°	16	0°.0	9:55:41

A persistent oval was observed from time to time in the SEBZ just following the Red Spot. The oval was especially bright in early June when it appeared to project when near the following limb of the planet.

S. Equatorial Current (N. edge SEB_n, S. part EZ), System I

No.	Mark	Limiting Dates	Limiting L.	L.	Transits	Drift	Period
1	Wc	Jun 2 - Sep 7	247° - 342°	---	9	+29°.4	9:51:10
2	Dp	Jun 2 - Aug 8	256 - 314	---	8	+26.0	9:51:05
3	Wc	Sep 9 - Nov 25	2 - 64	26°	8	+24.2	9:51:03
4	Wc	Aug 12 - Nov 4	355 - 60	39	6	+23.2	9:51:01
5	Dp	Jul 21 - Jan 29	2 - 141	58	22	+21.7	9:50:59
6	Wc	Jul 23 - Jan 29	2 - 139	60	36	+21.6	9:50:59
7	Dc	Sep 12 - Jan 29	49 - 148	67	12	+21.4	9:50:59
8	Wc	Oct 24 - Jan 17	97 - 165	---	11	+24.0	9:51:02
9	Wc	Sep 17 - Jan 6	113 - 216	132	12	+27.8	9:51:08
10	Wc	Jun 3 - Jan 16	76 - 267	188	39	+25.2	9:51:04
11	Dp	May 11 - Feb 17	70 - 292	195	36	+23.6	9:51:02
12	Dp	May 30 - Aug 16	152 - 214	---	4	+23.9	9:51:02
13	Wc	Jul 22 - Jan 31	247 - 88	322	10	+31.2	9:51:12
14	Wc	Oct 9 - Jan 22	357 - 101	---	9	+29.7	9:51:10

Mean rotation period: 9:51:04

All objects listed above were under the influence of the slow or B-component of the S. Equatorial Current (see Peek's The Planet Jupiter, pages 101-102). Numbers 3 and 4 probably coalesced in early December.

N. Equatorial Current (abnormally Slow Portion), System I

No.	Mark	Limiting Dates	Limiting L.	L.	Transits	Drift	Period
4a	Wc	Jun 21 - Sep 13	25° - 50°	---	8	+ 8°.9	9:50:42
5a	Dc	Jun 5 - Sep 12	26 - 60	---	8	+10.3	9:50:44
6a	Wc	Jun 6 - Aug 13	43 - 68	---	7	+11.0	9:50:45
8a	Wc	Jun 10 - Aug 13	57 - 85	---	5	+13.1	9:50:48
15a	Dc	Jun 3 - Sep 17	65 - 109	---	9	+12.5	9:50:47
16a	Wc	Jun 2 - Aug 18	81 - 114	---	17	+12.9	9:50:48
17a	Dc	Jun 2 - Jul 24	92 - 117	---	6	+14.4	9:50:49
24b	Wc	Sep 14 - Oct 18	181 - 218	207°	12	+32.6	9:51:14
25a	Dc	May 29 - Jul 22	164 - 185	---	3	+11.7	9:50:46
30	Wc	May 29 - Mar 11	180 - 305	240	67	+13.1	9:50:48
31	Dc	May 29 - Mar 11	191 - 317	251	50	+13.2	9:50:48

Mean rotation period: 9:50:48

The North Equatorial Current exhibited two distinct currents, which were in evidence simultaneously during the apparition. This is the first time, to the writer's knowledge, that an abnormally slow current has been observed in these latitudes. Objects under the influence of the slow current are listed separately in the table above. Objects having a normal rotation period are listed in the table below. Numbers 30 and 31 were remarkably active and prominent features and were recovered early in the apparition of 1964-65. As these two features moved forward in the direction of increasing longitude, normally moving objects such as Numbers 32, 33, 34, 35, and 36 were apparently annihilated. Activity in this current was so remarkable that a detailed longitude chart is presented in Figure 1. Another chart covering a greater time interval (Figure 2) emphasizes the unusual drift of Nos. 30 and 31 when compared to the normal drifts of

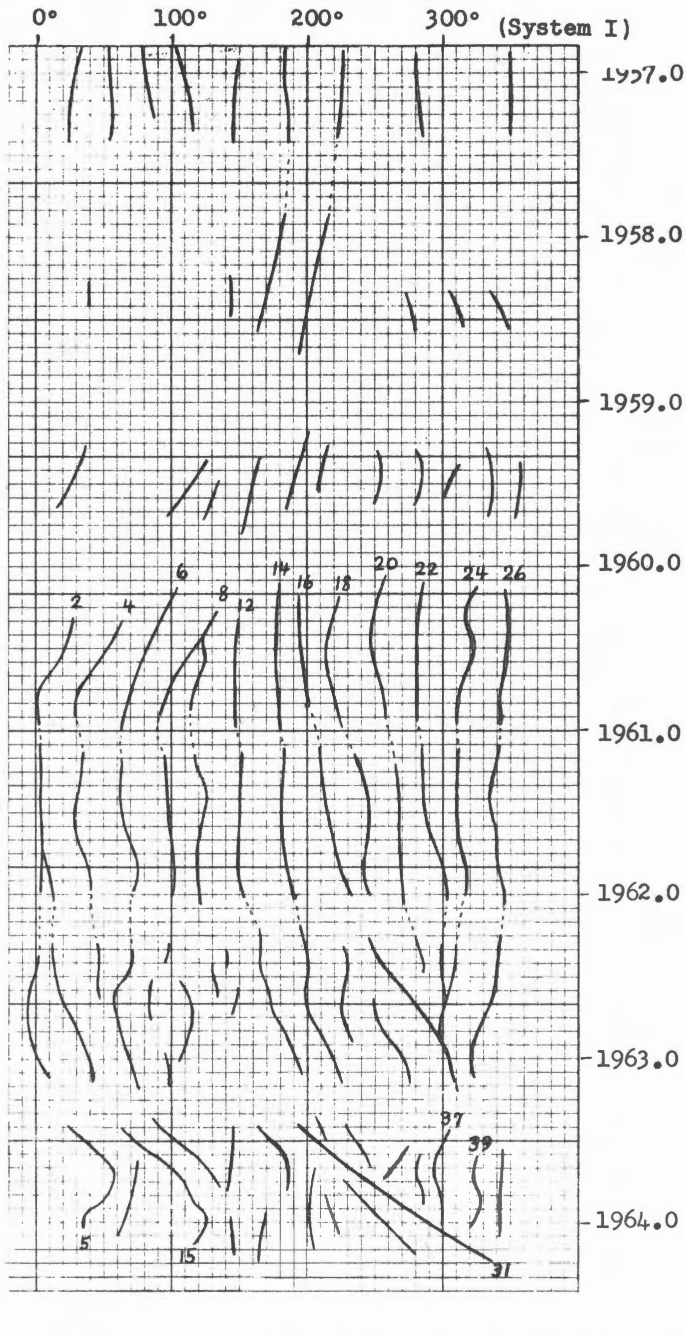

FIGURE 2. Smoothed drift lines of the centers of dark features on the south edge of the NEB of Jupiter from late 1956 to early 1964. Breaks occur in all curves when Jupiter is unobservable near conjunction, as early in 1962. This chart prepared by Elmer J. Reese; it is an extension of the one in Str.A., Vol. 16, pg. 198, 1962. See also text of lead article in this issue.

previous apparitions. Figure 2 also serves to show how the present confused activity has made it impossible to extrapolate, with any confidence, the long-enduring drifts of previous years into the apparition under review.

N. Equatorial Current (S. edge NEB, N. Part EZ), System I

No.	Mark	Limiting Dates	Limiting L.	L.	Transits	Drift	Period
1	Wc	Sep 30 - Jan 5	4° - 349°	0°	10	- 4.°6	9:50:24
2	Wc	Aug 20 - Jan 5	20 - 5	15	26	- 3.3	9:50:26
3	Dc	Aug 20 - Jan 14	28 - 15	30	22	- 2.7	9:50:26
4b	Wc	Sep 13 - Jan 26	50 - 23	45	19	- 6.0	9:50:22
5b	Dc	Sep 12 - Jan 19	60 - 35	55	22	- 5.8	9:50:22
6b	Wc	Aug 13 - Jan 17	68 - 45	65	21	- 4.4	9:50:24
7	Dc	Aug 13 - Jan 17	77 - 55	73	15	- 4.2	9:50:24
8b	Wc	Aug 13 - Jan 3	85 - 70	83	22	- 3.1	9:50:26
9	Dc	Sep 21 - Dec 2	90 - 83	90	12	- 2.9	9:50:26
10	Wc	Nov 9 - Jan 26	90 - 74	---	6	- 6.2	9:50:22
11	Dc	Nov 4 - Jan 31	96 - 80	---	11	- 5.5	9:50:23
12	Wc	Aug 28 - Jan 31	97 - 93	100	36	- 0.8	9:50:29
13	Dc	Jan 5 - Feb 16	107 - 94	---	4	- 9.3	9:50:18
14	Wc	Jan 1 - Feb 16	119 - 105	---	6	- 9.1	9:50:18
15b	Dc	Sep 17 - Feb 16	109 - 118	110	25	+ 1.8	9:50:33
16b	Wc	Aug 18 - Nov 23	114 - 135	125	24	+ 6.5	9:50:39
16c	Wc	Nov 23 - Feb 16	147 - 128	---	14	- 6.7	9:50:21
17b	Dc	Jul 24 - Oct 13	117 - 135	134	7	+ 6.7	9:50:39
18	Wc	Jul 27 - Sep 24	136 - 135	---	5	- 0.5	9:50:29
19	Dc	Jul 21 - Oct 20	145 - 142	144	10	- 1.0	9:50:29
20	Dc	Dec 14 - Mar 10	148 - 146	---	12	- 0.7	9:50:29
21	Wc	Dec 9 - Feb 14	159 - 154	---	7	- 2.2	9:50:27
22	Dc	Dec 2 - Jan 6	170 - 166	---	9	- 3.4	9:50:26
23	Wc	Jun 14 - Mar 1	156 - 181	160	22	+ 2.9	9:50:34
24a	Wc	Jul 31 - Oct 1	174 - 171	---	9	- 1.5	9:50:28
25b	Dc	Jul 22 - Oct 17	185 - 185	185	9	0.0	9:50:30
26	Dc	Oct 14 - Feb 28	200 - 201	---	9	+ 0.2	9:50:30
27	Wc	Oct 23 - Feb 28	211 - 214	---	12	+ 0.7	9:50:31
28	Dc	Nov 7 - Jan 25	217 - 223	---	12	+ 2.3	9:50:33
29	Wc	Nov 7 - Feb 5	228 - 239	---	17	+ 3.7	9:50:35
32	Wc	Jul 21 - Sep 6	263 - 256	---	6	- 4.5	9:50:24
33	Dc	Jul 13 - Sep 26	274 - 256	---	10	- 7.2	9:50:20
34	Wc	Aug 3 - Nov 28	275 - 276	276	16	+ 0.3	9:50:31
35	Dc	Aug 5 - Nov 28	283 - 285	286	15	+ 0.5	9:50:31
36	Wc	Jun 2 - Nov 28	291 - 295	292	17	+ 0.7	9:50:31
37	Dc	Jul 20 - Oct 20	298 - 296	298	11	- 0.7	9:50:29
38	Wc	Jul 20 - Jan 5	313 - 311	311	36	- 0.4	9:50:30
39	Dc	Aug 5 - Jan 9	325 - 321	326	16	- 0.8	9:50:29
40	Wc	Jul 25 - Jan 2	331 - 332	338	16	+ 0.2	9:50:30
41	Dc	Sep 30 - Feb 1	357 - 341	355	8	- 3.9	9:50:25
42	Wc	Sep 30 - Jan 5	7 - 352	2	10	- 4.6	9:50:24
43	Wc	Aug 20 - Jan 5	20 - 6	15	20	- 3.0	9:50:26

Mean rotation period: 9:50:27

Middle of N. Equatorial Belt, System II

No.	Mark	Limiting Dates	Limiting L.	L.	Transits	Drift	Period
1	Wc	Aug 16 - Sep 19	35° - 19°	---	5	-14.°1	9:55:21
2	Wc	Oct 30 - Dec 15	2 - 342	---	3	-12.7	9:55:23
3	Wc	Aug 5 - Oct 9	165 - 127	128°	5	-17.5	9:55:17
4	Dp	Oct 14 - Jan 31	142 - 93	---	4	-13.5	9:55:22
5	Wc	Dec 2 - Mar 12	192 - 150	---	10	-12.5	9:55:24
6	Wc	Aug 16 - Nov 9	335 - 308	318	9	- 9.5	9:55:28
7	Wc	Oct 3 - Nov 18	355 - 331	353	5	-15.7	9:55:19

Mean rotation period: 9:55:22

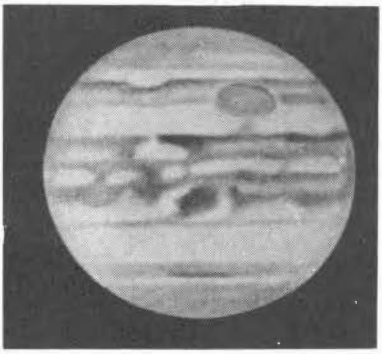

FIGURE 3. Jupiter. J. Dragesco. 10-inch refl. 265X. Sept. 18, 1963. $1^h 30^m$, U.T. $C.M._1 = 56.^\circ$ $C.M._2 = 4.^\circ$ Note Red Spot and STeZ oval BC.

FIGURE 4. Jupiter. J. Dragesco. 10-inch refl. 200X. Sept. 29, 1963. $1^h 15^m$, U.T. $C.M._1 = 345.^\circ$ $C.M._2 = 210.^\circ$ Poor image.[1] STeZ oval FA on disc.

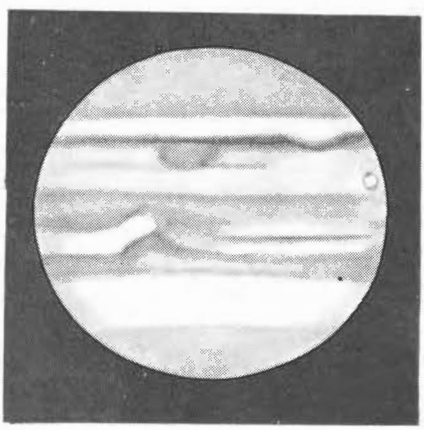

FIGURE 5. Jupiter. José Olivarez. 8-inch refl. 180X. Dec. 4, 1963. $0^h 25^m$, U.T. $C.M._1 = 301.^\circ$ $C.M._2 = 22.^\circ$ Seeing 4.[1] Transparency 3-2. Note Red Spot, STeZ oval DE, and Jupiter I (just inside right limb) on disc.

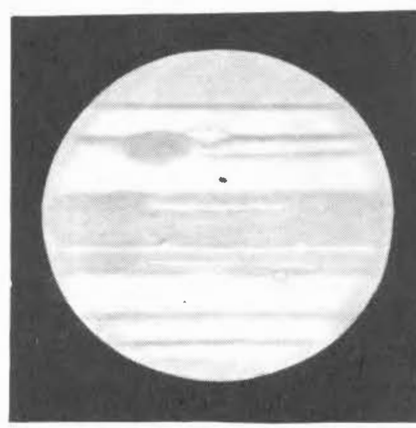

FIGURE 6. Francis J. Howie. 8.5-inch refl. 180X. Jan. 5, 1964. $17^h 28^m$, U.T. $C.M._1 = 213.^\circ$ $C.M._2 = 44.^\circ$ Seeing 3-5.[1] Red Spot and oval DE shown.

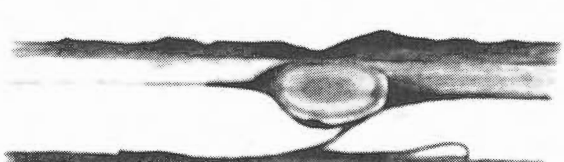

FIGURE 7. Red Spot and vicinity on Jupiter. James W. Young. 16-inch refl. (Table Mountain Observatory). 320X. Oct. 13, 1963. $7^h 15^m$ - $7^h 25^m$, U.T. Seeing 1-3. Transparency 6.5.

N. Tropical Current (N. edge NEB, NTrZ), System II

No.	Mark	Limiting Dates	Limiting L.	L.	Transits	Drift	Period
1	Wc	Sep 7 - Feb 28	55° - 8°	45°	16	- 8°.1	9:55:30
2	Dp	Jul 23 - Oct 24	87 - 77	79	10	- 3.2	9:55:36
3	Dc	Jul 21 - Oct 26	108 - 83	88	13	- 7.7	9:55:30
4	Df	Jun 23 - Nov 24	128 - 78	97	19	- 9.7	9:55:27
5	Wc	Jul 21 - Mar 4	127 - 36	100	46	-12.0	9:55:24
6	Wc	Jul 24 - Aug 24	158 - 135	---	6	-22.3	9:55:10
7	Wc	Sep 24 - Jan 7	118 - 80	113	15	-10.9	9:55:26
8	Wp	Jul 22 - Jan 28	223 - 173	202	23	- 7.9	9:55:30
9	Wc	Sep 6 - Dec 17	223 - 203	218	23	- 5.9	9:55:33
10	Dc	Dec 24 - Feb 27	261 - 239	---	10	-10.2	9:55:27
11	Wc	Jul 22 - Sep 28	328 - 295	---	7	-14.6	9:55:21
12	Wc	Oct 13 - Jan 10	305 - 280	---	5	- 8.4	9:55:29
13	Wc	Jun 12 - Sep 14	13 - 338	---	10	-11.2	9:55:25
14	Dp	Aug 17 - Oct 13	10 - 344	346	11	-13.7	9:55:22
15	Dc	Feb 11 - Mar 6	348 - 336	---	4	-15.0	9:55:20
16	Dc	Feb 16 - Mar 11	4 - 354	---	3	-12.5	9:55:24

Mean rotation period (without No. 6): 9:55:27

Numbers 15 and 16 were dark condensations on a thin dark belt at zenographic latitude 25 degrees N. This belt became remarkably red in color during the summer of 1964.

N. N. Temperate Current, System II

No.	Mark	Limiting Dates	Limiting L.	L.	Transits	Drift	Period
1	Dc	Oct 2 - Nov 10	155° - 150°	155°	8	- 3°.8	9:55:36
2	Df	Nov 17 - Jan 22	180 - 181	---	6	+ 0.5	9:55:41
3	Df	Jul 22 - Oct 13	212 - 202	203	4	- 3.6	9:55:36
4	Dp	Nov 20 - Jan 17	189 - 194	---	4	+ 2.6	9:55:44
5	Df	Nov 29 - Jan 15	201 - 212	---	8	+ 7.0	9:55:50
6	Dp	Aug 3 - Sep 30	251 - 251	---	5	0.0	9:55:41
7	Dp	Jul 20 - Aug 21	295 - 283	---	8	-11.6	9:55:25
8	Dp	Nov 23 - Dec 27	330 - 324	---	6	- 5.3	9:55:33

Mean rotation period: 9:55:38

No. 5 may have been a continuation of No. 3

N.N.N. Temperate Current, System II

No.	Mark	Limiting Dates	Limiting L.	L.	Transits	Drift	Period
1	Dp	Nov 4 - Jan 23	42° - 348°	---	7	-20°.3	9:55:13
2	Dc	Nov 9 - Jan 16	42 - 1	---	7	-18.1	9:55:16
3	Dc	Oct 21 - Nov 24	73 - 53	---	5	-17.6	9:55:17
4	Dc	Aug 28 - Jan 3	334 - 244	305°	8	-21.1	9:55:12
5	Df	Sep 21 - Jan 3	323 - 253	312	6	-20.2	9:55:13
6	Dp	Nov 23 - Jan 3	293 - 262	---	3	-22.7	9:55:10
7	Df	Oct 30 - Jan 1	352 - 329	---	9	-11.0	9:55:26

Mean rotation period: 9:55:15

Postscript by Editor. We express our thanks to Mr. Elmer J. Reese for his excellent presentation of Jovian rotation periods in 1963-4 as determined by C.M. transits by A.L.P.O. members. Mr. Reese has achieved a high standard with these reports, and we think that the present Jupiter staff will do well to preserve his general format. More textual discussion might be advantageous. We urge A.L.P.O. members to observe transits vigorously while the planet is well placed in the evening sky. Methods are described fully in a Jupiter Manual available from Mr. Glaser, the Jupiter Recorder. All observations should be submitted to Mr. Glaser. Dr. Charles H. Giffen is now in charge of reducing C.M. transits data.

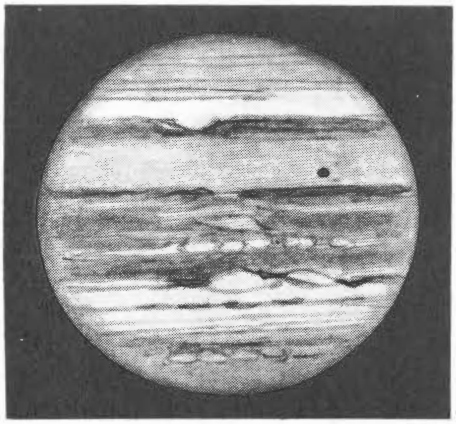

FIGURE 8. Jupiter. Alika K. Herring. 12.5-inch reflector. 275X. August 14, 1963. $13^h 53^m$, U.T. CM_1 = 20°. CM_2 = 231°. Seeing 8. Transparency 6. Note STeZ oval FA and shadow of J.I.

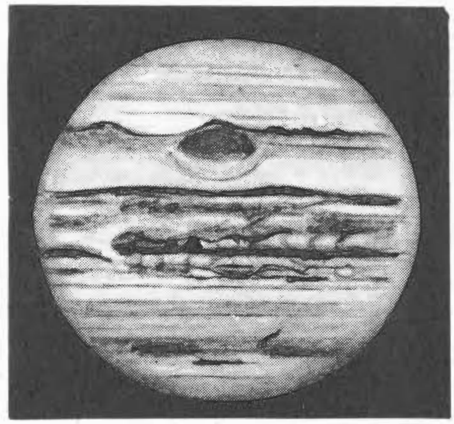

FIGURE 9. Jupiter. Alika K. Herring. 12.5-inch reflector. 275X. August 25, 1963. $12^h 5^m$, U.T. CM_1 = 252°. CM_2 = 19°. Seeing 7-8. Transparency 6. Note oval BC, Red Spot, and Jupiter II as bright spot in transit above STB.

ADDITIONS TO THE A.L.P.O. LUNAR PHOTOGRAPH LIBRARY - I

By: John E. Westfall, A.L.P.O. Lunar Recorder

The A.L.P.O. Lunar Section has recently received a number of additional Table Mountain Observatory lunar photographs, which have been added to the A.L.P.O. Lunar Photograph Library (see "A.L.P.O. Lunar Photograph Library", Str.A., Vol. 18, pg. 62, 1964). The new photographs are available to A.L.P.O. members on the same basis as the photographs listed previously.

Unless otherwise stated, all photographs were taken with the Jet Propulsion Laboratory's Table Mountain Observatory 16-inch Cassegrain reflector. Listed below are the new photographs received, which are all in the form of 8 X 10 enlargements.

Code Number	Area Covered (I.A.U. Directions)	Date & Time (U.T.)	Colong.	Approx.* Scale
712	West Mare Tranquillitatis	2 Mar 1963, 02:32	347°3	4M
1419a	N.M. Imbrium-Plato-N. Limb	14 Jul 1963, 11:08	186.8	4M
1751	Copernicus to West Limb	9 Nov 1963, 13:05	187.6	4.5M
2073a	Aristarchus-Kepler	30 Jan 1964, 11:01	103.9	4M
2073b	Aristarchus-Kepler-Copernicus	30 Jan 1964, 11:01	103.9	4M
2073c	North Oceanus Procellarum	30 Jan 1964, 11:01	103.9	4M
2153a	West Mare Tranquillitatis	19 Feb 1964, 02:16	342.9	4M
2153b	Mare Nectaris-Altai Mountains	19 Feb 1964, 02:16	342.9	4M
2174	Tycho-Sasserides	22 Feb 1964, 06:22	021.5	1M
2175a	Pitatus-Tycho-Clavius	22 Feb 1964, 06:44	021.6	4M
2175b	Ptolemaeus-East Mare Nubium	22 Feb 1964, 06:44	021.6	4M
2201	Whole disc (4-in. Refr.,60-in. F.L.)	28 Feb 1964, 07:19	094.8	22M
2202a	Aristarchus-Kepler	28 Feb 1964, 07:40	095.0	4.5M
2202b	Mare Tranquillitatis	28 Feb 1964, 07:40	095.0	4M
2202c	Mare Crisium region	28 Feb 1964, 07:40	095.0	3.5M
2203a	West Mare Imbrium-West Limb	28 Feb 1964, 08:16	095.3	4.5M
2203b	Tycho region	28 Feb 1964, 08:16	095.3	4M
2208a	West Mare Crisium	1 Mar 1964, 10:50	120.9	1M
2208b	Stevinus-Snellius	1 Mar 1964, 10:50	120.9	1M

Code Number	Area Covered (I.A.U. Directions)	Date & Time (U.T.)	Colong.	Approx.* Scale
2277a	Altai Mountains-Janssen	19 Mar 1964, 03:49	336°.7	4M
2277b	Theophilus Chain-Altai Mountains	19 Mar 1964, 03:49	336.7	4M
2277c	S.M.Nectaris-N. M.Tranquillitatis	19 Mar 1964, 03:49	336.7	4M
2277d	Posidonius-Atlas	19 Mar 1964, 03:49	336.7	4M
2305a	W. Mare Imbrium-Aristarchus-Kepler (yellow filter)	26 Mar 1964, 04:34	062.3	4M
2305b	W.M. Imbrium-Aristarchus-Kepler (light yel. filter -dark print)	26 Mar 1964, 04:34	062.3	4M
2305c	W.M. Imbrium-Aristarchus-Kepler (light yel.filter -light print)	26 Mar 1964, 04:34	062.3	4M
2305d	W.M. Imbrium-Aristarchus-Kepler (light blue filter)	26 Mar 1964, 04:34	062.3	4M
2305e	W.M. Imbrium-Aristarchus-Kepler (dark blue filter)	26 Mar 1964, 04:34	062.3	4M
2317	Whole disc (4-in Refr.)	28 Mar 1964, 10:22	089.6	24M
2444	M. Vaporum-S. Aestuum-Copernicus	21 Apr 1964, 05:36	019.9	4M
2445a	S.M. Serenitatis-N.M.Tranquillitatis (2 copies)	21 Apr 1964, 06:09	020.2	4M
2445b	Aristoteles-Aristillus-Plato-N. Limb	21 Apr 1964, 06:09	020.2	4M

* 4M is a scale of 1:4,000,000, etc.

ADDITIONS TO THE A.L.P.O. LUNAR PHOTOGRAPH LIBRARY - II

By: John E. Westfall, A.L.P.O. Lunar Recorder

NASA has recently furnished the writer with twenty additional 8 x 10 inch enlargements selected from the 4316 total of Ranger VII photographs. These new photographs have been added to the A.L.P.O. Lunar Photograph Library and are available to interested members on the same basis as previous photographs in the library.

The backs of the photographs furnish information as to time, coverage, etc. In general, this information is much more complete than that given on the earlier ten Ranger photographs released. The latest twenty photographs, therefore, are entirely suitable for research purposes, such as the determination of the depth: diameter relationship for small craters. The colongitudes of the photographs range from 177°.4 to 177°.6. The new photographs are listed below.

Code Number 64-H-	Universal Time: 1964 31 Jul, 13^h +	Width of Area Photographed	Slant Range	Scale
2126	21^m: $20^s.8$	182.7 miles	401 miles	1/1,520,000
2127	23 : 38.32	91.2	202	1/758,000
2128	23 : 53.68	80.7	179	1/671,000
2129	24 : 09.4	66.4	148	1/552,000
2130	24 : 55.12	37.48	84.9	1/312,000
2131	25 : 05.36	30.35	68.9	1/252,000
2132	25 : 10.48	26.79	60.9	1/223,000
2133	25 : 15.60	23.23	53.5	1/193,000
2134	25 : 20.72	19.64	44.8	1/163,000
2135	25 : 25.84	16.1	36.7	1/134,000
2136	25 : 30.96	12.51	28.6	1/104,000
2137	25 : 36.08	8.95	20.4	1/74,400
2138	25 : 41.20	5.47	12.2	1/45,500
2139	25 : 46.32	1.84	4.01	1/16,200
2140 LL	25 : 45.08 (3.74 bi)	1147.3 feet	6.09	1/3800
UL	25 : 45.28 (3.54 bi)	3370.5	5.75	1/11,200
LR	25 : 45.48 (3.34 bi)	1052.5	5.43	1/3700
UR	25 : 45.68 (3.14 bi)	2965.5	5.1	1/10,800

Code Number 64-H-		Universal Time: 1964 31 Jul, 13^h+	Width of Area Photographed	Slant Range	Scale
2141	LL	25:45.9 (2.9 bi)	914.7 feet	4.71 mis.	1/3200
	UL	25:46.1 (2.7 bi)	2550.8	4.38	1/9300
	LR	25:46.3 (2.5 bi)	790.1	4.07	1/2600
	UR	25:46.5 (2.3 bi)	2167.3	3.73	1/7200
2142	LL	25:46.76 (2.06 bi)	649.2	3.35	1/2400
	UL	25:46.96 (1.86 bi)	1760.7	3.03	1/6200
	LR	25:47.16 (1.66 bi)	537	2.7	1/1800
	UR	25:47.36 (1.46 bi)	1390	2.4	1/4600
2143	LL	25:47.60 (1.22 bi)	364	10502 ft.	1/1300
	UL	25:47.80 (1.02 bi)	967	8796	1/3300
	LR	25:48.00 (0.82 bi)	277	7056	1/950
	UR	25:48.20 (0.62 bi)	583	5317	1/2000
2145		10:43	260 miles	1163 mis. alt.	approx. 1/2,200,000
2148		----	1.84	----	1/15,200

Notes: 1. 64-H-2126 through 64-H-2139 form a sequence of Fa camera photographs all of which show the impact point to the north-east (IAU) of center. The coordinates of the impact point, as calculated by JPL, are 10°.68 S, 20°.68 W (IAU).

2. 64-H-2140 through 64-H-2143 each contain four partial-scan photographs: LL = Lower Left (P-1 camera); UL = Upper Left (P-3 camera); LR = Lower Right (P-2 camera); UR = Upper Right (P-4 camera); bi = seconds before impact, which was at 1964 31 July, $13^h\ 25^m\ 48.82^s$ U.T.

3. 64-H-2145, taken with Fb camera, is an oblique view of the eastern (IAU) Mare Nubium including the craters Arzachel, Alphonsus, and part of Ptolemaeus. This photograph accompanies this article as an illustration (Figure 10).

4. 64-H-2148 is a mosaic prepared from the final Fa photograph (64-H-2139) and the last five partial-scan photographs.

The complete set of Ranger VII photographs will be available in early December, 1964, from the Superintendent of Documents, U.S. Government Printing Office, Washington 25, D.C. as NASA Special Report (SP-61). Three volumes will be issued at approximately $8.00 each.

A PLEA FOR POSTAL SANITY AMONG AMATEUR ASTRONOMERS

By: David D. Meisel

It is a favorite line of politicians to promise a chicken for every pot and a car for every garage. They have tried to bring about some measure of success in certain areas. One area, however, in which they have failed is that of postal service. For those of us who can remember the old penny postcard, the 300% increase in its price borders on gross inflation. People like the A.L.P.O. staff members, who have to pay for their Section correspondence out of their own pockets, find that it takes approximately four times as much money for postage as it used to do. For mailing The Strolling Astronomer to its readers, the drain on the budget became so great that a subscription increase was necessary. In addition, there is the large amount of correspondence and inquiries for "free" literature received every day. One can envision a time when the cost of mailing the magazine will be more

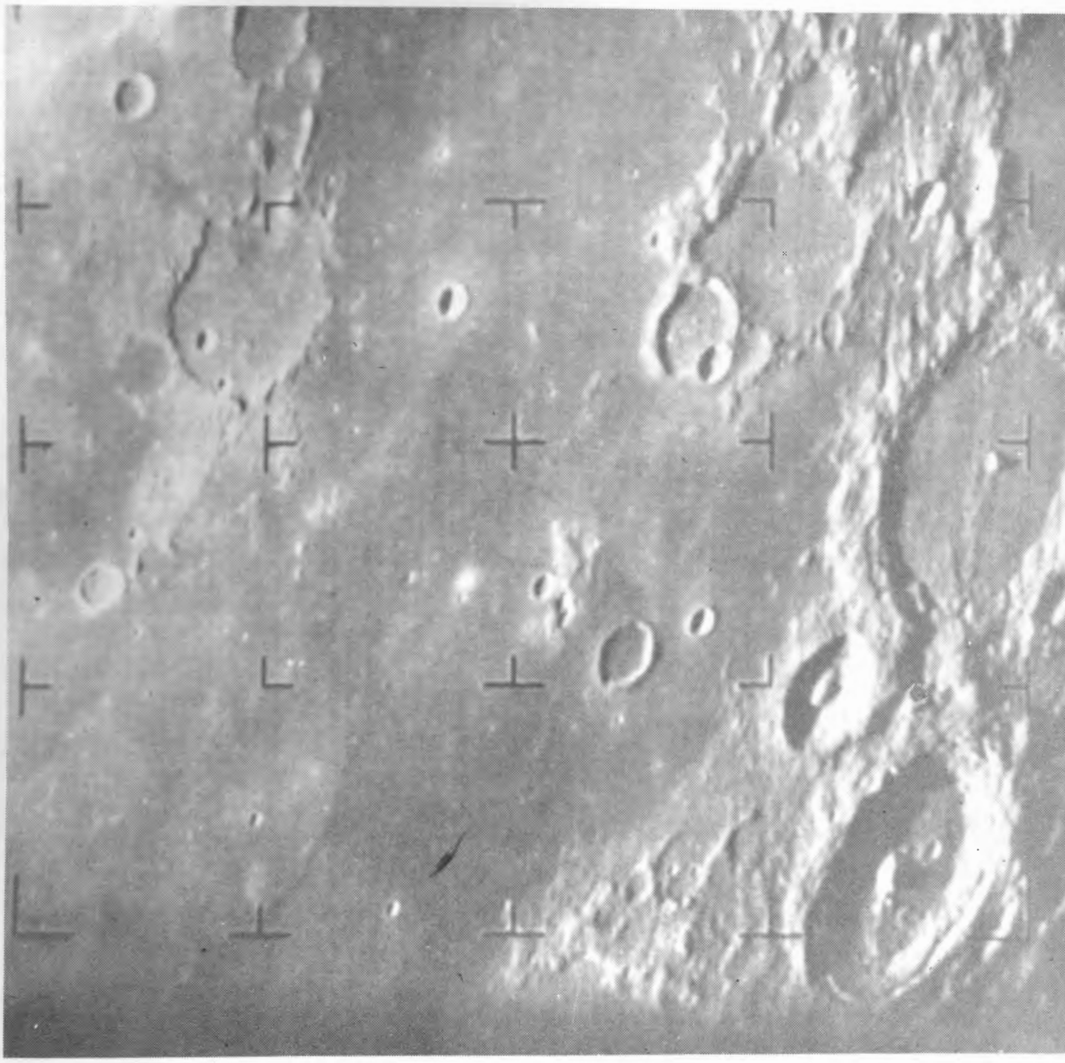

FIGURE 10. Ranger VII lunar photograph, code number 64-H-2145. Eastern (IAU) Mare Nubium from an altitude of 1163 miles (1872 kms.), July 31, 1964, 13^h 10^m 43^s, U.T., colongitude 177°.4. Taken with the Fb camera, approximate scale 1/2,200,000, showing an area 260 miles (420 kms.) wide. North at top, east (IAU) at right. An oblique view of lunar surface, foreshortening features. Guericke in upper left, part of Ptolemaeus at upper right corner, with Alphonsus below it and Arzachel in lower right. Note elongated valleys left of Ptolemaeus.

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than the cost of production. Now the question is, what can the average member of the A.L.P.O. and his non-member friends do to help out?

I do not advocate writing to your Congressman about this unless you want to. What I am suggesting is a rather simple plan which has been used by the people in radio communications for years: INCLUDING RETURN POSTAGE, or better yet, enclosing a self-addressed envelope with the postage. When writing to Section Recorders or to the Director on matters where a direct reply is expected, would it not be a gesture of courtesy to include the postage? I think so. In fact, if you are making a request for information from anyone whom you do not know personally, it would be proper to include postage. In this way you can usually be sure that your request will be answered. However, if you can honestly say to yourself, "I cannot really afford to prepay the return postage", then I am sure that the person who receives your letter will be considerate.

This plan does not help the subscription rate. In this connection, I would like to suggest to those who are able and have not as yet done so that they take out one of the sustaining or sponsor memberships in our organization. The revenue from these memberships helps to defray some of the added expenses, of which postage is one.

One point should be mentioned. Some of your correspondents may well reside in a foreign country, where your own stamps are not of any value for return mail. In this case the International Reply Coupon is recommended. The I.R.C. (not Internal Revenue Commission!) is available at any post office in the International Postal Union and is good for single letter return postage from anywhere in the world.

Therefore, the next time you write a letter requesting a reply or information, I suggest that you ask yourself if you would appreciate return postage from people who write to you asking questions. If so, remember that somebody has to start, and it might as well be you.

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

By: David D. Meisel, 1963 A.L.P.O. Comets Recorder

Comet Ikeya 1963a

One of the best observed comets of 1963 was Comet Ikeya. In spite of its unfavorable location for northern observers, a number of observations were obtained. Among the visual observations, the work of Mr. Gordon Solberg should be mentioned. Mr. Solberg made a long series of consistent magnitude and coma diameter estimates. Even though the number of magnitude estimates received was smaller than for Comet Seki-Lines, the mean error of magnitude estimates for the entire set of A.L.P.O. observations was $\pm 0^m_. 2$ for nine normal points. These nine normal points were based on thirty-five estimates.

Date	Aperture reduced, heliocentric visual magnitude		Number of estimates
1963 Feb. 21	$6^m_.6$	$\pm 0^m_.2$	2
27	5.46	0.04	4
Mar. 02	5.4	0.4	3
03	4.45	0.05	6
06	3.85	0.05	5
10	4.5	0.2	3
12	4.2	0.3	2
13	4.7	0.1	4
14	4.45	0.05	5
23	4.1	0.3	3

A number of other estimates were contributed by Sky and Telescope from their files of unused material on the comet. However, since some of this material was already included in the A.L.P.O. work and since the mean deviation of the non-A.L.P.O. material was much higher than the mean dispersion quoted above, it was decided not to use the S and T material in this report. The Comets Recorder would like to thank the staff of Sky and Telescope, many of whom are A.L.P.O. members, for the loan of this material.

Late in June of 1963, after Comet Ikeya was again visible, Mr. Solberg picked it up again. Many observers were surprised at its post-perihelion brightness. In fact Mr. Alcock found it, thought that it was much too bright for Ikeya, and reported it as a new comet! Whereas the pre-perihelion normal points are represented by the formula:

$$M_r = 8^m.0 + 20 \log r ,$$

the post-perihelion observations indicate something more like:

$$M_r = 5.0 + 20 \log r.$$

Since the object was in the early morning sky few subsequent observations were made anywhere. From the present data, the reason for this curious behavior cannot be determined. The reduced magnitude estimates are shown in Figure 11. The normal points are there indicated by the error brackets. The names and addresses of observers of this comet along with the orbit selected for the reduction have been published earlier in Str. A., Vol. 17, pp. 233 and 234, 1963.

In addition to magnitude estimates, estimates of other visual aspects of the comet were also received and are presented in Figure 12. The coma diameter has there been reduced to unit geocentric distance. The apparent visual tail length is also included. Since no definite solar parameters are available, no comments will be made on possible solar activity effects. The gaps in the data are caused by interference from moonlight.

Also worthy of special mention are the photographs of Comet Ikeya obtained by Alan McClure and those obtained by C. F. Capen and J. W. Young at the Table Mountain Observatory. Capen and Young even attempted a color shot, which showed the comet coma to be a definite blue color contrasted against the orange presented by some of the late type field stars. They further found that the position angle of the tail deviated from the anti-solar direction on a number of occasions. The tail was first to the north of the anti-solar position and then to the south. A summary of their observations is given in Table I. The evolution of the delicate tail structure can be seen from the set of twelve sketches (negatives) made from their photographs.* The sketches are used in order to show details that are very faint on the originals. The change of position angle seems to indicate rotation of the entire tail structure. The question is, "Is this change produced by a rotation of the nucleus"?

Table I

The Apparent Position of Comet Ikeya's Tail Relative to the Direction away from the Sun (C. F. Capen and J. W. Young)

Date (1963)	Position of Tail	Photographic Tail Length in Degrees
28 February	4° N.	15°
1 March	3 N.	
2 "	2 N.	
5 "	1.5 N	9 Moonlight
7 "	1 N.	
8 "	1 N.	
11 "	0	10
12 "	1.5 S.	10
13 "	3 S.	10
14 "	5.5 S.	9
16 "	6	10
19 "	7 S.	11
20 "	7.5 S.	9
21 "	8. S.	7

* A portion of these sketches of photographs are published on pages 102 and 103 and also illustrate the change in the direction of the tail.

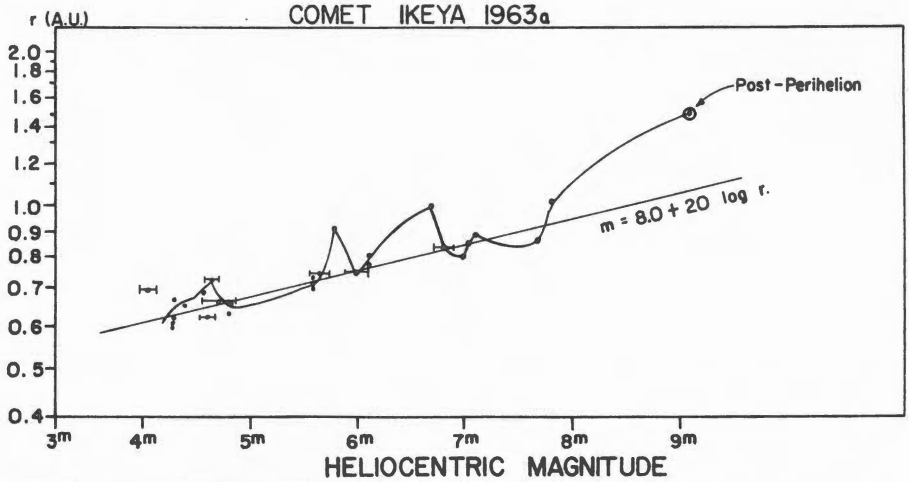


FIGURE 11. Heliocentric visual stellar magnitude of Comet Ikeya (1963a) plotted against heliocentric distance r in astronomical units. See also text. Chart contributed by David D. Meisel. This figure and Figure 12 prepared for publication in this periodical by Ray Montes.

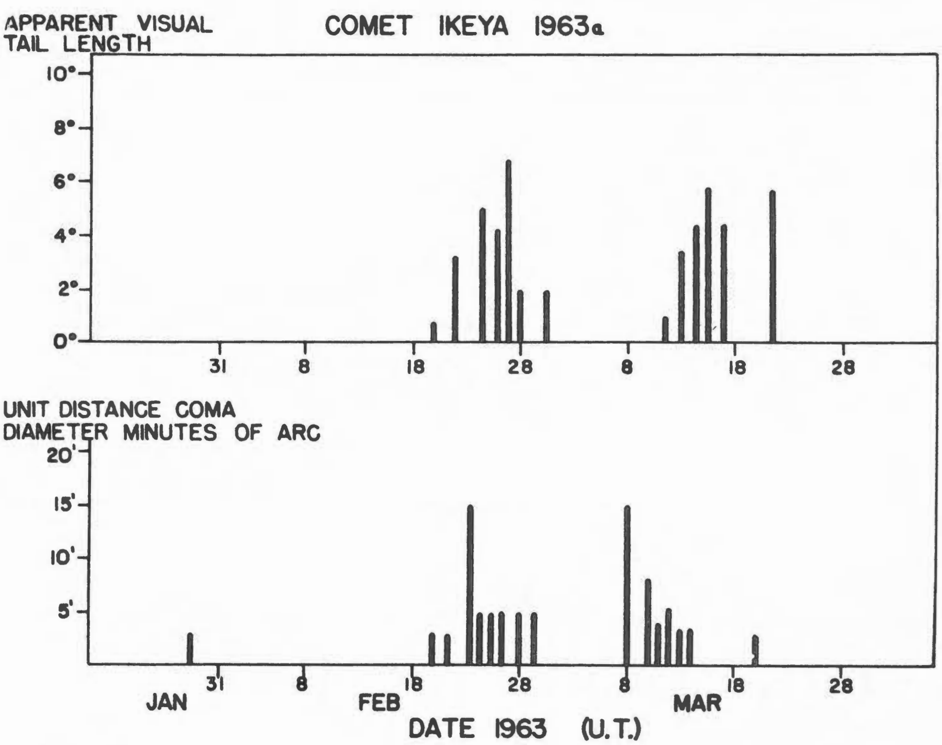


FIGURE 12. Apparent visual tail length in degrees and observed coma diameter (reduced to unit distance) in minutes of arc for Comet Ikeya (1963a) plotted against date. See also text. Chart contributed by David D. Meisel.

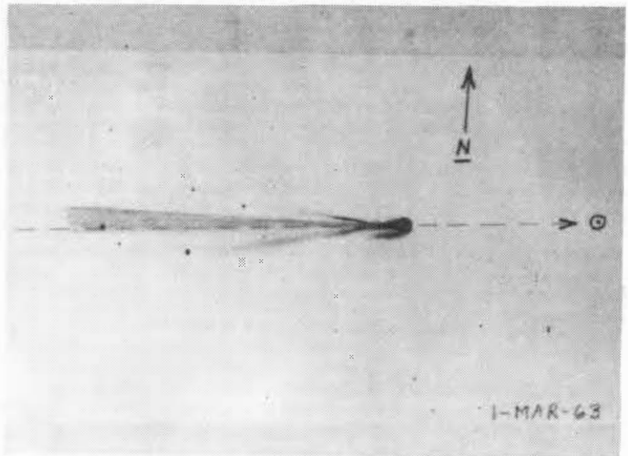


FIGURE 13. March 1, 1963

Figures 13- 18 are sketches from photographs of Comet Ikeya (1963a) taken at the Table Mountain Observatory by C. F. Capen and J. W. Young. Negative shading, dark where actually bright. The sketches show the evolution of the delicate tail structure and the change in the direction of the tail from north of the anti-solar direction to south of it. See Table I on pg.100. The arrow on each sketch shows the direction to the sun. Dates by U.T.

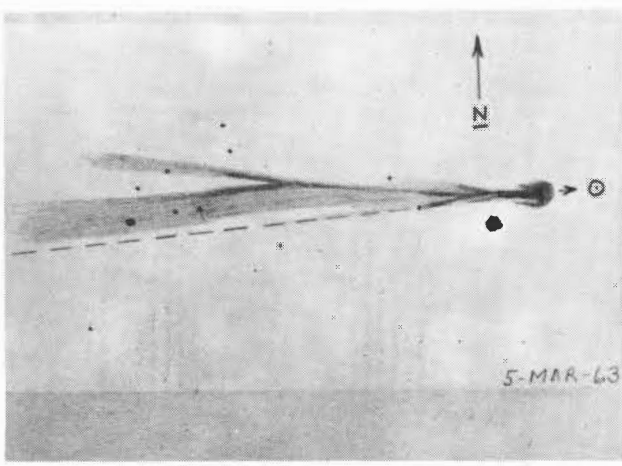


FIGURE 14. March 5, 1963.

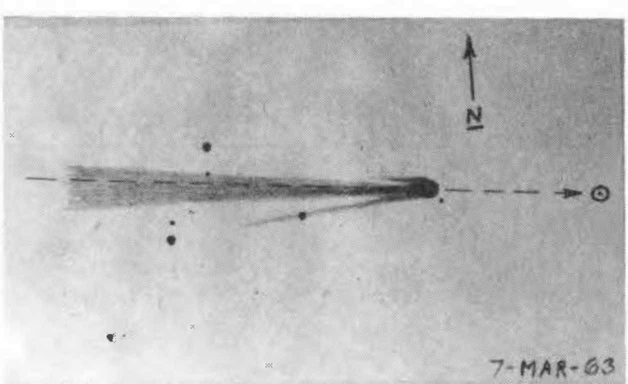


FIGURE 15. March 7, 1963.

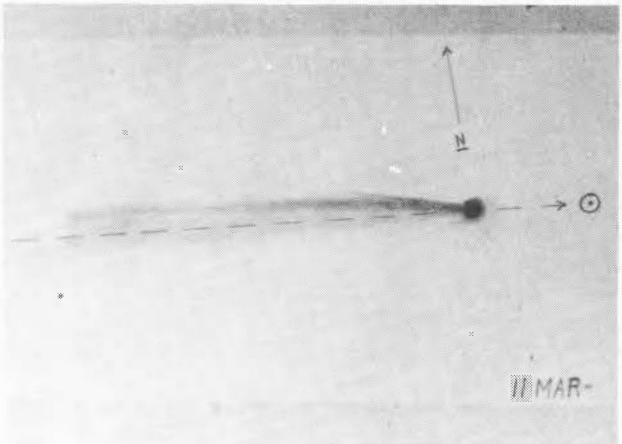


FIGURE 16. March 11, 1963.

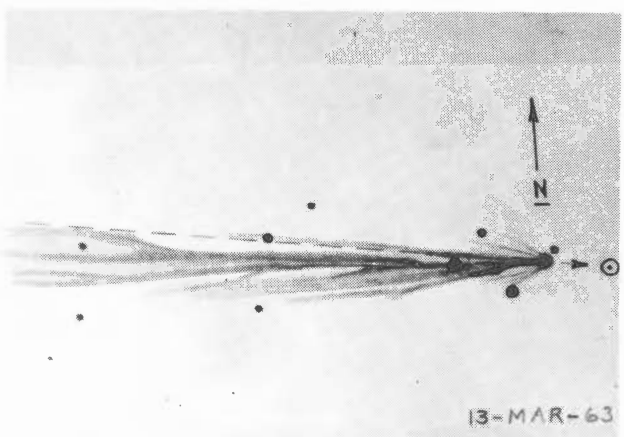


FIGURE 17. March 13, 1963.

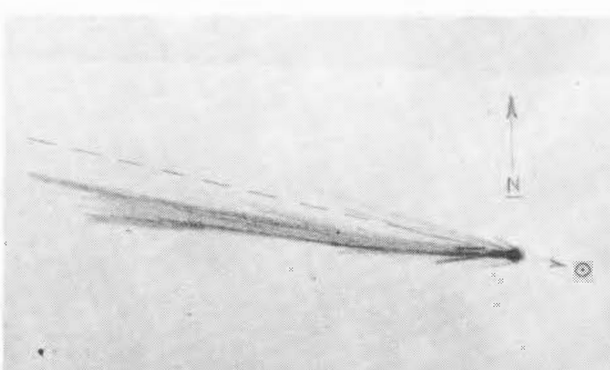


FIGURE 18. March 16, 1963

REPORT ON THE 1964 NATIONWIDE AMATEUR ASTRONOMERS CONVENTION

AND THE TWELFTH A.L.P.O. CONVENTION

By: Ken Thomson

The University of Denver and the Denver Astronomical Society hosted a joint meeting of the Astronomical League, Western Amateur Astronomers, American Association of Variable Star Observers, Western Satellite Research Network, unaffiliated amateur astronomers, and A.L.P.O. on the campus of the University of Denver, August 27-31, 1964.

Accommodations and meals were made available in the University's newly constructed Centennial Hall. The program began officially on Friday, August 28, the preceding day being used for registration. Papers were read during each of the four days, beginning on Friday. Friday afternoon was occupied by a field trip to the National Bureau of Standards at Boulder, followed in the evening by an informal banquet. The banquet speaker was Mrs. Winifred Cameron of NASA, who gave an interesting and informative talk on the experiences of our astronauts, plus some more conjectural remarks on the origin of lunar surface features.

A trip to the Air Force Academy was in store for Saturday, and on each of the four days of the convention an all-day trip to the High Altitude Observatory at Climax afforded the rare opportunity to view the sun through a quartz monochromator. Although the sun was relatively quiet, a few limb prominences put on a striking display.

On Friday and Sunday evenings, many visited Chamberlain Observatory for a brief session at the eyepiece of the 20-inch f/15 Clark refractor. Members of the A.L.P.O. Comets Section, operating an 8-inch reflector on the Observatory grounds, picked up Comets Ikeya and Everhart.

A banquet on Monday evening closed the convention. Dennis Milon showed a large number of high-resolution Ranger VII photographs previously unreleased. Robert E. Cox gave a talk entitled "Project Channel Infinity", dealing with image orthicon astronomy.

Under the direction of Clark Chapman, A.L.P.O. members assembled an attractive exhibit of photographs and drawings in the meeting hall in the Student Union. Some of the contributors were Alika Herring, Jack Eastman, Phil Budine, Joseph Vitous, Steve Larson, and Dennis Milon. The Comets Section, Lunar Section, Jupiter Section, and Saturn Section were represented. Many visitors stopped at this display, as well as at others by the A.A.V.S.O. and various optical manufacturers.

The A.L.P.O. Observing Manual was the principal subject discussed at the A.L.P.O. business meeting Sunday night. The Editors, Clark Chapman and Dale Cruikshank, reported that chapters on Mercury, Venus, Saturn, and colorimetry had been edited and mimeographed for distribution to persons wishing to criticize or to comment on them. They also stated that it is hoped to have a completed manuscript within a year, the chapters on observing techniques, photography, comets, the moon, and Mars being near completion. The mode of publication of this work was discussed at some length. It was decided to defer any decision until the manuscript is finished.

As a final item, it was decided to hold the 1965 A.L.P.O. Convention at Milwaukee with the Astronomical League at the beginning of July.

A listing of the papers read during the A.L.P.O. portion of the program on Monday follows:

1. "The A.L.P.O. Observing Manual", by Clark R. Chapman and Dale P. Cruikshank.

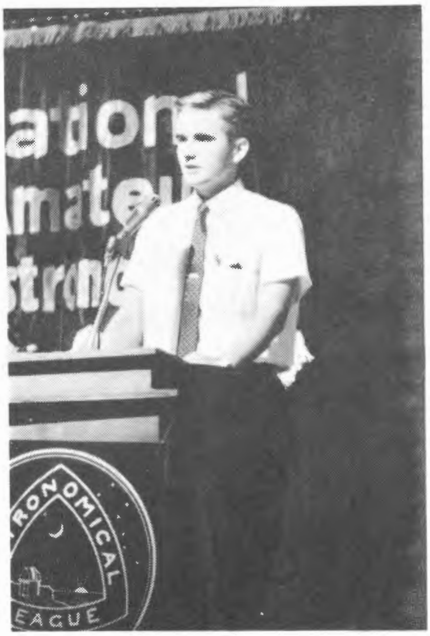


FIGURE 19. Dale Cruikshank addressing the 1964 Nationwide Amateur Astronomers Convention on phase anomalies of the interior planets. Photograph by Craig L. Johnson, also Figure 20.

FIGURE 20. David Dunham speaking to the Convention on grazing lunar occultations of stars. A number of the attending amateurs observed early morning grazing occultations in the Denver area during the meeting.

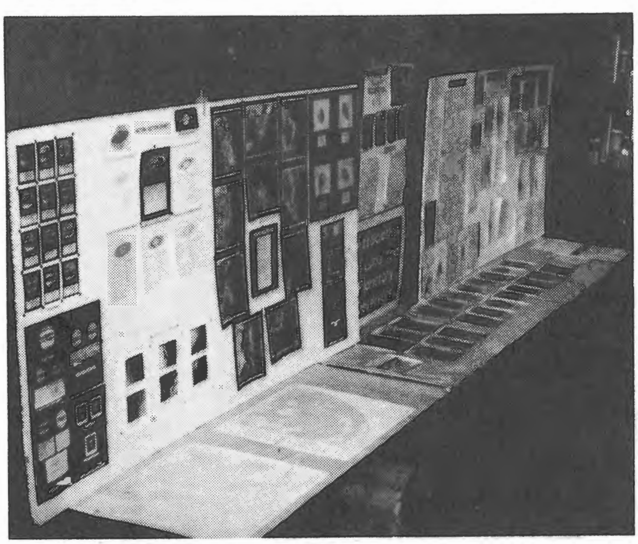


FIGURE 21. A portion of the A.L.P.O. Exhibit at the Denver Convention. Exhibit assembled and arranged by Clark R. Chapman. Figures 21 to 25, inclusive, are photographs by Jack Eastman.

2. "The Phase of the Inferior Planets: A Study of the Moon's Phase with the Naked Eye", by Geoffrey Gaherty, Jr. (read by Robert Shayler).

3. "The Schroeter Dichotomy Effect on Mercury", by Charles H. Giffen (read by Charles Wood).

4. "The Determination of the Dichotomy of Venus", by Dale P.Cruikshank.

5. "Estimation of the Cytherean Dichotomy by Least Squares",by John E. Westfall (read by Harry Jamieson).

6. "Nitrogen Dioxide on Mars?", by Rodger W. Gordon (read by Tom Cave).

7. "The Surface of Saturn", by Patrick Moore (read by Richard Wend).

8. "Rotation Periods of Latitude Zones on Saturn", by Joel W. Goodman.

9. "Interpretation of Short-Wave Reception on 7.33 Megacycles during the July 20, 1963 Total Solar Eclipse", by David D. Meisel (read by Craig Johnson).

10. "Lunar Eclipse Projects", by Ken Thomson.

11. "Lunar Changes and the Modern Amateur Observer", by Walter H. Haas.

12. "Operation Moon-Blink", by John J. Gilheany.

13. "Lunar and Planetary Photography with an 8-inch Reflector", by Dennis Milon.

These papers, as well as equally interesting ones by members of other groups, will be published in the Convention Proceedings; however, a delay of up to 90 days from convention time may elapse before these are in the hands of the registrants.

Everyone present will long remember this convention as one of the most successful in the histories of all societies attending. Special thanks are due to Mr. Ken Steinmetz, the Chairman, and all who worked with him to produce an enjoyable, smooth-running event.

LUNAR ECLIPSE PROJECTS *

By: Ken Thomson

Lunar eclipses offer unique opportunities for a great variety of observing projects. Many of these (crater timings, coloration, brightness of the eclipsed moon, occultations, etc.) have been extensively described in the literature[1]. This paper is restricted to a discussion of certain devices and procedures found helpful in increasing the yield of useful data, and to a few suggestions for possible future projects.

Recording Methods. Some automatic method of recording times and observers' comments is desirable. Many observers have used a tape recorder with a communications receiver for time signals with good results. However, one often encounters difficulty in producing intelligible recording of speech. Therefore, some discussion of microphone type and placement is warranted.

Several types of microphones were tested for convenience and reproduction quality. It was found that microphones mounted on fixed supports were especially troublesome to the observer, who continually had to exercise care in maintaining a suitable mouth-to-microphone distance. Lavalier types have a bad tendency to swing free or to rub against the clothing,

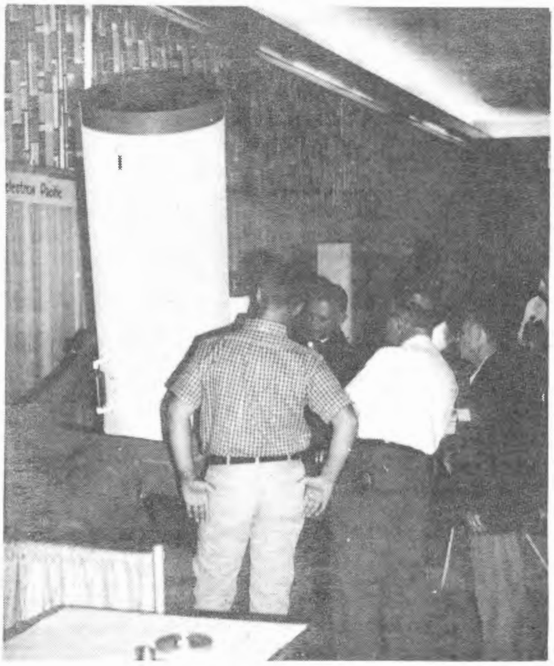


FIGURE 22. Tom Johnson explaining his 22-inch Schmidt-Cassegrain telescope, the largest telescope exhibited at Denver during the 1964 Nationwide Amateur Astronomers Convention.

FIGURE 23. Head table at the Final Banquet on August 31. Left to right: Mrs. Wilma Cherup, Walter Houston (G. Bruce Blair awardee), Mrs. Houston, Mrs. Phyllis Steinmetz, Walter Haas, Dennis Milon, Robert Cox, Mrs. Rita Treleven, and John Treleven.

FIGURE 24. A necessary and beloved feature of any W. A. A. Convention: Tom Cragg (left) and the "plumber's nightmare" at Denver. Also known as the Cragg A-1-A Super-Efficiency 6-Inch Telescope.

FIGURE 25. Chapel at U.S. Air Force Academy in Colorado. There are Catholic, Protestant, and Jewish sanctuaries under the one roof.

producing noise. A military surplus throat microphone was also tried,but was capable of reproducing only the gutturals.

One obtains better results with a boom microphone similar to that used by telephone operators; in fact, a standard operator's headset allows monitoring of the recording through the earpiece. Unfortunately, such devices are ordinarily quite costly (in the vicinity of $20).

A surplus mask type carbon microphone has several advantages. Although ungainly in appearance and slightly uncomfortable, the intelligibility is very good and the cost nominal[2].

Both an operator's headset and a mask microphone were available for the June 24-25, 1964 eclipse, and a powering/mixing box was constructed. A diagram of this box with its connections to microphones, receiver, and recorder is shown on pg. 111. It should be realized that this design represents a hurried effort to meet the eclipse deadline and was made to suit the available equipment from components at hand. Since both microphones have carbon elements, a battery must be provided. Their impedances were low enough to permit the use of unshielded lamp cord without undue hum pickup. Hum was negligible with 25-foot cords on each microphone. It should be noted on pg. 111 that the microphones are wired in series. Provision was made to feed the recorder's monitor output through a suitable attenuator to the earpiece of the operator's headset. However, it was found possible to leave the monitor speaker on without causing feedback, enabling the entire group to hear the recording. This was desirable, since the mask microphone muffles speech transmitted through the air. Accurate timings were facilitated by the transistorized event marker. Several of these may be provided, each operating on a different frequency[3]. The frequency of oscillation is somewhat dependent on transistor parameters and consequently on temperature, and oscillation may stop under conditions of extreme cold if R1 is too large. No difficulty resulted in inserting the event marker in series with the microphone circuit. Independent level controls were found unnecessary.

Certain telescopes employing brush-type motors in their drives generate considerable radio-frequency interference, and may require the installation of simple filters.

A recording system such as described will operate unattended once the initial levels are set, thus relieving the group of the necessity of providing a person to record times and comments. It may be desirable,however, to have such a person in case of system failure.

Photography. Much interest in the color photography of lunar eclipses has arisen of late. The results have been largely disappointing due to poor color balance in the resultant pictures. Nevertheless, if the limitations are realized and if proper precautions are taken, one can obtain useful records.

Unequal reciprocity failure of the three color-sensitive layers is the probable leading cause of color imbalance. Table I later in this paper gives a listing of color-compensating filters and exposure adjustments for some common films. Mr. Dennis Milon has used the inexpensive 2" X 2" gelatin Wratten filters with good results. Gelatin filters, properly cared for, possess excellent optical qualities[4]. A holder may be easily contrived for the filters; the filters themselves may be mounted in 2" X 2" Superslide cardboard "readymounts" with only a small loss in area. One should provide some easy method for inserting and changing filters between exposures. In the case of a Newtonian reflector, a simple cardboard or sheet metal holder can be mounted inside the tube; and filters are then changed by reaching into the tube from the top. (Care should be taken that the eyepiece drawtube will not protrude into the main tube if this method is used.) Slight bending of the gelatin is ordinarily of no optical consequence.

Color films are easily affected by temperature and humidity; this is especially true of the latent image. Film should be purchased only from dealers who refrigerate their stock; the expiration date must also be checked. After exposure, the film should be processed without delay.

Processing, in the experience of the author, is best done by the manufacturer whenever possible. Many independent processors have inadequate quality control. The observer may process some types of film himself with good results, provided that the solutions are fresh and the instructions are carefully followed. All solutions should be prepared with distilled water; in areas where the local water supply is heavily mineralized or is heavily treated chemically, the rinsing and washing steps should also be done with distilled water.

There are many suggested exposure tables in print[5]. These should be regarded merely as guides, and the exposure times given should be bracketed. One should also not expect good color balance to be preserved over a great range of brightness; for example, during the partial phases, the film cannot render both the eclipsed and the uneclipsed portions of the moon accurately.

It is strongly recommended that the observer take notes on the visual appearance of colors while photographs are being made, as a check on film rendering. Often one can correct moderate imbalances by binding a gelatin filter with a transparency. Those having access to an enlarger which has selectable filters built into the illumination system can determine easily what filter or filters will be needed.

One may expect less satisfactory results from color negative films than from transparency types. Color balance and saturation may also be affected in prints and duplicates.

Infrared Observations. Observation of the umbra in the near infrared (0.7 to 1.0 micron region) may possibly disclose some interesting phenomena. There exist surplus image converter tubes[6] which, when used with suitable filters, will permit viewing within this region. Preliminary experiments with a British "snooperscope" tube operated at 4 kilovolts have been made. Projection of a magnified image on the photocathode is required to offset the relatively poor (approximately 10 lines/mm.) resolution of the tube. There are several infrared sensitive films and plates available for this spectral region[7].

Crater timings. Observers timing immersion and reappearance of craters for determining umbral enlargement may find a recording method suggested by Mr. Dennis Milon helpful. A lunar chart, or preferably a full-moon photograph, is covered by a plastic film or sheet. As each feature is timed, it is assigned a number which is marked on the plastic with a grease pencil. Thus a knowledge of the names of the craters is not required.

This practice does not remove the need, however, for some practice in advance of the eclipse in identifying features. Recognizing craters as they reappear is difficult without some familiarity with their positions. It would be well to increase the number of craters timed in order more completely to specify umbral shape.

Other Projects. A complete discussion of lunar eclipse studies is beyond the scope of this paper. The reader should consult *The Strolling Astronomer* and *Sky and Telescope*, both of which publish suggested programs well in advance of an eclipse.

Studies of possible eclipse-induced changes are especially timely and are adaptable to individuals and groups familiar with specific features or areas.

Searches for lunar meteors and for the L_4 and L_5 cloud satellites will appeal to many observers.

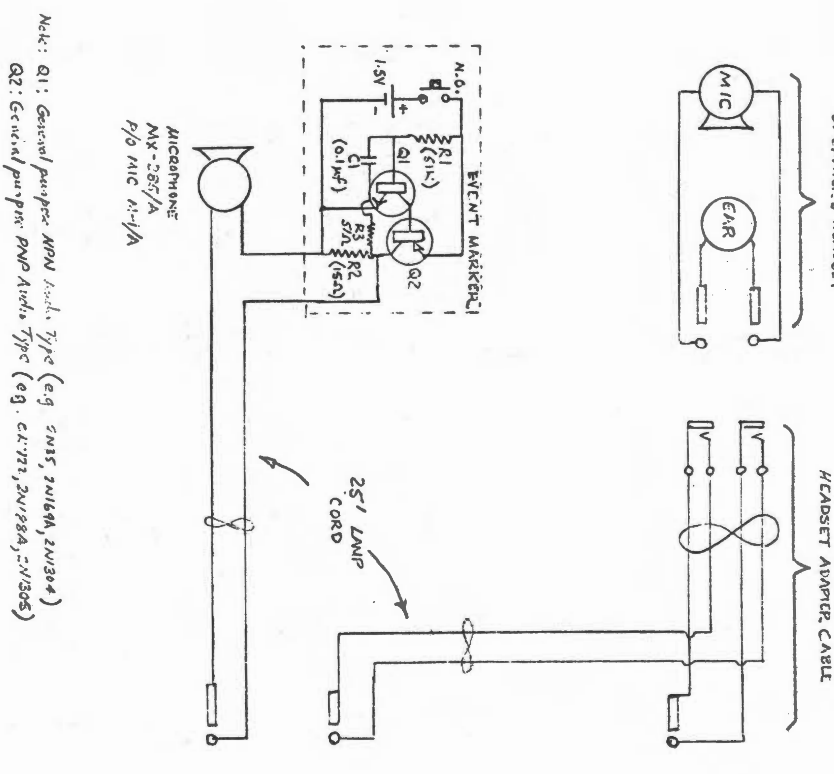


FIGURE 26. Diagram of automatic recording system for times and voice comments developed by Mr. Ken Thomson and others. Powering/mixing box and connections to microphones, receiver, and recorder. See also discussion by Mr. Thomson in text of article "Lunar Eclipse Projects".

TABLE I

EXPOSURE AND FILTER COMPENSATION FOR RECIPROCITY CHARACTERISTICS

KODAK Film Name & Type	Exposure Time (sec.) 1/100	1/10	1	10	100
EKTACOLOR Professional S (Short Exposure)	None No Filter	None No Filter	Not Recommended		
EKTACOLOR L (Long Exposure)	Not Recommended		No Filter from 1/5 to 1/60 sec.		
KODACOLOR	None No Filter	None No Filter	None No Filter	Not Recommended	
KODACOLOR-X	None No Filter	None No Filter	None No Filter	+ 1 Stop No Filter	+2 Stops No Filter
EKTACHROME Daylight (E-3)	None No Filter	+1/2 Stop CC10B	+ 1 Stop CC30B	+2 Stops CC40B + CC10M	+3-1/3 Stp. CC50B + CC10M
High Speed EKTACHROME Daylight	None No Filter	+1/3 Stop CC10B	+ 1 Stop CC10B	+1-2/3 St. CC05G	+2-2/3 Stp. CC05M
EKTACHROME-X	None No Filter	None No Filter	+2/3 Stop CC05Y	+1-1/3 St. CC20Y	+2 Stops CC40Y
KODACHROME II Daylight	None No Filter	None CC05R	+2/3 Stop CC10R	+1-1/3 St. CC20R	+2-1/3 Stp. CC25R
KODACHROME-X	None No Filter	None No Filter	+1/3 Stop CC05M	+2/3 Stop CC05M	+1-2/3 Stp. CC10R

The exposure increase, given in lens stops, includes the adjustment required by any filter or filters suggested.

Data for this table obtained from Kodak Handbook News, issue 63-2 .

Communications of results. As Mr. Westfall pointed out in his recent article[8], Sky and Telescope is in a better position to analyze certain data than is the ALPO; and observations of crater timings, coloration, and full-disk photographs should be sent without delay to them. In the A.L.P.O. send results to Walter H. Haas, Box 26, University Park, New Mexico. It is well to supply a detailed, prompt report to as many interested persons and organizations as practical.

Results of the eclipse of December 30, 1963. This eclipse was observed by the author in collaboration with Mr. Dewey Burkes, who provided a 16" f/6 Newtonian, and Messrs. Dennis Milon, Michael McCants, Paul Knauth, Robert Souther, and Jerry Russell. An 8" Newtonian was also available for crater timings. The observations took place at Pasadena, Texas.

Mr. Milon photographed the event through the larger instrument, using a single lens reflex camera at the prime focus. Using compensating filters as previously described, he obtained very good color photographs of the disappearing moon. His difficulties in having his exposure times and data recorded (he was on the periphery of our group) stimulated the construction of the recording system described. The author performed crater timings, and the other observers timed occultations and made notes of colorations. Approximately ten minutes after the onset of totality dense clouds obscured the moon, ending all observations.

Observations of this eclipse are well documented[9], the outstanding feature being, of course, the extreme dimness of the eclipsed moon.

Results of the eclipse of June 24-25, 1964. Unfavorable weather conditions prevailed at the time of this eclipse. Nevertheless, Messrs. Burkes, Knauth, and the author set up a 16" telescope and a 12.5" telescope near Friendswood, Texas. The moon appeared briefly through a rift in the clouds, permitting five emergence crater timings, made extremely difficult by the darkness of the umbra. The newly constructed recording system received a valuable field test, and was found perfectly satisfactory.

The coming eclipse of December 19, 1964. Circumstances of this lunar eclipse are as follows:

Moon enters penumbra	00h	00.7m
Moon enters umbra	00h	59.2m
Totality begins	02h	07.2m
Middle of eclipse	02h	37.3m
Totality ends	03h	07.3m
Moon leaves umbra	04h	15.4m
Moon leaves penumbra	05h	13.8m

Times given are Universal Time; please note that the phenomenon occurs on the evening of December 18 by local standard times in this country. The northerly declination of the moon will place it favorably for most of the United States, despite the earliness in the evening.

It is urged that this eclipse be widely observed, considering the unusally dark nature of the preceding two eclipses.

Conclusions. It is hoped that the contents of this paper may stimulate increased efforts in observing lunar eclipses. Some of the suggested apparatus and techniques may also find application in other types of observations.

References

1. Some recent articles are:
   "Moon Eclipse December 30", Sky and Telescope, December 1963, pp. 324-327.
   "A Remarkable Eclipse of the Moon", Sky and Telescope, March 1964, pp. 142-146.
   "The Total Lunar Eclipse of December 30, 1963", Strolling Astronomer, Vol. 17, pp. 255-259, 1963.

2. This microphone is available from Gulf Electro Sales Co., 7031 Burkett, Houston, Texas. Request Microphone MX-285/A, P/O MIC M-1/A. Cost $0.35 plus postage.

3. Geilker, Charles D., "The Tape-Recorder Timing of Astronomical Observations", Sky and Telescope, May 1964, pp. 314 - 315.

4. Kodak Wratten Filters for Scientific and Technical Use, Eastman Kodak Co., Rochester, New York. Many editions.

5. "Moon Eclipse December 30", Sky and Telescope, December 1963, pp. 326 - 327.

6. Consult Mail-order catalogs of:
Barry Electronics Mail Order Corp., 512 Broadway, New York, N.Y.
John Meshna, Jr., 19 Allerton St., Lynn, Mass.

7. Infrared and Ultraviolet Photography, Eastman Kodak Co., Rochester, New York. Many editions.

8. Westfall, John E., "Lunar Eclipses", Strolling Astronomer, Vol. 17, pp. 225 - 227, 1963.

9. Brooks, Edward M., "Why Was Last December's Lunar Eclipse So Dark?" Sky and Telescope, June 1964, pp. 346 - 348.
See Also Ref. 1.

*(Paper read at the Twelfth A.L.P.O. Convention at Denver, Colorado, August 28 - 31, 1964).

USING THE A.L.P.O. LUNAR ECLIPSE OBSERVATION FORM AND ECLIPSE STAR MAP

By: John E. Westfall, A.L.P.O. Lunar Recorder

Introduction

In the recent Lunar Section Report (Str. A., 17, Nov.-Dec., 1963, 221 - 227), a prototype "Lunar Eclipse Observation Form" was mentioned and illustrated. This trial form was distributed on a limited basis, and a number of suggestions were subsequently received. A final form has been prepared and is now available to interested A.L.P.O. members who should immediately write to the author in order to obtain copies for the forthcoming total lunar eclipse on December 19, 1964. This final form is illustrated in Figure 27.

Use of the Form

General. The A.L.P.O. Lunar Section Lunar Eclipse Observation Form is not intended to restrict its users to the types of observations indicated on the form; a much greater variety of eclipse observations is possible than ever could be summarized on a single sheet of paper. Rather, the form exists solety for the convenience of the observer and the Lunar Recorder in providing a standard format for the more routine or quantified types of eclipse data. For example, sketches and detailed written accounts of lunar eclipses are greatly desired and should be submitted in addition to any material given on the form itself.

The lunar eclipse form can be divided into six sections, which are individually discussed below. The purpose of this article is only to explain the use of the form, and not how to make the observations themselves. For information on observing methods, the reader should consult one or more of the sources listed at the end of this paper.

The lunar eclipse form is intended for use at any lunar eclipse, with the exception of the section on "Eclipse Luminosity", which is for total eclipses only.

Heading. All blanks in the heading (upper left) must be filled in; in general, their contents should be obvious. "SITE" refers to the place where the observations were made; if at the address given, merely write "Address"; if elsewhere, indicate either the city or town, and state, or the latitude and longitude to one minute of arc. Here "S" stands for "seeing" which should be expressed on the standard scale running from 0 (worst) to 10 (perfect). Symbol "T" represents "transparency" expressed in terms of the revised scale which, for all practical purposes, will be the limiting stellar magnitude during totality. It should be explicitly indicated if "S" or "T" varies during the course of observation.

Eclipse Luminosity. Simply check the most appropriate description of the total phase of the eclipse. This is the only portion of the form that is restricted to total lunar eclipses.

Reference Map. The observer need do nothing to this map; it is merely for his reference, being a schematic diagram of the full moon. The fifteen craters numbered are the only craters for which umbral contact times are acceptable.

Written Description of Eclipse. Written accounts of lunar eclipses are highly desired, particularly if accompanied by sketches. Do not hesitate to use the back of the form for such notes, and staple an additional sheet to the form if necessary.

A.L.P.O. Crater Timings. The bottom of the form is reserved for umbral contact timings of the fifteen craters labeled on the Reference Map. Each observation should include the name (not number) of the crater, the umbral contact time to 0.1 minute, and whether the crater entered (E) or left (L) the umbra (Ex.: Aristarchus 01:23.4 L). This portion of the form is detachable and, if used, should be mailed directly to Sky and Telescope magazine for reduction, which will not be done by the A.L.P.O. itself. Obviously, the back of this portion of the form should not be written upon.

Returning Forms. Completed forms, excepting any crater timings, should be immediately mailed to:

Walter H. Haas
Box 26, University Park, New Mexico.

Lunar Eclipse Star Map

Figure 28 illustrates a "Star Map of the Vicinity of the Eclipsed Moon: December 19, 1964" which is intended for use during that eclipse only. The published copy of this map that appears with this article is suitable for use during the eclipse. If, for any reason, additional copies are desired, they can be obtained by writing to the author.

The eclipse star map depicts the magnitudes of the stars near the moon in the sky at the time of eclipse. The magnitude of the moon may then be estimated by comparison with these stars. Stellar magnitudes here are expressed in units of hundredths of a magnitude; for example: 258 = + 2.58, - 142 = - 1.42. The letter "v" indicates a variable star, which should not be used for comparison. Underlined magnitudes indicate class M stars which, normally, are the most desirable for comparison with the reddened moon during totality. Unfortunately for the December 19th eclipse, all these reference stars are also variable and should not be used.

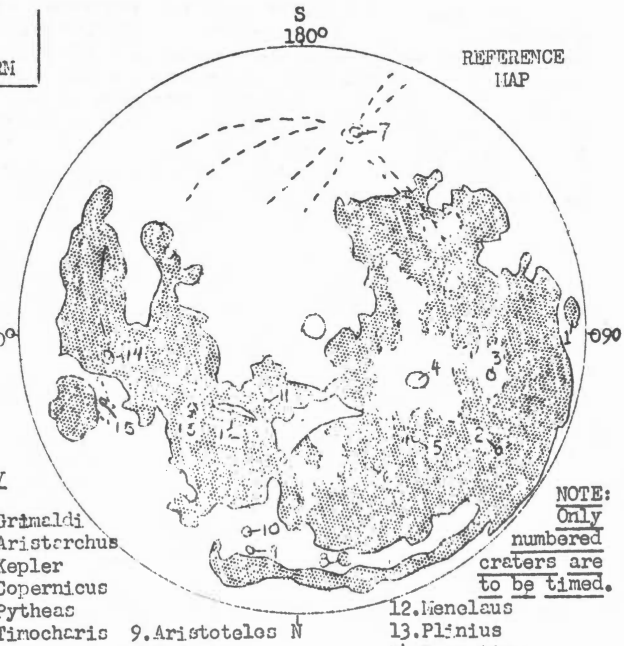
It is not the purpose of this article to discuss the several methods for estimating the magnitude of an object by comparison with objects of known magnitude (for a general discussion see Sections 17.2 -17.4 of J.B.Sidgwick's Observational Astronomy for Amateurs). One simple and useful method is outlined below:

1. Select two comparison stars which are both as close to the moon in brightness as possible. One should be slightly brighter

A.L.P.O. LUNAR SECTION -
LUNAR ECLIPSE OBSERVATION FORM

OBSERVER ____________
ADDRESS ____________
____

SITE ____________
DATE ____________ 19 __
TIME ____ U.T. TO ____ U.T.
S(0-10) ___ T(rev.) ___
INSTRUMENT(S) & MAGNIFS.
____
____
____



Key
1. Grimaldi
2. Aristarchus
3. Kepler
4. Copernicus
5. Pytheas
6. Timocharis
7. Tycho
8. Plato
9. Aristoteles
10. Eudoxus
11. Manilius
12. Menelaus
13. Plinius
14. Taruntius
15. Proclus

ECLIPSE LUMINOSITY
(Check One Value)

( ) 0: Very dark eclipse, moon almost invisible, especially at mid-totality.
( ) 1: Dark eclipse, gray or brownish coloration, details distinguishable only with difficulty.
( ) 2: Deep red or rust-colored eclipse, with a very dark central part in the shadow, and the outer edge of the umbra relatively bright.
( ) 3: Brick-red eclipse, usually with a bright or yellow rim to the shadow.
( ) 4: Very bright copper-red or orange eclipse, with a bluish very bright shadow rim.

LUNAR MAGNITUDE ESTIMATES
Method used ____________

U.T.	MAG.	U.T.	MAG.

WRITTEN DESCRIPTION OF ECLIPSE:

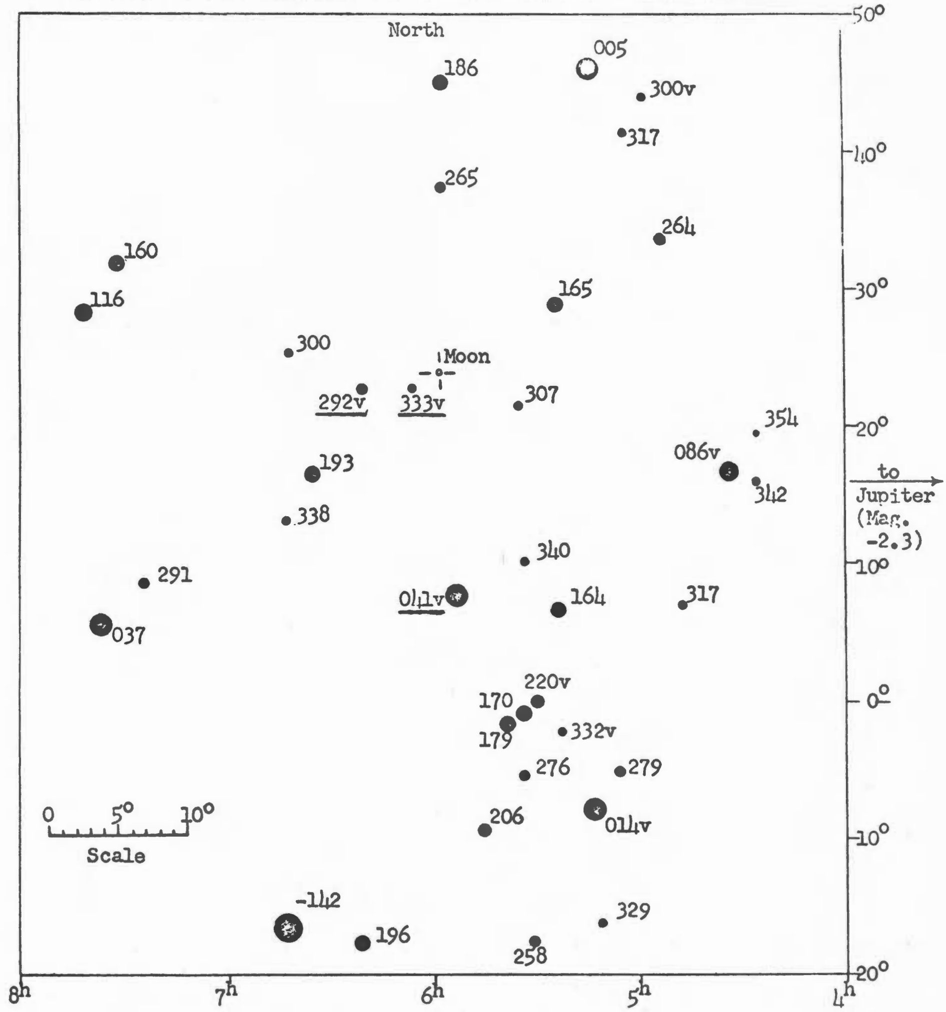
(Please continue on top of back)

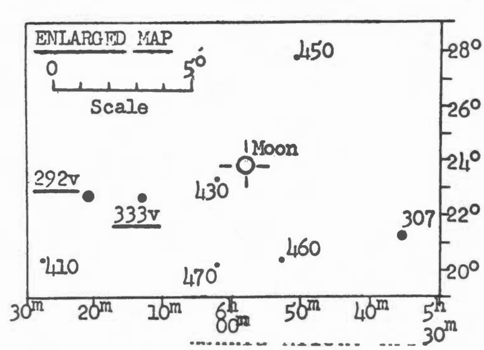
ALPO CRATER TIMINGS - DETATCH AND MAIL TO: Sky and Telescope, 49-50-51 Bay State Rd. (After time add: "E" for entering umbra; "L" for leaving umbra) Cambridge 38, Mass.

Crater	U.T. (.1^m)	Crater	U.T. (.1^m)	Crater	U.T. (.1^m)	Crater	U.T. (.1^m)

FIGURE 27. Lunar eclipse observing form designed and supplied by John E. Westfall, A.L.P.O. Lunar Recorder. The use of the form is explained on pages 114 and 115.

STAR MAP OF THE VICINITY OF THE ECLIPSED MOON: DECEMBER 19, 1964





NOTES:
Stellar magnitudes expressed in units of hundredths of a magnitude. The suffix "v" designates a variable. Magnitudes of stars of spectral class M are underlined. The position of the moon is shown for the time of opposition in right ascension (Dec. 19, 1964, 02:43 E.T.)

FIGURE 28. Chart of stars near totally eclipsed moon on December 19, 1964. The stellar magnitudes are for estimating the brightness of the moon in eclipse. The chart and its use are further described on pages 115 and 118.

than the moon; call this star a. The other should be slightly dimmer than the moon; call this star b.

2. Divide the brightness interval between a and b into ten imaginary units. Estimate how many such units the moon is dimmer than a.

3. After the eclipse, compute the magnitude of the moon from step 1 and 2 as illustrated in the example below:

Example:

Magnitude of a = + 3.07
Magnitude of b = + 3.38
b - a = + 0.31 = 10 units

The moon is estimated to be 3 units fainter than a. Thus:

Magnitude of moon = a + 0.3 (b - a) = 3.07 + 0.3 (+ 0.31)
= 3.07 + 0.09
= + 3.16, which would usually be rounded off to + 3.2.

The observer should practice with the above method before applying it to the moon during the coming eclipse.

The observer will experience some difficulty in estimating the moon's magnitude for two reasons. First, the moon is an extended source of light, difficult to compare with a star. If very near-sighted observers remove their glasses, the images of the moon and the stars will appear more comparable. Otherwise, the moon may be viewed through reversed binoculars or a small telescope (i.e., point the eyepiece at the moon and look through the objective) or as reflected in a ball-bearing or Christmas-tree ball. Such methods will reduce the apparent size of the moon almost to a point, but will also reduce the brightness of the moon. Hence, such devices should be calibrated to the full moon just before or just after the eclipse, when its magnitude will be about -12.7.

Second, for most of the eclipse, the moon will be brighter than the brightest comparison object (Jupiter, magnitude - 2.3). Reversed optics or specular reflection (as described above) or a neutral density filter can be used to reduce the brightness of the moon to an acceptable level. If so, the dimming of the moon, in magnitudes, must be known. Again, this dimming can best be determined by observing the uneclipsed full moon.

If the observer makes only one magnitude estimate, this should be during totality. It is much better, however, to make a series of such estimates throughout the course of the eclipse; the more the better. The Universal Time should be noted with each magnitude estimate.

Lunar Eclipse Observation References

Ashbrook, Joseph. "Moon Eclipse December 30th." Sky and Telescope, 26 (Dec., 1963), 324 - 327.

Haas, Walter H. "The Coming Total Lunar Eclipse on November 18, 1956". Str. A., 10 (May-June, 1956), 50 - 53.

--------------. "Some Suggested Observations of the Total Lunar Eclipse on March 13, 1960". Str. A., 14 (Jan.-Feb., 1960), 28 - 32.

Sidgwick, J.B. Observational Astronomy for Amateurs. London: Faber and Faber, Ltd., 1955. pp. 84 - 85.

Postscript by Editor: We express our thanks to Messrs. Thomson and Westfall for their informative articles presented above. We further cordially invite our readers to observe the imminent total lunar eclipse on

December 19, 1964. Careful brightness estimates are the more wanted because of the extreme dimness of the total lunar eclipses on December 30, 1963 and June 24 - 25, 1964. Possible physical changes as a result of the eclipse have also acquired an unforeseen timeliness. It is asked that the central peak of Alphonsus and the Aristarchus-Herodotus region be carefully watched because of recent recorded changes in these two regions.

It has appeared best to postpone the publication of A.L.P.O. work on the June 24 - 25, 1964 total lunar eclipse until the next issue.

BOOK REVIEW

A Photographic Study of the Brighter Planets, by Dr. Earl C. Slipher. Published by Lowell Observatory and the National Geographical Society, 1964. Available from Sky Publishing Co., Cambridge, Mass. Price $10. 125 pages, with many plates of planetary photographs.

Reviewed by Rodger W. Gordon

Once again E. C. Slipher has produced a volume of planetary photographs comparable to his earlier work Mars, The Photographic Story. In fact, many of the Martian plates found in the earlier work are reproduced in his newest book. The newer volume, however, contains many photographs of all the other bright planets, many never before published. Outstanding photos of Venus, Jupiter, and Saturn dominate the major portion of the book; and the latest 1963 photos of Mars are included. Essentially, the material is presented in the same manner as in his earlier work, Mars. A page of explanation precedes each page of photographs to help the reader to identify prominent features contained in the photos. The Jupiter photographs are truly outstanding examples of what a refractor of moderate aperture can accomplish under excellent seeing conditions. The extremely minute detail in the Jovian section photographs probably represents the truest rendition of Jupiter's complex features that has ever been recorded by photographic means. A comparison of a drawing made by T.E.R. Phillips and a photo made one Jovian revolution later, on page 86 of the book, shows that, given the right conditions, the photograph can equal or exceed a visual observer's drawing in regard to minute, delicate detail. A comparison of photographs and drawings of the planet Mars is included on pages 62 - 63 and 68 - 69 for the reader to judge for himself the reality of the linear markings on Mars called "canals". Certainly the photos 2, 3, and 4 on page 69 show many of the more prominent canals and traces of the fainter ones. A significant sign of the importance of this work in planetary research is the fact that this book is produced in two versions. The second version, known as the "limited" version, contains actual photographic reproductions in order to preserve virtually all the original detail present in the photographs. This version is available to those engaged in important planetary research.

The price of this book is $10.00, which is rather high for 125 pages. The earlier work on Mars cost $8.50 for a book of 168 pages. However, the unexcelled photographs plus the easy-to-follow writing of Dr. Slipher more than make up for the cost. The cost of the limited version has not been announced, but will undoubtedly be higher due to the methods involved in reproduction of the photographs.

To sum up, one might say that the importance of this work will probably grow as time and astronomy march on, for newer facts will be discovered concerning our planetary neighbors. Too, Dr. Slipher's tremendous volume of photographs will undoubtedly be of major importance in interpreting the past changes and possible future phenomena on these bodies. Every A.L.P.O. member should add this work to his book collection. This book and Mars, The Photographic Story probably represent the finest pieces of planetary literature available today.

Regretfully, Dr. Slipher passed away on Aug. 7, 1964, after almost 60 years of devoted study of the planets. We may rest assured, though, that his books will long be used by many generations of future astronomers and serve as a model for a thorough scientific research program.

THE ROTATION OF SATURN

By: Joel W. Goodman, A.L.P.O. Saturn Recorder

(Paper read at the Twelfth A.L.P.O. Convention at Denver, Colorado, August 28 - 31, 1964.)

Our knowledge of the rotation of Saturn had its rudimentary origins in the observations of Christian Huyghens, who discovered Titan and described its motion in his treatise Systema Saturnium, which was published in 1659. Huyghens found that Titan revolved about Saturn in 16 days and consequently inferred that the planet, since it was situated at the center of the satellite's orbit, must rotate on its axis in considerably less than 16 days. Huyghens' instruments were too primitive to permit direct estimates of Saturn's rotation period from the motion of markings on its globe; hence he was merely able to fix in the manner described an upper limit to the period.

It remained for William Herschel, almost a century and a half later, to provide the first direct estimates of the rotation period, employing the now familiar technique of timing the passage of markings across the central meridian of the planet. Herschel regularly recorded slight variations of the widths, intensities, and irregularities of the belts. He then selected pairs of very similar observations which were assumed to be of the same feature, as far apart in date as possible, and calculated a rotation period which was compatible with an integral number of rotations during the interval spanned by the two dates. For example, a pair of observations, the first on December 4, 1793 and the second on January 7, 1794, yielded a period of $10^h\ 15^m\ 40^s$ if it was assumed that 79 rotations had transpired during the interim. Herschel finally computed a mean rotation period of $10^h\ 16^m\ 0^s.4$ based on transits of features in the belts which lay in near-equatorial latitudes. This value stands in surprisingly good agreement with more recent determinations, particularly when considered in light of the fact that Herschel's estimates were based almost exclusively on vague irregularities of intensity in the belts rather than on sharply defined, discrete markings.

Shortly after the work of Herschel, Johann Schroeter and his assistant, Karl Harding, detected some spots on Saturn and from their observations of these features deduced rotation periods ranging from $11^h\ 40^m.5$ to more than 12 hours. These values are decidedly longer than those of Herschel and seem excessive even if the markings were in temperate latitudes where rotation is slower than in the equatorial regions.

During the mid-nineteenth century little was accomplished in the direction of refining Saturn's rotation periods. The most productive observers of the planet were the Bonds in America, using the Harvard 15-inch refractor, and Reverend Dawes and William Lassell in England. Dawes customarily employed small refraotors of up to about a 6-inch aperture while Lassell was partial to larger reflectors of his own manufacture. Although a small number of distinct spots were detected by these observers on several occasions, they were generally of inadequate duration. This period was better noted for achievements in characterization of the rings; the existence of the Crepe Ring and a number of intensity minima in the two brighter rings were established.

The tempo quickened during the last quarter of the 19th century. In 1876, just one year prior to his discovery of the satellites of Mars, Asaph Hall detected a bright, well-defined spot with an apparent diameter of 2" - 3" of arc in the Equatorial Zone of Saturn. Hall alerted other observers and, in all, 19 transit observations of the spot, extending over 61 rotations of the planet, were obtained. Reduction of the data yielded a period of $10^h\ 14^m\ 23^s.8$ with a probable error of only $2^s.5$.

A series of bright equatorial spots and dark notches in the two segments of the North Equatorial Belt were reported intermittently during the last decade of the 19th century. Stanley Williams of England, who used reflectors in the 6-inch aperture range, was the foremost observer of these features. The bright equatorial spots predominated in 1891 and 1892. Rotation periods derived from observations of them ranged from $10^h\ 13^m\ 38^s.4$ to $10^h\ 14^m\ 21^s.8$, in excellent agreement with Hall's value and not very discordant with that of Herschel a century before. In 1893, dark North Equatorial Belt spots made their appearance between Saturnicentric latitudes 17°N and 37°N. The periods of the markings fell into two clearly defined classes, depending on the hemisphere in which they lay. One class had a mean period of $10^h\ 14^m\ 29^s.1$ while the other, at the same numerical latitude in the other hemisphere, possessed a mean period of $10^h\ 15^m\ 0^s.7$. Thus, Williams' findings indicate that atmospheric material in one hemisphere of Saturn rotates about 0.5 minutes faster than material in the analogous latitude zone of the other hemisphere. This phenomenon was confirmed by observations of similar markings during the subsequent apparition.

Continued observations of bright spots in the Equatorial Zone by Williams and others suggested an accelerating trend in the rotation of that region, as shown by the following figures:

Year	Period
1891	$10^h\ 14^m\ 22^s$
1892	10 13 38
1893	10 12 52
1894	10 12 36

The surprising feature of these values is the magnitude of the change within so short a time: a rate of about 45 seconds/year from 1891 to 1893. The rate markedly decelerated during the succeeding year.

Flammarion and Antoniadi, in France, reported the existence of dark spots in the North Equatorial Belt during the apparitions of 1896 and 1897. Three spots in 1896 had a mean rotation period of $10^h\ 14^m\ 14^s$ while the mean value for a group of 4 spots seen the following year was $10^h\ 14^m\ 04^s$. These periods are somewhat shorter than those computed by Williams for the apparitions of 1891 to 1895. They were considered applicable for a latitude of 18°N, and the discrepancy may arise from a more northerly position of the earlier markings.

The next noteworthy period of activity occurred in 1903 and involved an outbreak of bright spots in the north temperate region. They were initially detected by E. E. Barnard, who had expressed skepticism about the existence of detail on the globe of Saturn during the previous decade. It seems that during the 1890's, when Williams and others had been busily accumulating transit data, Barnard was unable to discern any discrete detail on the globe with the 12-inch and 36-inch refractors of Lick Observatory, apertures which, for the most part, were considerably larger than those with which the markings were supposedly seen. Although the spots of 1903 were numerous, which made identification difficult, a rotation period of about $10^h\ 38^m$ was calculated for the latitude zone centered at 36°N. This value was based on some 170 observations of 18 spots by a variety of observers.

The two most dramatic outbursts of the 20th century up to now, however, were still to come. In 1933 a very large conspicuous equatorial white spot was discovered by W. T. Hay, an English amateur who used a 6-inch refractor. This spot, the principal one of an outbreak that included several smaller features of the same type, was oval in shape and about 1/5 of Saturn's diameter in length. The spots remained sufficiently distinct to permit transit timings over a span of about 6 weeks, after which they became too diffuse for precise estimation. Transits of the principal spot yielded a period which was not consistent but varied from about $10^h\ 16^m$ during its early life to

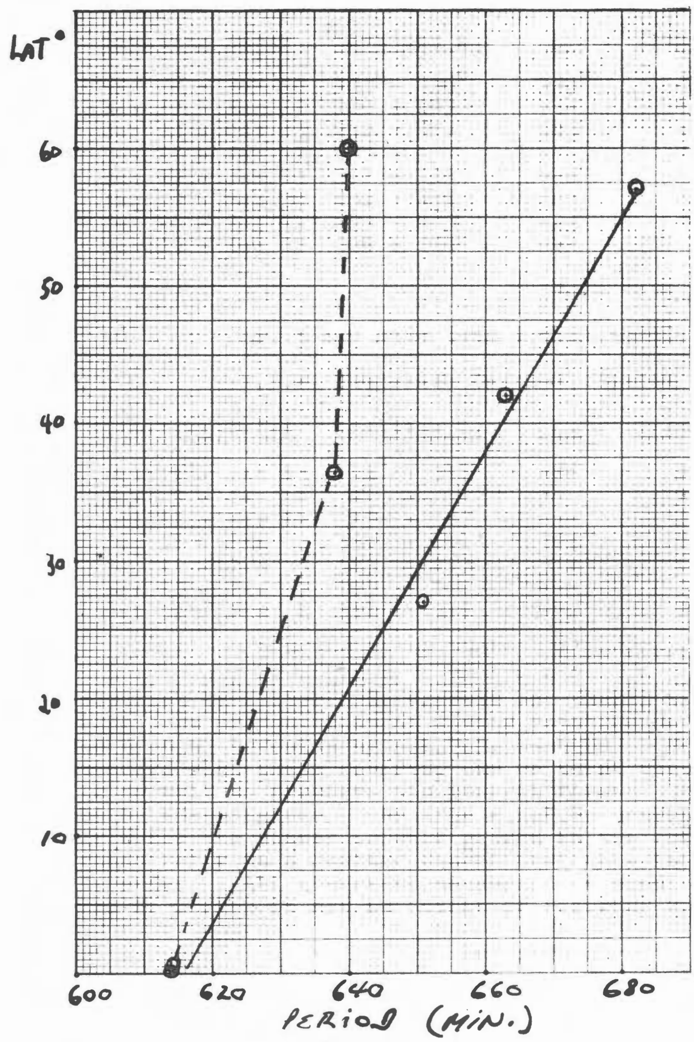


FIGURE 29. Observed rotation periods of Saturn in minutes plotted against numerical latitudes in degrees. Solid line: spectroscopic data; dashed line: visual data. Chart contributed by Joel W. Goodman. See also text of Dr. Goodman's article in this issue. The connecting of the visual points here shown must be regarded as uncertain and tentative.

approximately $10^h\ 13^m$ during the last days of observation, indicating either a change in depth of the feature in Saturn's atmosphere or a complex circulatory pattern for a given depth.

Then in 1960, as the readers of this paper should recall, a spectular series of bright spots made their appearance at about 60°N. The initial observations of these features are generally jointly credited to J. H. Botham of South Africa and A. Dollfus at the Pic-du-Midi Observatory in France. Botham's observations actually predated those of Dollfus by about three weeks, but he failed immediately to publicize his discovery. The spots proved to be a windfall as they remained visible for about 5 months, allowing the compilation of a generous body of transit data. Never before had so many large telescopes and relatively new techniques, such as polarimetry, been applied to the observation of detail on Saturn. When the smoke cleared, the mean rotation period of the zone centered at about 60° N latitude was determined to be approximately $10^h\ 40^m$ from visual transit observations.

Meanwhile, studies have been conducted on other fronts. In 1939, Dr. J. H. Moore of the Lick Observatory published an account of his spectrographic studies of Saturn. He derived rotation periods for several latitudes based on the inclinations of spectral lines on his spectrograms. These, as shown on the accompanying Figure 29, yield a linear rotation gradient for the planet and stand in sharp disagreement with values which rest upon visual transit observations. The most obvious explanation for this enigma is that the atmospheric layers which are observed visually and those which are responsible for the absorption bands are not the same. This concept still does not explain why the spectroscopic data yields a linear gradient while the visual data does not, nor why values for the period at the equator are the same by both methods. The discrepancy certainly emphasizes the need for more observational data employing a variety of approaches which, hopefully, can provide an unambiguous solution to the problem.

Comments by Editor. Much of the information cited by Dr. Goodman can be pursued in greater detail in A. F. Alexander's splendid book, The Planet Saturn. This book can be borrowed from the A.L.P.O. Library. The article here is not intended to include all Saturnian rotation-periods which have ever been determined. For example, it omits a number of visual periods published by W. H. Haas and other A.L.P.O. members since 1940. Probably, however, Dr. Goodman has included most of the more important and more reliable Saturnian rotation-periods.

It would be well to investigate whether the curious relationship between spectroscopic and visual periods for Saturn also applies to Jupiter since the two giant planets are known to be similar in physical nature.

The Editor thinks that the relationship between period and latitude for visual data suggested by the dashed line on Figure 29 must be regarded as extremely tentative. He would himself prefer to suppose (with present limited data) that Saturn resembles Jupiter in having two fundamental visual periods of rotation. In this opinion features in low latitudes on Saturn, say between the North Equatorial Belt and the South Equatorial Belt, inclusive, have a period of about 10 hrs., 14 mins. and those in higher latitudes a period of about 10 hrs., 38 to 40 mins. Two narrow transitional zones of latitude presumably exist. Deviations from the two basic periods are probably greater on Saturn than on Jupiter.

ANNOUNCEMENTS

Sustaining Members and Sponsors. As of November 29, 1964 we have in the special classes of membership:

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

Sustaining Members - Grace E. Fox; Sky Publishing Corporation; Joseph Ashbrook; Charles F. Capen; Kenneth J. Delano; Craig L. Johnson; Geoffrey Gaherty,Jr.; Dale P. Cruikshank; Charles L. Ricker; James W. Young; Charles M. Cyrus; Alan McClure; Elmer J. Reese; George E. Wedge; Carl A. Anderson; Richard E. Wend; Gordon D. Hall; Michael McCants; Ernst E. Both.

Sustaining members pay $10 per year; sponsors, $25. The excess over the ordinary rate is used to support the work and activities of the A.L.P.O.

1965 A.L.P.O. Convention. Our meeting next year will be held at the beginning of July as part of the Astronomical League's National Convention at Milwaukee. More details will appear in future issues.

Staff Changes. Mr. José Olivarez has resigned as a Lunar Recorder. We thank him for his aid in this post.

Mr. Richard E. Wend, already the Assistant Mars Recorder, has also been appointed an Assistant Jupiter Recorder. The three present Jupiter Section staff members are working upon the analysis of observational data, other than C.M. transits, over several recent apparitions of the Giant Planet. We apologize to the contributing observers for the long delay in publication.

Appreciation Note from Mr. Meisel. David Meisel, until recently the A.L.P.O. Comets Recorder, has asked us to publish this note: "I would like to thank all those A.L.P.O. members who have supported the Comets Section in the past. I hope that you and other A.L.P.O. members will give Mr. Milon your full cooperation in the future."

Correction to Article about Ranger VII by John E. Westfall in March-April, 1964 Issue. In a letter dated October 5, 1964 Lunar Recorder Westfall has reported some correspondence with NASA about his interpretation of the Ranger VII photographs in his paper "The Ranger VII Photographs: A Preliminary Report." Mr. Westfall's impact-point at 10°37' S, 20°27' W (IAU sense, where Mare Nubium is in the moon's west hemisphere) compares well with JPL's latest known figures on October 5 of 10°41' S, 20°41' W, subject to a 3-sigma error of 3 miles N-S and 0.6 miles E-W. However, the flight-path derived by Mr. Westfall and shown on Figure 18 on pg. 67 of our March-April issue is in reality the locus of center points of the F a camera. The axis of this camera was not normal to the surface of the moon, as was wrongly assumed, but instead was tilted at a substantial angle to the vertical. The spacecraft was actually moving southeast (IAU sense again) and crossed the lunar equator at 42°.2 W. longitude some 46 minutes before impact. This information was kindly supplied by Mr. Michael R. Gill, Ranger Program Scientist with NASA.

John Westfall's article was submitted only two weeks after the Ranger VII impact, and his assumption of normality of the camera axis to the moon's surface would then appear rather plausible.

Passing of E. C. Slipher. We have learned with sorrow of the death of Dr. E. C. Slipher of the Lowell Observatory on August 7, 1964. An appreciative biography appeared on pp. 208-209 of Sky and Telescope for October, 1964. Dr. Slipher's unfailing courtesy and hospitality to visitors to the Lowell Observatory will long be remembered with great affection by many who met him there, including the Editor. His 60 years of planetary research may well constitute a unique achievement. It is singularly fitting that the First A.L.P.O. Convention in 1956 was held at Flagstaff.

CENTRAL MERIDIAN AND TERMINATOR LONGITUDES OF MERCURY IN 1965

By: Geoffrey Gaherty, Jr., A.L.P.O. Mercury Recorder

The eccentricity of Mercury's orbit causes libration effects similar to those of the Moon. The sub-solar point, i.e., the point on the surface of Mercury at which the Sun is overhead, thus varies by 23.7 degrees on either side of its mean position, which is taken to define the zero meridian of longitude. The apparent shifts in the positions of Mercury's surface markings as a result of this libration must be taken into account in analyzing observations of the planet.

The table on pg. 125 gives at five-day intervals the longitude of the central meridian (C.M.) and the longitude of the visible terminator (T.) in terms of the longitude system used in the map by E. M. Antoniadi. It is based on libration tables by M.B.B. Heath (J.B.A.A., 69 , p. 48) and formulae developed by the writer. Note that the central meridian is that of the whole disk, not that of the illuminated portion as in the central

Date	C.M.	T.	Date	C.M.	T.	Date	C.M.	T.	Date	C.M.	T.
	°	°		°	°		°	°		°	°
Jan. 0	-125	-112	Apr.10	167	-111	Jul.19	89	82	Oct.27	50	98
5	-108	-114	15	-170	-105	24	105	89	Nov. 1	63	104
10	-92	-112	20	-149	-101	29	123	96	6	77	109
15	-77	-108	25	-128	-94	Aug. 3	143	102	11	92	113
20	-64	-103	30	-109	-87	8	163	107	16	106	113
25	-51	-97	May 5	-93	-81	13	-176	111	21	125	112
30	-37	-90	10	-77	-75	18	-142	-67	26	145	106
Feb. 4	-24	-83	15	-63	-70	23	-122	-67	Dec. 1	170	97
9	-12	-77	20	-50	-67	28	-102	-71	6	-162	-95
14	0	-72	25	-38	-67	Sept.2	-92	-86	11	-137	-104
19	11	-68	30	-27	-69	7	-72	-90	16	-118	-111
24	19	-66	Jun. 4	-17	-76	12	-60	-101	21	-100	-113
Mar. 1	35	112	9	-7	-85	17	-48	-109	26	-86	-113
6	45	107	14	3	85	22	-37	-113	31	-72	-110
11	56	99	19	13	74	27	-28	-114	36	-57	-104
16	68	88	24	23	68	Oct. 2	-12	69			
21	81	77	29	34	64	7	-1	73			
26	98	70	Jul. 4	47	68	12	11	78			
31	118	67	9	60	71	17	23	84			
Apr. 5	140	67	14	74	76	22	37	92			

meridian tables for Jupiter.

Comments by Editor. We thank Mr. Gaherty for this very conveniently expressed information about Mercury in 1965 and hope that our readers will use his table. In fact, we hope that the table will motivate our members to more regular and more systematic studies of Mercury. Readers will recognize in the table that the central meridian of Mercury is unilluminated when the planet is crescentic. The plus signs in the table denote western Mercurial longitudes, where east and west are defined so that the planet rotates from west to east. At evening (eastern) apparitions the terminator occupies western longitudes; it occupies eastern Mercurial longitudes at morning (western) apparitions.

It may be worthwhile to compare Mr. Gaherty's table with results from Mr. Cruikshank's graph on pg. 73 of our March-April, 1963 issue. For example, the table gives us for January 0, 1965 C.M. = -125° and T = -112°. Mercury is then 14 days past perihelion (on December 17, 1964). Cruikshank's graph gives us a libration of $+22^\circ$ in longitude. The planet is in the morning sky so that eastern longitudes are on the terminator. The positive libration exposes the east limb (see Mr. Cruikshank's paper) and gives $T = -90^\circ - 22^\circ = -112^\circ$. The value of the phase-angle i on January 0, 1965 can be found to be 103° so that the C.M. lies 13° toward the dark limb from the terminator. (The reader may find it helpful to draw a rough sketch to verify this assertion.) Finally, C.M. = $-112^\circ - 13^\circ = -125^\circ$.

OBSERVATIONS AND COMMENTS

An Excellent Lunar Photograph. Mr. Philip R. Glaser has called to our attention the outstanding amateur lunar photograph here published as Figure 30. The photographers are Thomas Osypowski, 8808 W. Lincoln Ave., West Allis, Wisc. and Thomas Pope, 3824 N. 20th St., Milwaukee, Wisc. Mr. Elmer J. Reese has pointed out that the detail on the print contributed by Mr. Glaser compares favorably with Plate I c facing page 58 in The Moon by Wilkins and Moore, a Pic-du-Midi photograph. Of course, some detail on Figure 30 has necessarily been lost in the process of reproduction.

FIGURE 30. Photograph of Triesnecker, Hyginus Cleft, and vicinity on the moon. Taken with Milwaukee Astronomical Society 12.5-inch F: 9 reflector at New Berlin, Wisc. on August 29, 1964 at $10^h\ 20^m$, U.T. Original Kodachrome color transparency by Tom Osypowski. Exposure ½ sec. at F: 64. Black and white print here published a 14X enlargement of original by Tom Pope. Colongitude 170.3. See also text.

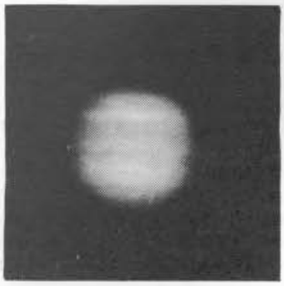


FIGURE 31. Photograph of Jupiter by Dennis Milon with a 4-inch refractor at F: 262 on October 30, 1964 at $7^h\ 36^m$, U.T. C.M.$_1$ = 228°. C.M.$_2$ = 300°.1

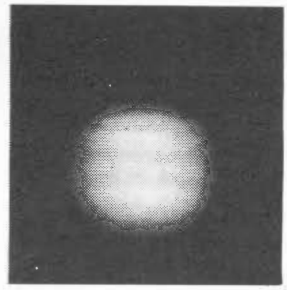


FIGURE 32. Photograph of Jupiter by Dennis Milon with a 4-inch refractor at F: 262 on October 23, 1964 at $8^h\ 17^m$, U.T. C.M.$_1$ = 226°. C.M.$_2$ = 352°.1 1 sec. exposure. Tri-X film developed in DK60a. Note Red Spot and Hallow.

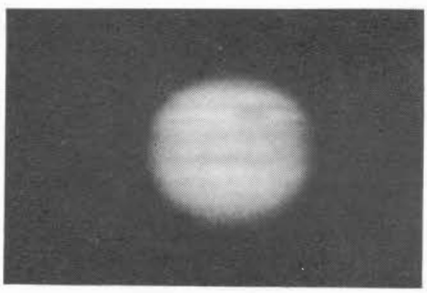


FIGURE 33 (left). Photograph of Jupiter by J. Russell Smith with a 16-inch reflector at F: 150 on November 27, 1964 at $2^h\ 21^m$, U.T. C.M.$_1$ = 140°. C.M.$_2$ = 1°. 1 sec. exposure, developed for 8 minutes in DK60a. Note Red Spot, Hollow, and North Temperate Belt.

Writing on October 28, 1964, Mr. Osypowski further reports that the smallest craters shown on the original photograph were slightly less than one second of arc in diameter. The seeing was 8 on a scale of 0 to 10, with 10 best. A vast amount of minute detail was seen visually that escaped the camera. The sky was fairly bright at the time, the photograph being made about 40 minutes before sunrise. Mr. Osypowski notes: "The original Kodachrome - X transparency was made with a Pentax single-lens-reflex camera. An adapter tube which slid into the focusing mount of the telescope accommodated the 16-mm. projection eyepiece at one end and the lens-less camera at the other. A black card flicked across a slot in this adapter tube served as a convenient, vibrationless shutter".

Lunar and Planetary Photographs with a 4-Inch Refractor. The front cover photograph by Dennis Milon should also encourage the lunar photographers among our members. Mr. Milon writes that the smallest craters resolved on it are about 2 miles in diameter. He used Tri-X roll film and developed for 9 minutes in DK60a.

The Jupiter photographs by Mr. Milon on this page must be regarded as extremely good for an aperture of 4-inches. Again, some loss of the finer detail in publication cannot be avoided.

Figure 33, a photograph kindly contributed by Mr. J. Russell Smith, will further show much of the current aspect of Jupiter.

Very Swift North Temperate Belt South Current on Jupiter. We have learned with great interest from Bradford A. Smith and Elmer J. Reese of the Research Center of New Mexico State University of the present activity of this Jovian current at the south edge of the North Temperate Belt. The current is so far manifested by a single dark spot on the belt and an associated dusky column across the North Tropical Zone. These objects have been moderately difficult to see in July-November, 1964 even with an aperture of 16 inches. Nevertheless, A.L.P.O. members should watch carefully for them; for they may be growing more conspicuous, and other related features may naturally appear at the same latitude. Conjunctions of the dark column with normally moving features in the NTrZ should be observed critically for evidences of differences in level of the different Jovian currents. The spot is much more conspicuous on Research Center photographs in blue and ultra-violet light than in longer wavelengths.

The longitude of the NTB_s spot (and of the north base of the NTrZ column) can be extrapolated from an extremely linear past drift to be:

$L = 18^{\circ}.5 - 9^{\circ}.36\ (T - \text{Nov. } 6.44,\ 1964)$ in System I, or

$L = 0^{\circ}.1 - 1^{\circ}.73\ (T - \text{Nov. } 6.44,\ 1964)$ in System II.

Here T is the time measured in days. If present drifts are preserved, the column will be in conjunction with two ovals in the NTrZ in the *approximate* longitude of the Red Spot on December 19 and 21, 1964 respectively. At present (December 2) both components of the NTB are growing more visible on Research Center red light photographs, i.e., becoming less deficient in blue light. The spot here discussed lies in the south component of the belt and incidentally has varied appreciably in darkness in blue light. The drifts assumed in the two formulas above correspond to a period of 9 hrs., 49 mins., 20 secs.

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