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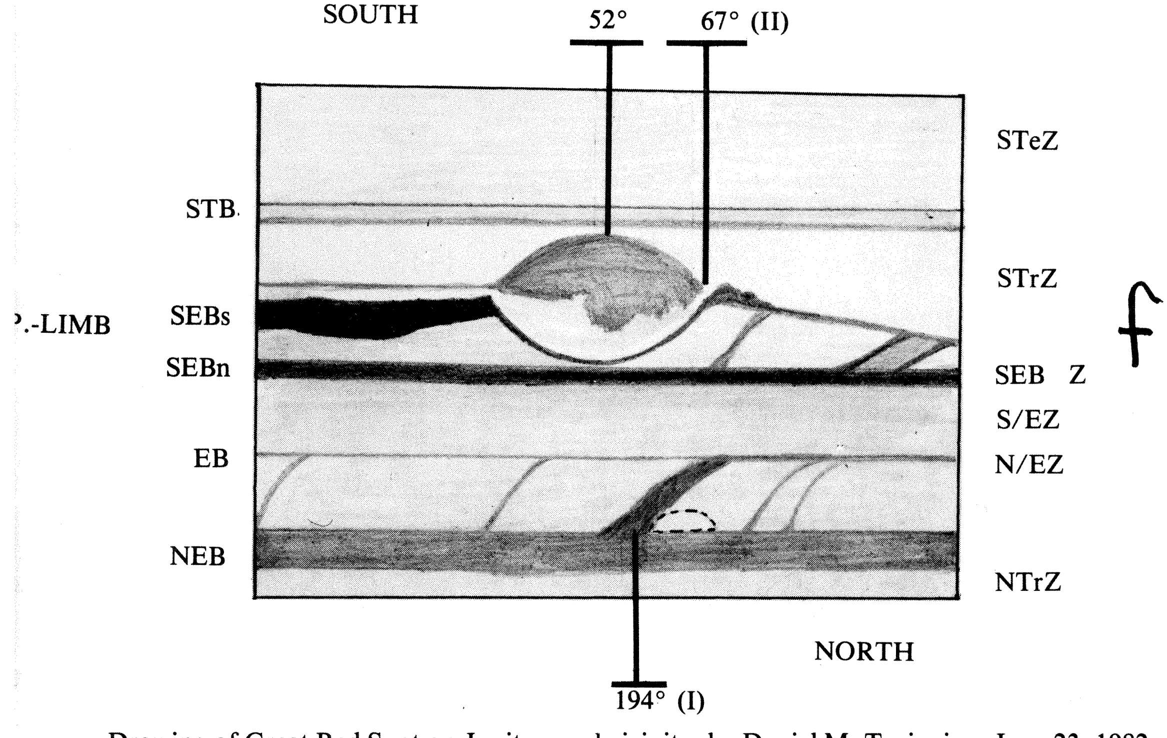

Drawing of Great Red Spot on Jupiter, and vicinity, by Daniel M. Troiani on June 23, 1982, 2 hrs., 40 mins. - 3 hrs., 1 min., Universal Time. 10-inch Newtonian reflector, 374-223X. Seeing poor, sky clear. Simply inverted view with south at the top. Observed longitudes of selected features are marked.

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ASSOCIATION OF LUNAR & PLANETARY OBSERVERS
ALPO
Founded In 1947

IN THIS ISSUE

JUPITER IN 1980-81: ROTATION PERIODS

By: Phillip W. Budine, A.L.P.O. Jupiter Recorder

The highlights of the 1980-81 apparition were: the continuing observation of a South Tropical Zone Disturbance and the fading of the Red Spot area. Some data pertinent to the apparition follow:

Date of Opposition: March 26, 1981
Solar Declination of Jupiter: -2°98
Equatorial Diameter: 44"23
Zenocentric Declination of Earth: -3°19
Stellar Magnitude of Jupiter: -2.2
(All data above for the date of opposition).

This report is based on 1927 visual central meridian transit observations submitted by 14 observers of the A.L.P.O. When plotted on graph paper, 1212 transits form usable drifts for 86 Jovian spots distributed in 9 different atmospheric currents. The contributing observers are listed below by name and number of transits (t) submitted along with the station of observation and telescope(s) employed:

Bagger, Claus. Birkerod, Denmark. 20-cm Refl., 6.4-cm & 7.5-cm Refrs. 298t.
Barnett, John H. Richmond, Va. 15-cm & 17.8-cm Refrs. 48t.
Boing, Jochen. Berlin, W. Germany. 20-cm Refl.45t.
Budine, Phillip W. Walton, N.Y. 10-cm Refr. 240t.
Forgensen, Bjorn L. Birkerod, Denmark. 20-cm Refl. 1t.
McNamara, Geoff. Allawah, Australia. 20-cm Refl. 28t.
Parker, Dr. Donald C. Coral Gables, Fl. 32-cm Refl. Photos.
Phillips, Dr. James H. Mt. Pleasant, S.C. 17.8-cm Cat. s.s. & 30t.
Robotham, Rob. Pt. Rowan, Ontario, Canada. 20-cm Cat., 8.3-cm Refr., and 15-cm Refl. s.s. & 316t.
Sherrod, Clay.* N. Little Rock, Ark. 36-cm Refl. s.s. & 663t.
Sorensen, Ebbe. Birkerod, Denmark. 25-cm Refl. 1t.
Sorgenfreu, Ulrik. Birkerod, Denmark. 8.3-cm Refr. 2t.
Stelzer, Harold J. River Forest, Il. 35-cm Refl. 65t.
Tatum, Randy. Richmond, Va. 15-cm Refl. 89t.
Troiani, Daniel M. Chicago, Il. 25-cm Refl. s.s. & 92t.

Refr. is refractor, Refl. is reflector, Cat. is catadioptric, and s.s. is strip sketches.

*The Clay Sherrod group consists of: John Carrington, David Schall, Eric Schultz, Dale Seidenschwarz, James Sullivan, and Clay.

The distribution of transit observations by months is as follows:

1980, November	12	1981, February	70	1981, May	505
December	10	March	241	June	314
1981, January	35	April	663	July	77

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 date of observations; the fourth column, the longitudes on those dates. The fifth column gives the longitude at opposition, March 26, 1981, whenever the feature existed at that time. The sixth column gives the number of observed transits. 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 indicates the standard deviation of this drift. The ninth column shows the corresponding rotation period in hours, minutes, and seconds.

Figure 1 gives the standard nomenclature of the belts and zones of Jupiter as used in this report.

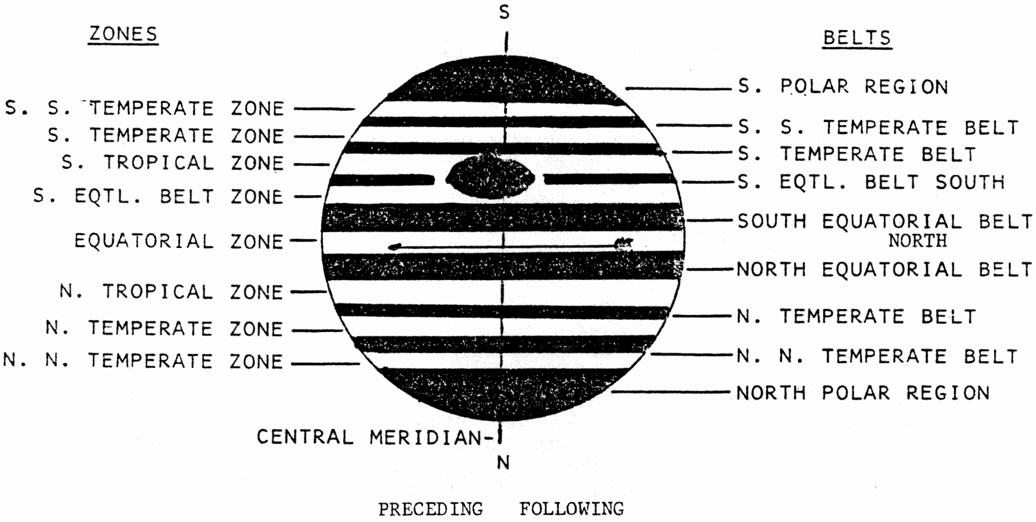

Figure 1. Diagram showing standard nomenclature of the belts and zones of Jupiter. Contributed by Phillip W. Budine but long used by the Jupiter Section of the British Astronomical Association and others. Simply inverted view with south at the top. The arrow shows the direction of the planet's rotation. The Great Red Spot is shown, in the South Tropical Zone, crossing the central meridian.

South South Temperate Current (S. edge SSTB, SSTeZ), System II

No.	Mark	Limiting Dates	Limiting L.	L.	Transits	Drift	±SD	Period
1	Dp	Mar. 22-May 14	175°-131°	172°	7	-24°4	0°2	9:55:07

No. 1 above was the preceding end of the dark section of the SSTB. From this end was a dark festoon running diagonally across the STrZ and connecting to the south edge of the SEB$_{S}$. This feature was recorded by Dr. Parker on photographs he took on April 1 and 6, 1981. Also, the marking was recorded on a disc sketch by Dr. Phillips on April 8, 1981.

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

No.	Mark	Limiting Dates	Limiting L.	L.	Transits	Drift	±SD	Period
D	Wp	Feb.28-Jul.14	112°- 50°	100°	32	-13°5	0°1	9:55:22
1	Wc	Feb.28-Jul.14	118°- 57°	106°	61	-13°3	0°1	9:55:22
E	Wf	Feb.28-Jul.14	124°- 65°	112°	23	-13°3	0°1	9:55:22
2	Wc	Feb.15-May 15	204°- 125°	166°	11	-26°3	0°1	9:55:05
3	Wc	Mar.15-May 16	201°- 140°	187°	7	-29°0	0°1	9:55:01
4	Df	Apr. 7-Jun.26	236°- 204°	-	17	-11°9	0°5	9:55:24
FA	Wc	Dec.21-Jul.14	326°- 206°	267°	21	-17°6	0°2	9:55:17
B	Wp	Mar.14-Jul. 3	355°- 307°	348°	11	-13°0	0°2	9:55:23
5	Wc	Mar.14-Jul. 3	1°- 313°	354°	32	-13°0	0°7	9:55:23
C	Wf	Mar.14-Jul. 3	7°- 319°	360°	12	-13°0	0°3	9:55:23
					Mean Rotation Period:			9:55:22
					Nos. 2-3:			9:55:03

The three long-enduring white ovals of the STeZ Current continued to be observed by A.L.P.O. Jupiter Section members. Their order of conspicuousness was the same as in the 1979-80 apparition, namely: DE, BC, and FA. The length in longitude of the ovals was: BC- 12°, DE-12°, and FA- 10°. Oval BC was in conjunction with the center of the Red Spot on November 14, 1980 near 56° (II), and DE was in conjunction with the center of the Red Spot on July 24, 1981 at a longitude of 50° (II).

Great Red Spot (STrZ), System II

Mark	Limiting Dates	Limiting L.	L.	Transits	Drift	±SD	Period
RSp	Jan.26-Jul.28	43°- 40°	40°	42	-0°49	0°07	9:55:40
RSc	Jan.26-Jul.28	56°- 49°	50°	65	-1°15	0°11	9:55:39
RSf	Jan.26-Jul.28	68°- 58°	60°	40	-1°64	0°26	9:55:38
				Mean Rotation Period:			9:55:39

The Red Spot had a mean length during the apparition of 17°. Early in the apparition it was only 15° in length, but by the end of the apparition it was 18° in longitudinal measurement. Its greatest length was near opposition when it was 20° long. The Hollow aspect was the most prominent and was sometimes of greater longitudinal length than stated above. The RS was most prominent in the southern portion of the RSH. During early April the Red Spot was often seen attached to the north edge of the STB.

South Tropical Zone Disturbance, (STrZ), System II

No.	Mark	Limiting Dates	Limiting L.	L.	Transits	Drift	±SD	Period
1	Wc	Mar.17-Apr.28	199°- 181°	196°	12	-12°.9	0°.7	9:55:23
2	Wc	Feb.15-Jun. 9	229°- 186°	215°	14	-11°.3	0°.3	9:55:25
3	Dp	Feb.15-Jun.27	235°- 189°	218°	18	-10°.5	0°.4	9:55:26
4	Dc	Feb.15-Jun.13	240°- 195°	225°	14	-11°.5	0°.3	9:55:25
5	Df	Feb.15-Jul.15	245°- 187°	232°	20	-11°.6	0°.3	9:55:25
6	Wc	Jan.31-Jun.30	286°- 270°	280°	20	- 3°.2	0°.8	9:55:36
7	Dp	Feb.12-May 8	287°- 280°	283°	17	- 2°.5	0°.4	9:55:37
8	Dc	Jan.31-Jul. 8	300°- 289°	293°	28	- 2°.1	0°.4	9:55:38
9	Df	Dec.21-Jul. 8	311°- 293°	303°	27	- 3°.2	0°.7	9:55:36
					Mean Rotation Period:			9:55:30

The South Tropical Zone Disturbance which had first developed during the 1978-79 apparition continued to be observed for the third consecutive apparition of Jupiter. Late in the 1979-80 apparition the Disturbance was last observed on June 12, 1980. Extrapolation of the drift curve indicates that the Disturbance (preceding end) was in conjunction with the Red Spot (following end) on October 26, 1980 and probably crossed the Red Spot area in a period of only 5.3 days. The 1901-40 South Tropical Zone Disturbance transited the Red Spot in periods ranging from very short to 3 days and up to 14 days, and even 6 weeks for one conjunction.

Late in the 1979-80 apparition the Disturbance had a length of 196°. During the six months prior to its conjunction with the Red Spot, and while Jupiter was near conjunction with the Sun, the Disturbance decreased considerably in length and also in prominence. Possibly some of its material was lost when crossing the Red Spot area. In any case, after conjunction, and when next observed in December, 1980, its length was only 70°. Its prominent following end was observed by Rob Robotham of Canada on December 21, 1980 at 300° (II). Both ends of the Disturbance were fairly prominent features during the 1980-81 apparition. The preceding end was prominent with a bright oval preceding it on February 15, 1981 at 240° (II), according to Budine. Good views of the STrZ Disturbance were obtained by Robotham, Sherrod, Troiani, Budine, Bagger, Barnett, Phillips, and Tatum.

During conjunction with the Red Spot the Disturbance probably had a period near 9:55:37, and the Red Spot then had a period close to 9:55:38. However, since no direct observational evidence was obtained at the time of conjunction, the above statement is based solely on extrapolation; and the period of the Disturbance at the time of conjunction could have been as short as 9:55:16. Evidence does indicate, however, that the period of the South Tropical Zone Disturbance was lengthened after its conjunction with the Red Spot, as similar results happened after the conjunctions of the 1901-40 STrZ Disturbance with the Red Spot. The period increased for the p-end from 9:55:23 to 9:55:26 and for the f-end from 9:55:34 to 9:55:38. The STrZ Disturbance was last observed on July 15, 1981 and had then increased its length to 105° in longitude. Its remnants (preceding and following ends) continue to be observed well in mid-1982!

In the tables above Nos. 1 and 2 are bright ovals preceding the dark preceding end of the STrZ Disturbance. Nos. 3-5 and Nos. 7-9 are the dark preceding and following ends of the Disturbance respectively. No. 6 is a bright oval within the confines of the Disturbance.

Activity in the SEB started in late February when Sherrod observed bright ovals in the SEB Z near 126° - 131° (II) on February 26, 1981. These features had linear drift lines, however; and more of the same type of features were observed on April 11 by Bagger.

* * * * * * * *

Note by Editor. Readers are invited to help the A.L.P.O. Jupiter Section by making central meridian transit observations of Jovian surface features. One simply times, usually to the nearest minute, when a marking is midway between the east and west limbs as the planet's rotation carries it accross the disc. Detailed instructions can be obtained from Jupiter Recorder Phillip Budine at his address on the back inside cover. The method requires no equipment beyond a telescope and a watch giving the correct time.

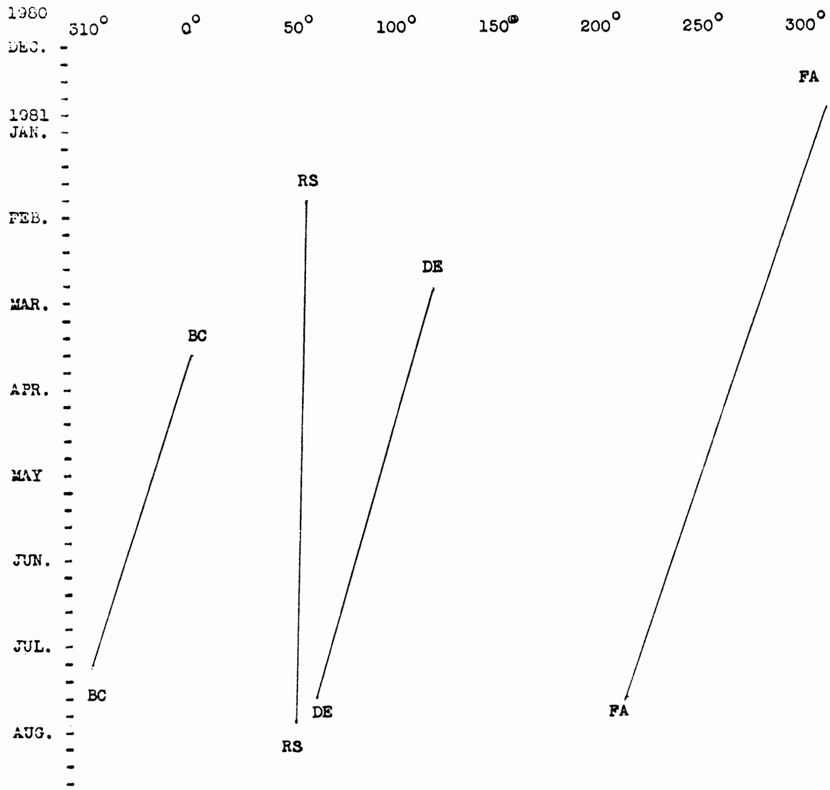

Figure 2. Drift-chart, longitude vs date, of important features on Jupiter in System II during the 1980-81 apparition. Prepared and contributed by Phillip W. Budine. See also text.

South edge SEB_s, $STrZ_n$, System II

No.	Mark	Limiting Dates	Limiting L.	L.	Transits	Drift	±SD	Period
1	Dc	May 5-May 24	125°- 175°	-	4	+71°.4	0°.1	9:57:19
2	Dc	May 24-Jun. 3	157°- 179°	-	3	+55°.0	0°.2	9:56:56
3	Dc	Apr.19-Apr.28	236°- 265°	-	4	+96°.7	0°.2	9:57:54
4	Dc	May 20-May 28	238°- 266°	-	3	+93°.3	0°.1	9:57:49
5	Dc	Jun.13-Jun.30	227°- 267°	-	4	+66°.7	0°.1	9:57:12

Mean Rotation Period: 9:57:34
(Without No. 2)

In the table above Nos. 1-5 are dark spots moving along the south edge of the SEB.

South Equatorial Belt Current, (S. edge SEB_n, SEB Z), System II

No.	Mark	Limiting Dates	Limiting L.	L.	Transits	Drift	±SD	Period
1	Wc	Feb.26-Mar.25	126°- 123°	-	4	-3°.3	0°.8	9:55:36
2	Wc	Feb.26-Apr.12	132°- 130°	131°	12	-1°.3	0°.2	9:55:39

Mean Rotation Period: 9:55:38

Nos. 1 and 2 above are SEB Z ovals, first seen by Clay Sherrod and later by Bagger, which have near linear drifts.

South Equatorial Current (EZ_s), System I

No.	Mark	Limiting Dates	Limiting L.	L.	Transits	Drift	±SD	Period
1	Wc	Feb.28-Mar.30	19°- 38°	36°	6	+19°.0	0°.3	9:50:56
2	Wc	Mar.13-May 26	15°- 86°	31°	38	+28°.4	0°.5	9:51:08
3	Wc	Apr.11-May 21	14°- 7°	-	11	- 5°.0	0°.6	9:50:23
4	Wc	Mar.17-May 1	311°- 312°	311°	17	+ 0°.7	0°.1	9:50:31

Mean Rotation Period:
(Nos. 1, 3-4): 9:50:37
(No. 2): 9:51:08

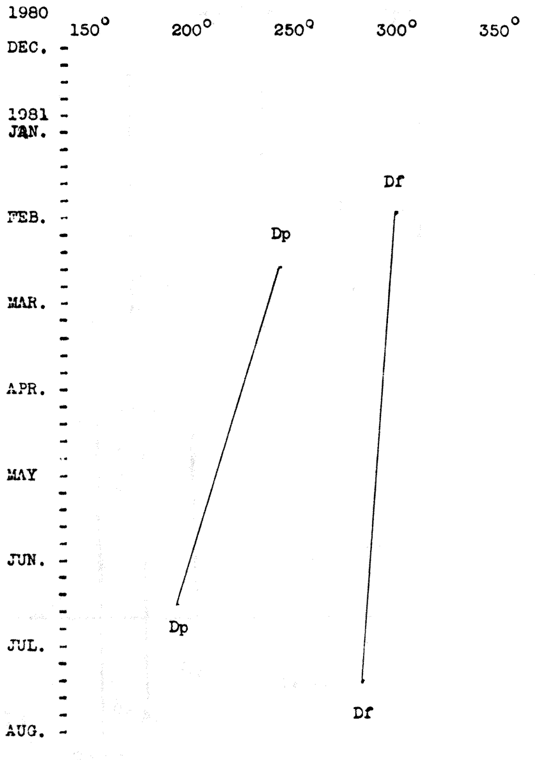

Figure 3. Drift-chart, longitude (II) vs date, for terminal ends of the South Tropical Zone Disturbance of Jupiter in 1980-81. Prepared and contributed by Phillip W. Budine. See also text.

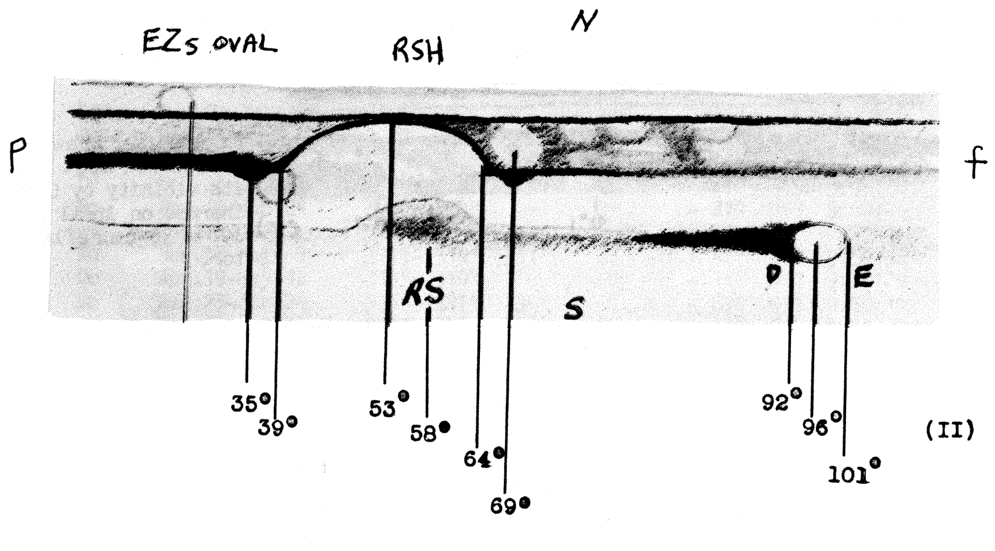

Figure 4. Drawing of the Red Spot Area and vicinity by Dr. James H. Phillips on April 7, 1981. 17.8-cm. Catadioptric, 159X. Seeing 7 (on a scale of 0 to 10, with 10 best). Transparency 3 (estimated limiting stellar magnitude). Observed longitudes of different features are marked. Note that north is at the top in this drawing.

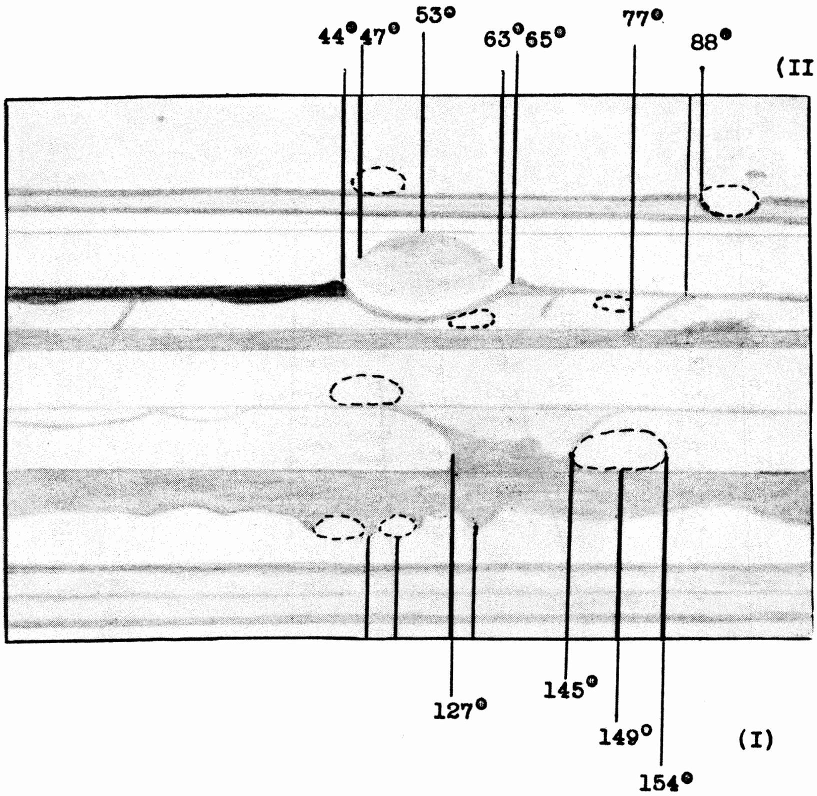

Figure 5. Drawing of the Red Spot Area and its vicinity by Daniel M. Troiani on April 15, 1981. 25-cm. reflector, 283x, 374x. Seeing 9, Transparency 4.5. South at top on Figures 5-11.

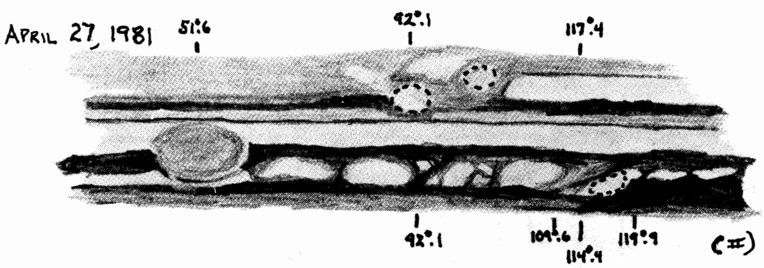

Figure 6. Drawing of the Red Spot and its vicinity by Clay Sherrod on April 27, 1981. 36-cm.reflector.

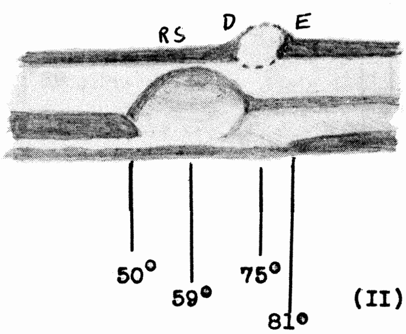

Figure 7. Drawing of the Red Spot Area and its vicinity by Rob Robotham on June 19, 1981. 20-cm. reflector, 200x. Seeing 5-7, transparency 4-5.

Nos. 1 and 3-4 are bright ovals moving in the South Equatorial Current A. No. 2 is rotating in the South Equatorial Current B. This object passed several features in the North Equatorial Current to the north as the feature moved in the direction of increasing (+) longitude. No. 2 has been observed now for three consecutive apparitions and continues to be a long-lived feature of the South Equatorial Current.

North Equatorial Current (S. Edge NEB, Ez_n), System I

No.	Mark	Limiting Dates	Limiting L.	L.	Transits	Drift	±SD	Period
1	Dc	Feb.28-Jul. 8	5°- 344°	6°	42	- 4°8	0°5	9:50:24
2	Wc	Mar.31-Jun.22	25°- 32°	-	25	+ 2°5	0°3	9:50:33
3	Dc	Apr.10-Apr.30	29°- 25°	-	11	- 5°7	0°4	9:50:22
4	Dc	Apr. 6-Jun.15	30°- 26°	-	16	- 1°7	0°3	9:50:28
5	Dc	May 12-Jun.11	55°- 45°	-	7	-10°0	0°1	9:50:17
6	Dc	May 26-Jul. 6	62°- 57°	-	6	- 3°6	0°8	9:50:25
7	Wc	May 4-Jul. 4	65°- 65°	-	8	0°0	0°0	9:50:30
8	Dc	Mar.25-May 7	69°- 70°	70°	9	+ 0°7	0°1	9:50:31
9	Dc	Feb.16-May 19	69°- 83°	76°	16	+ 4°5	0°9	9:50:36
10	Dc	Mar.16-May 16	102°- 87°	96°	12	- 7°5	0°8	9:50:20
11	Dc	Apr.19-May 26	101°- 91°	-	10	- 8°3	0°1	9:50:19
12	Dc	Apr.15-Jun.18	122°- 102°	-	13	- 9°5	0°7	9:50:17
13	Dc	Dec.20-Jul.17	140°- 108°	137°	32	- 4°6	0°2	9:50:24
14	Dc	May 15-Jul.16	126°- 121°	-	10	- 2°4	0°5	9:50:27
15	Wc	Jan.31-Jun. 7	147°- 140°	146°	12	- 1°6	0°6	9:50:28
16	Wc	Jan.31-Apr.17	159°- 146°	158°	13	- 5°0	0°2	9:50:23
17	Wf	Jan.31-Apr.15	169°- 154°	165°	8	- 6°3	0°5	9:50:22
18	Dc	Apr.11-Jun.18	169°- 150°	-	9	- 8°3	0°1	9:50:19
19	Dc	Jan.10-Jun.30	191°- 169°	183°	19	- 3°9	0°3	9:50:25
20	Dc	Jan.10-Feb.15	215°- 208°	-	6	- 5°8	0°2	9:50:22
21	Dc	Nov.26-Jul.14	231°- 220°	230°	26	- 1°4	0°7	9:50:28
22	Wp	Apr. 2-Apr.27	235°- 236°	-	4	+ 1°1	0°9	9:50:31
23	Wc	Apr. 2-Apr.27	240°- 240°	-	6	0°0	0°0	9:50:30
24	Wf	Apr. 2-Apr.27	245°- 245°	-	4	0°0	0°0	9:50:30
25	Dc	Dec.21-Jul.14	274°- 241°	260°	22	- 4°9	0°2	9:50:23
26	Dc	Apr.27-Jul.14	270°- 262°	-	14	- 3°1	0°3	9:50:26
27	Dc	Mar.24-Jun. 3	272°- 276°	273°	10	+ 1°7	0°6	9:50:32
28	Wc	Mar.31-Jun.24	277°- 281°	-	18	+ 1°4	0°7	9:50:32
29	Dc	Feb.28-Jun. 8	302°- 298°	301°	16	- 1°2	0°3	9:50:28
30	Dc	Apr.14-Jun.24	305°- 298°	-	21	- 2°9	0°3	9:50:26
31	Wc	Mar.18-May 7	311°- 319°	311°	20	+ 4°7	0°2	9:50:36
32	Dc	Apr.19-May 18	311°- 310°	-	8	- 1°0	0°1	9:50:29
33	Dc	Mar.25-Apr.24	335°- 327°	334°	6	- 8°0	0°1	9:50:19
34	Dc	Feb.28-May 19	345°- 332°	338°	17	- 4°8	0°2	9:50:24
35	Dc	Apr.17-Jul. 8	340°- 326°	-	20	- 4°8	0°2	9:50:24
36	Wc	Apr.21-Jun.24	341°- 340°	-	14	- 0°5	0°5	9:50:29
				Mean Rotation Period:				9:50:27
				(Nos. 5,11,12,18, & 33):				9:50:18

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

No.	Mark	Limiting Dates	Limiting L.	L.	Transits	Drift	±SD	Period
1	Wc	Apr. 7-May 26	35°- 41°	-	6	+ 3°8	0°6	9:55:46
2	Dc	Mar. 2-Jun.17	55°- 65°	58°	12	+ 2°8	0°4	9:55:44
3	Dc	Mar.23-May 15	168°- 115°	165°	8	-29°4	0°0	9:55:00
4	Wc	Apr. 9-Apr.24	209° 202°	-	4	-14°0	0°1	9:55:21
5	Dc	Apr.22-May30	292°- 277°	-	6	-11°5	0°1	9:55:25
6	Dc	Jan.24-Apr.20	317°- 312°	315°	9	- 1°7	0°6	9:55:38
				Mean Rotation Period:				
				(Nos. 1-2, 4-6):				9:55:35
				(No. 3):				9:55:00

Nos. 1-2 and 4-6 were moving in the North Tropical Current A. No. 3 was rotating in the faster current, the North Tropical Current B.

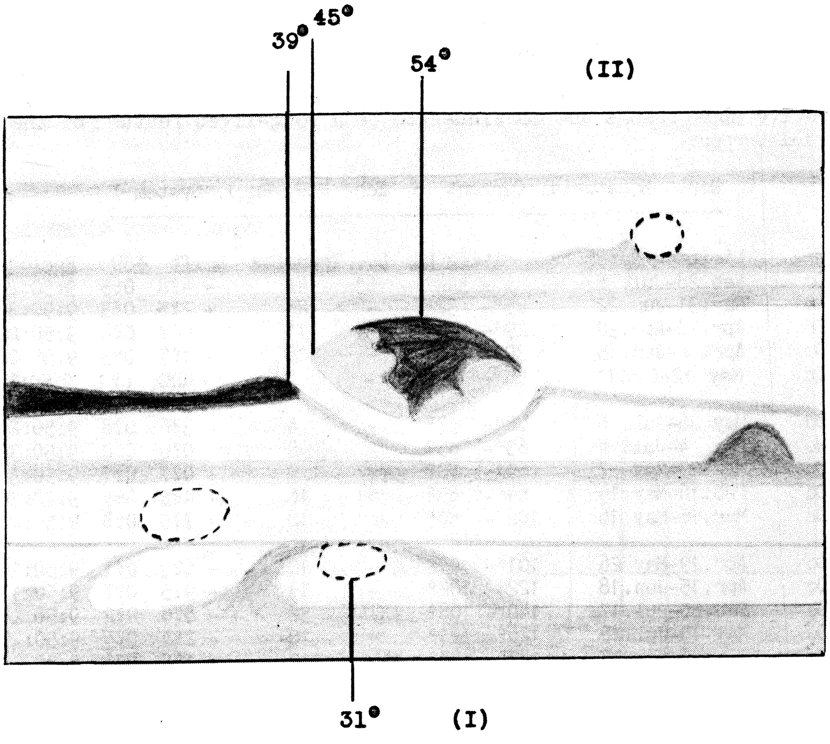

Figure 8. Drawing of the Red Spot Area and its vicinity by Daniel M. Troiani on May 21, 1981. 25-cm. reflector, 283X and 374X. Seeing 8, transparency 4.

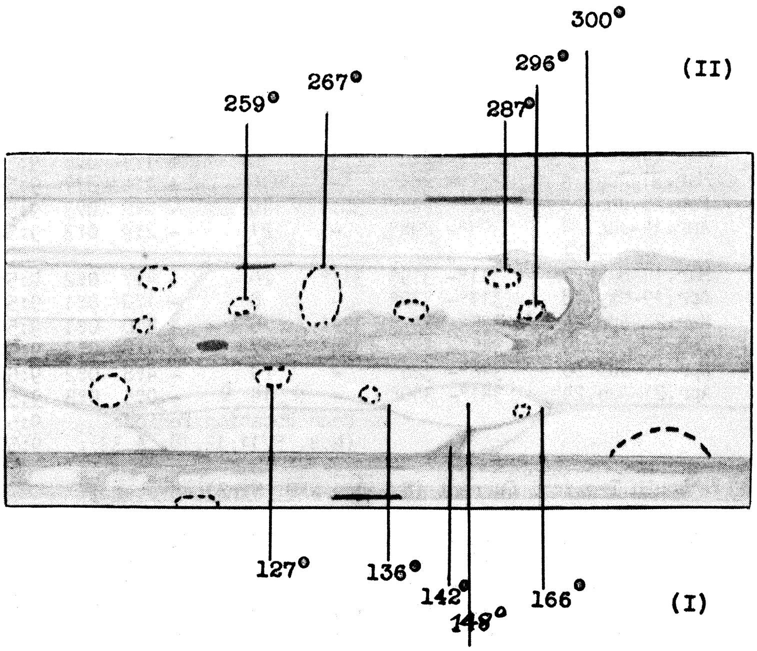

Figure 9. Drawing of the South Tropical Zone Disturbance and its following end by Daniel M. Troiani on January 31, 1981. 25-cm. reflector, 283X and 374X. Seeing 9.5, transparency 5.

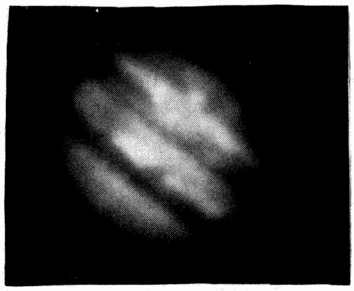

Figure 10. Photograph of Jupiter by Dr. Donald C. Parker on July 11, 1981 at 0 hrs., 51 mins., U.T. 32-cm. reflector. 3.5 seconds exposure, f/110, TP 2415 film. CM(I)=76°. CM(II)=63°. Note the Red Spot Area and South Temperate Zone Oval DE. Compare to Figure 7 on June 19, 1981; and note the motion of oval DE relative to the Red Spot in 22 days. Seeing 4-6, transparency 4.

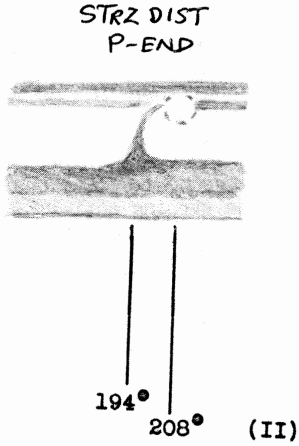

Figure 11. Drawing of the preceding end of the South Tropical Zone Disturbance by Rob Robotham on July 14, 1981. 20-cm. catadioptric, 200X. Seeing 4-7, transparency 3-2.

The A.L.P.O. AT ALCON '82

By: Julius L. Benton, Jr., A.L.P.O. Saturn and Venus Recorder

The 1982 National Convention of the Astronomical League, known as ALCON '82, was held at the Continental Regency Hotel in Peoria, Illinois from Wednesday, July 21 through Saturday, July 24. About 260 members of the Astronomical League attended, representing nearly all of the League's regions. The A.L.P.O., which was invited to participate by the League in ALCON '82, was represented by about 28 members. The host Society for ALCON '82 was the Peoria Astronomical Society, Inc.; and a special commendation is due the Convention Committee of the Society for an excellent and thorough job of preparation and execution. ALCON '82 also was the site of joint meetings of the International Amateur-Professional Photoelectric Photometry group (I.A.P.P.P.), the International Occultation Timing Association (I.O.T.A.), and the National Deep Sky Observers Society (N.D.S.O.S.). All of us who were fortunate to attend this year's gathering will remember throughout the coming months the renewed friendships, the new acquaintances made, and the many enjoyable experiences too numerous to outline here.

Most of Wednesday, July 21st, was occupied with registration, setting up of group and commercial exhibits, and the Council meeting of the Astronomical League. On the next day, Thursday, July 22, opening remarks by the ALCON '82 Convention Chairman, Ms. Georgia Sutherland, were followed by brief commentaries by heads of the various groups in attendance. Thursday's guest speaker, Dr. Michael M. Davis, a radio astronomer in charge of the 1000-foot radio telescope at Arecibo, Puerto Rico, spoke on the "Large Scale Structure of the Universe." Following Dr. Davis' very informative and thought-provoking talk, Paper Session I convened with Dr. Douglas Hall's "Sunspots and Starspots." After lunch, due to the absence of scheduled guest speaker Dr. Elaine Hendry (due to illness), the A.L.P.O. lunar and planetary paper session (Paper Session II) commenced, presided over by Mr. Walter H. Haas, Director of the A.L.P.O. Lunar Recorder Winifred S. Cameron spoke on "Comparative Methods and Results of Brightness Measurements for LTP Features," in which she enlightened us all on some of the photometric data which have been accumulated in recent years on selected LTP areas. In the absence of Mars Recorders Charles F. Capen, Jeff Beish, and Donald Parker, John Westfall read their paper dealing with Martian atmospheric and surface phenomena in 1981-82. Eric Clifton, President of the Peoria Astronomical Society, told us about the history and development of the Decker-Grebner-Van Zandt Observatory, owned by the Society. A.L.P.O. Director Walter H. Haas presented some speculative remarks as to whether or not the Galilean satellites of Jupiter can be seen without optical aid, elaborating a little on some of the optimum observational circumstances. Lunar Recorder and Associate A.L.P.O. Director John E. Westfall described the A.L.P.O. program of timing mutual phenomena of Jupiter's satellites, followed by the writer's paper entitled "Observations of the Planet Saturn: Projects for the '80s." Finally, mention was made by Walter H. Haas of Phil Budine's paper on long-enduring ovals in the South Temperate Zone (STeZ) of Jupiter. At the close of the A.L.P.O. Paper Session delegates moved on to business meetings of the A.L.P.O. and N.D.S.O.S., or prepared for the evening activities.

On each evening bus transportation was available to Jubilee Observatory, where numerous telescopes were set up for viewing along with the permanent instruments at the site. Unfortunately for A.L.P.O. members, the planets Jupiter, Saturn, and Mars were poorly placed for extended observation, even though the weather cooperated on two of the three nights that Jubilee was open. Also, on Thursday evening, workshops on computers and on extraterrestrial intelligence were held, chaired respectively by Dr. Michael M. Davis and Dr. J. Allen Hynek.

On Friday, July 23rd, morning activities began with the annual group photography session in front of the Continental Regency Hotel; and following the Astronomical League meeting that same morning, Paper Session III convened, including interesting topics in galactic astronomy. After lunch, guest speaker Dr. J. Allen Hynek, formerly head of Northwestern University's Department of Astronomy and now Director of the Corralitos Observatory near Las Cruces, New Mexico, spoke on the topic "The Dawn and Tomorrow of Corralitos Observatory." Many of us were interested to learn that worthy projects by diligent amateur astronomers can be carried out at Corralitos Observatory by making application to Dr. Hynek.

Paper Session IV, dealing heavily with photoelectric photometry, was cut short by the exciting and most enjoyable trip to the Wildlife Prairie Park, including the Chuck Wagon Dinner, a culinary delight few of us will forget. Observing followed the outing well into the night as on the previous evening at Jubilee.

Saturday, July 24th, was the official final day of the Convention; but it was full of activities, the first being an interesting presentation by noted author Philip José Farmer entitled "Science Fiction and Astronomy." Paper Session V followed, with diverse topics ranging from Hydrogen Alpha studies of the Sun to a "Trans-Stellar Space Flight" movie.

The afternoon of July 24th was essentially devoted to Workshop Sessions as follows: Telescope Making, headed by Robert E. Cox; the A.L.P.O. Workshop, headed by John E. Westfall; the I.A.P.P.P. Workshop, chaired by Orville H. Brettman; Cosmology Workshop, headed by Dr. Michael Davis; and the A.A.V.S.O. Workshop. The A.L.P.O. Workshop was attended by some 75 or so persons to hear discussions by A.L.P.O. staff members on various phases of lunar and planetary studies.

The Saturday evening program included the Banquet, at which Convention Awards were presented to a number of deserving individuals. The Leslie C. Peltier Award was presented to A.L.P.O. Director Walter H. Haas in recognition of his myriad contributions to lunar and planetary astronomy and observing. Certainly his best known contribution has been the founding of the A.L.P.O. with a handful of colleagues in 1947. The National Astronomical League Award went to Dr. Clyde W. Tombaugh, discoverer of the planet Pluto. He was recognized for paving the way for many of us in amateur astronomy toward professional careers, toward successful observing programs, and for his congenial relationship with amateur astronomers throughout the nation in encouragement and example. Dr. Tombaugh's presentation as the banquet speaker was entitled "History and Discovery of Pluto." His talk was truly a highlight of the Convention, and certainly we came to recognize the persistence and painstaking work that went into the methodical photographic plate examination which led to the discovery of Pluto by Dr. Tombaugh.

ALCON '82 was a very solid, smoothly-run educational experience, all to the credit of the conscientious efforts of our friends and colleagues of the Peoria Astronomical Society. Special thanks are due Ms. Georgia Sutherland, the Convention Chairman, Astronomical League President Orville H. Brettman, and all others who were instrumental in bringing about a memorable astronomical experience.

The A.L.P.O. has accepted an invitation from the Astronomical League to participate in its convention to be held in Jacksonville, Florida, details to be forthcoming soon. We fervently hope that A.L.P.O. members will join us for what promises to be another enjoyable and educational endeavor.

SATURN CENTRAL MERIDIAN EPHEMERIS: 1983

By: John E. Westfall, A.L.P.O. Associate Director

The two tables on pages 232 and 233 give the longitude of Saturn's geocentric central meridian for the illuminated (apparent) disk for 0^h, Universal Time (U.T.), for each day in 1983. These tables are a continuation of those previously published in the JALPO for 1969-82, and include corrections for phase, light-time, and the Saturnicentric longitude of the Earth. As with the 1982 ephemeris, quantities have been computed directly from the elements of Saturn's orbit.

"System I" assumes a sidereal rotation rate of 844°.00 per day (period = 10^h 14^m $13^s.08$), and should be used for features in the NEB_s, EZ, and SEB_n. "System II", to be used for the rest of the ball, has a rotation rate of 812°.00 per day (period = 10^h 38^m $25^s.42$). Note that, on the basis of Voyager-1 and -2 findings, the preferred System for the NEB_n and the SEB_s has been changed from System I to System II.

Voyager-1 and Voyager-2 studies of Saturn's atmospheric currents showed them to be extremely variable with latitude.[1] It is clear that any central meridian ephemeris simple enough to be useful will also be only an approximation, although, when used with care, one close enough to give conveniently small drift rates for most short-lived features. The uncertain nature of Saturn's rotation period is shown by the mutual disagreement between the two Systems employed here and the Astronomical Almanac "System I" (10^h 14^m $00^s.0$, 844°.300/d) and "System III" (10^h 30^m $00^s.0$, 822°.857/d), as well as the so-called radio period (10^h $39^m.4$, 810°.76/d). Table 1, below, is based on the wind velocities recorded by the Voyager-1 and -2 Missions, and shows the differences between the periods those imply and the Systems used here. These results are approximate, being based on wind velocities scaled from published graphs. The feature identifications are based on Voyager images, and their latitudes may differ from telescope measures. Naturally, the two Voyagers observed Saturn only briefly (in November, 1980, and August, 1981, respectively), and it is likely that the latitude-dependent wind velocities they recorded are subject to both short-term and seasonal changes. Thus, it remains important for A.L.P.O. members to make central meridian timings of Saturnian features, combined with latitude measures or estimates.

Table 1. Latitude-Dependent Voyager-1 and -2 Rotation Rates

Lat*	Daily Rotation Rate	Period	Daily Drift (System)	Feature
+80°	821°.51	10^h $31^m.0$	+ 9°.51 (II)	NPC
+75°	819°.45	10^h $32^m.6$	+ 7°.45 (II)	NPC
+70°	810°.76	10^h $39^m.4$	- 1°.24 (II)	NPR
+65°	823°.33	10^h $29^m.6$	+11°.33 (II)	NPR
+60°	825°.28	10^h $28^m.2$	+13°.28 (II)	NPR
+55°	813°.44	10^h $37^m.3$	+ 1°.44 (II)	NPR
+50°	816°.80	10^h $34^m.7$	+ 4°.80 (II)	NPR (S. edge)
+45°	821°.84	10^h $30^m.8$	+ 9°.84 (II)	NTez
+40°	809°.73	10^h $40^m.2$	- 2°.27 (II)	NTeB
+35°	813°.19	10^h $37^m.5$	- 1°.19 (II)	NTeB
+30°	817°.25	10^h $34^m.3$	+ 5°.25 (II)	NTrZ
+25°	819°.67	10^h $32^m.4$	+ 7°.67 (II)	NTrZ
+20°	821°.13	10^h $31^m.3$	+ 9°.13 (II)	NEB_n
+15°	830°.19	10^h $24^m.4$	-13°.81 (I)	NEB_s
+10°	846°.49	10^h $12^m.4$	+ 2°.49 (I)	EZ_n
+ 5°	848°.62	10^h $10^m.9$	+ 4°.62 (I)	EZ_n
0°	846°.04	10^h $12^m.7$	+ 2°.04 (I)	EZ
- 5°	844°.10	10^h $14^m.1$	+ 0°.10 (I)	EZ_s
-10°	842°.75	10^h $15^m.1$	- 1°.25 (I)	EZ_s
-15°	832°.29	10^h $22^m.9$	-11°.71 (I)	SEB_n

[1]Smith, Bradford A. et al. "Encounter with Saturn: Voyager 1 Imaging Science Results", Science 212 (10 April 1981), 163-165.

________. "A New Look at the Saturn System: The Voyager 2 Images", Science 215 (29 Jan. 1982), 506.

SATURN, 1983

LONGITUDE OF CENTRAL MERIDIAN OF ILLUMINATED DISK

SYSTEM I--0 HR U.T.

DAY	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEP.	OCT.	NOV.	DEC.
1	232.6	117.7	351.8	238.7	001.1	245.9	004.6	245.4	125.2	240.9	120.7	237.8
2	356.6	241.7	115.9	002.8	125.2	009.9	128.5	009.3	249.1	004.7	244.6	001.7
3	120.6	005.8	240.0	126.9	249.2	133.9	252.4	133.2	012.9	128.6	008.5	125.6
4	244.6	129.9	004.1	251.0	013.3	257.9	016.4	257.1	136.8	252.4	132.3	249.6
5	008.7	253.9	128.2	015.1	137.3	021.9	140.3	020.9	260.6	016.3	256.2	013.5
6	132.7	018.0	252.3	139.2	261.4	145.8	264.2	144.8	024.5	140.1	020.1	137.4
7	256.7	142.0	016.3	263.3	025.4	269.8	028.1	268.7	148.3	264.0	144.0	261.4
8	020.7	266.1	140.4	027.4	149.5	033.8	152.0	032.6	272.2	027.9	267.9	205.3
9	144.7	030.2	264.5	151.5	273.5	157.8	275.9	156.4	036.0	151.7	031.8	329.2
10	268.8	154.3	028.6	275.6	037.6	281.7	039.8	280.3	159.9	275.6	155.7	093.2
11	032.8	278.3	152.7	039.6	161.6	045.7	163.8	044.2	283.7	039.4	279.6	217.1
12	156.8	042.4	276.8	163.7	285.6	169.7	287.7	168.0	047.6	163.3	043.5	341.1
13	280.8	166.5	040.9	287.8	049.7	293.6	051.6	291.9	171.4	287.2	167.4	105.0
14	044.9	290.5	165.0	051.9	173.7	057.6	175.5	055.8	295.3	051.0	291.3	229.0
15	168.9	054.6	289.1	176.0	297.7	181.5	299.4	179.6	059.1	174.9	055.2	352.9
16	292.9	178.7	053.2	300.1	061.8	305.5	063.3	303.5	183.0	298.7	179.1	116.9
17	057.0	302.8	177.3	064.1	185.8	069.5	187.2	067.3	306.8	062.6	303.0	240.8
18	181.0	066.9	301.4	188.2	309.8	193.4	311.1	191.2	070.7	186.5	066.9	004.8
19	305.0	190.9	065.5	312.3	073.8	317.4	075.0	315.1	194.6	310.3	190.8	128.7
20	069.1	315.0	189.6	076.4	197.9	081.3	198.8	078.9	318.4	074.2	314.7	252.7
21	193.1	079.1	313.7	200.5	321.9	205.3	322.7	202.8	082.3	198.1	078.6	016.7
22	317.2	203.2	077.8	324.5	085.9	329.2	086.6	326.6	206.1	321.9	202.5	140.6
23	081.2	327.3	201.9	088.6	209.9	093.1	210.5	090.5	330.0	085.8	326.4	264.6
24	205.2	091.4	326.0	212.7	333.9	217.1	334.4	214.4	093.9	209.7	090.3	028.5
25	329.3	215.4	090.1	336.7	097.9	341.0	098.3	338.2	217.8	333.6	214.2	152.5
26	093.3	339.5	214.2	100.8	221.9	105.0	222.2	102.1	341.6	097.4	338.2	276.5
27	217.4	103.6	338.3	224.9	345.9	228.9	346.1	225.9	105.5	221.3	102.1	040.5
28	341.4	227.7	102.4	348.9	109.9	352.8	109.9	349.8	229.3	345.2	226.0	164.4
29	105.5		226.5	113.0	233.9	116.7	233.8	113.6	353.2	109.1	349.9	288.4
30	229.6		350.6	237.1	357.9	240.7	357.7	237.5	117.0	232.9	113.8	052.4
31	353.6		114.6		121.9		121.6	001.3		356.8		176.4

MOTION OF THE CENTRAL MERIDIAN

1H...35.2	9H..316.5	17H..237.8	10M....5.9	1M....0.6
2H...70.3	10H..351.7	18H..273.0	20M...11.7	2M....1.2
3H..105.0	11H...26.8	19H..308.2	30M...17.6	3M....1.8
4H..140.7	12H...62.0	20H..343.3	40M...23.4	4M....2.3
5H..175.8	13H...97.2	21H...18.5	50M...29.3	5M....2.9
6H..211.0	14H..132.3	22H...53.7		6M....3.5
7H..246.2	15H..167.5	23H...88.8		7M....4.1
8H..281.3	16H..202.7	24H..124.0		8M....4.7
				9M....5.3

Table 1. Latitude-Dependent Voyager-1 and -2 Rotation Rates (Cont.)

Lat*	Daily Rotation Rate	Period	Daily Drift (System)	Feature
-20°	822°86	10^h 30^m0	+10°86 (II)	SEB_s
-25°	819°67	10^h 32^m4	+ 7°67 (II)	STrZ
-30°	816°32	10^h 35^m0	+ 4°32 (II)	STeB
-35°	814°16	10^h 36^m7	+ 2°16 (II)	STeB
-40°	811°28	10^h 39^m0	- 0°72 (II)	STeZ
-45°	811°87	10^h 38^m5	- 0°13 (II)	STeZ
-50°	811°97	10^h 38^m4	- 0°03 (II)	SPR (N. edge)
-55°	812°77	10^h 37^m8	+ 0°77 (II)	SPR

*Saturnigraphic latitude.

SATURN, 1983

LONGITUDE OF CENTRAL MERIDIAN OF ILLUMINATED DISK

SYSTEM II--0 HR U.T.

DAY	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEP.	OCT.	NOV.	DEC.
1	023.2	356.2	054.2	029.1	271.5	244.3	123.1	092.0	059.8	295.6	263.4	140.5
2	115.2	088.2	146.3	121.2	003.5	336.3	215.0	183.9	151.7	027.4	355.3	232.4
3	207.2	180.3	238.4	213.3	095.6	068.3	306.9	275.8	243.5	119.3	087.2	324.3
4	299.2	272.3	330.5	305.4	187.6	160.3	038.8	007.6	335.4	211.1	179.1	056.2
5	031.2	004.4	062.6	037.5	279.7	252.2	130.7	099.5	067.3	303.0	270.9	148.2
6	123.2	096.4	154.6	129.5	011.7	344.2	222.7	191.4	159.1	034.8	002.8	240.1
7	215.3	188.5	246.7	221.6	103.8	076.2	314.6	283.3	251.0	126.7	094.7	332.0
8	307.3	280.6	338.8	313.7	195.8	168.2	046.5	015.1	342.8	218.6	186.6	244.0
9	039.3	012.6	070.9	045.8	287.9	260.2	138.4	107.0	074.7	310.4	278.5	335.9
10	131.3	104.7	163.0	137.9	019.9	352.1	230.3	198.9	166.5	042.3	010.4	067.9
11	223.3	196.8	255.1	230.0	112.0	084.1	322.2	290.7	258.4	134.1	102.3	159.8
12	315.3	288.9	347.2	322.1	204.0	176.1	054.1	022.6	350.2	226.0	194.2	251.7
13	047.4	020.9	079.3	054.2	296.0	268.0	146.1	114.5	082.1	317.9	286.1	343.7
14	139.4	113.0	171.4	146.2	028.1	000.0	238.0	206.3	174.0	049.7	018.0	075.6
15	231.4	205.1	263.5	238.3	120.1	092.0	329.9	298.2	265.8	141.6	109.9	167.6
16	323.5	297.1	355.6	330.4	212.1	183.9	061.8	030.1	357.7	233.4	201.8	259.5
17	055.5	029.2	087.7	062.5	304.2	275.9	153.7	121.9	089.5	325.3	293.7	351.5
18	147.5	121.3	179.8	154.6	036.2	007.8	245.6	213.8	181.4	057.2	025.6	083.4
19	239.6	213.4	271.9	246.6	128.2	099.8	337.5	305.7	273.2	149.0	117.5	175.4
20	331.6	305.5	004.0	338.7	220.2	191.7	069.4	037.5	005.1	240.9	209.4	267.3
21	063.6	037.5	096.1	070.8	312.2	283.7	161.2	129.4	096.9	332.8	301.3	359.3
22	155.7	129.6	188.1	162.9	044.3	015.6	253.1	221.2	188.8	064.6	033.2	091.3
23	247.7	221.7	280.2	254.9	136.3	107.6	345.0	313.1	280.6	156.5	125.1	183.2
24	339.8	313.8	012.3	347.0	228.3	199.5	076.9	045.0	012.6	248.4	217.0	275.2
25	071.8	045.9	104.4	079.1	320.3	291.5	168.8	136.8	104.4	340.3	308.9	007.2
26	163.8	137.9	196.5	171.1	052.3	023.4	260.7	228.7	196.3	072.1	040.9	099.1
27	255.9	230.0	288.6	263.2	144.3	115.3	352.6	320.5	288.1	164.0	132.8	191.1
28	347.9	322.1	020.7	355.3	236.3	207.3	084.5	052.4	020.0	255.9	224.7	283.1
29	080.0		112.8	087.3	328.3	299.2	176.4	144.3	111.9	347.8	316.6	015.0
30	172.0		204.9	179.4	060.3	031.1	268.2	236.1	203.7	079.6	048.5	107.0
31	264.1		297.0		152.3		000.1	328.0		171.5		199.0

MOTION OF THE CENTRAL MERIDIAN

1H...33.8	9H..304.6	17H..215.2	10M....5.6	1M....0.6
2H...66.7	10H..338.3	18H..249.0	20M...11.3	2M....1.1
3H..101.5	11H...12.7	19H..282.8	30M...16.9	3M....1.7
4H..135.3	12H...46.0	20H..316.7	40M...22.6	4M....2.3
5H..169.2	13H...79.8	21H..350.5	50M...28.2	5M....2.8
6H..203.0	14H..113.7	22H...24.3		6M....3.4
7H..236.8	15H..147.5	23H...58.2		7M....3.9
8H..270.7	16H..181.3	24H...92.0		8M....4.5
				9M....5.1

The central meridian tables which follow may be used to find the C.M. at any time. To do this, first find the 0^h, U.T., C.M. for the appropriate date and system. Then, add hours and minutes corrections from the appropriate "Motion of the Central Meridian" table, as shown in this example:

* * * * * * *

Remarks by Editor. The purpose of publishing John Westfall's tables of Saturn central meridians is, of course, to encourage observations of central meridian transits of features on Saturn. These objects are much more difficult than the corresponding markings on Jupiter. For this very reason observers should make every effort to record such transits whenever they can distinctly perceive recognizable features in the cloud belts and zones of Saturn. They should also quickly notify the Saturn Recorder and other observers so that enough future observations to determine a reliable period of rotation of the feature can be obtained.

A dark spot in the SEB_n transits the central meridian at $11^h\ 38^m$ on 21 JUN 1983 U.T. (Note: The SEB_n is in System I.)

System I C.M. at 0^h U.T., 21 JUN 1983	. . . .	205°3
+ Motion of the System I C.M. in: 11^h	. . . .	026.8
30^m	. . . .	017.6
08^m	. . . .	004.7
System I C.M., $11^h\ 38^m$, 21 JUN 1983 U.T..	. .	254°4 (254°)

Note that one should subtract 360° from any result exceeding 360°, and that it is more realistic to round the final result to the nearest whole degree, particularly if timings are to a precision of only 1 minute. The tables may also be used in reverse; namely, to find the U.T. of central meridian transit of a feature of known longitude. To do this, for a particular date, find the difference between the 0^h longitude and the feature's longitude. Then, find the appropriate hours and minutes values to generate the necessary motion in the central meridian. Bear in mind that successive central meridian transits will occur at intervals of $10^h\ 14^m$ in System I and $10^h\ 38^m$ in System II. Central meridian transits repeat themselves at very close to a 3 terrestrial day interval for System I and very close to a 4 terrestrial day interval for System II.

SHEDDING A LITTLE LIGHT: THE NEW A.L.P.O. SOLAR SECTION

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The A.L.P.O. has embarked on an exciting new field of study, the study of our own star, The Sun. This is a particularly rewarding field of study for the amateur astronomer since the features of the Sun are the most active and changing in the whole of the Solar System. The work of the Solar Section of the A.L.P.O. will be the morphology of these features. This Section will not involve itself with any tabulation of relative sunspot numbers or with radio flare patrols (i.e. SES and SEA observations). These are handled by the American Association of Variable Star Observers (AAVSO) through their Solar Division Chairman, Robert Ammons (411 Keith Ave., Missoula, Montana, 59801); and all such observations should be forwarded to him. What this new Section will do is study, visually and photographically, the structure and evolution of solar features in integrated light. While monochromatic observations will be accepted and kept on file by the Recorder, such observations will be used to augment the white light observations and will not be actively pursued at this time due to the expense and complexity of the equipment. Few amateurs presently own such equipment. Expansion of the Section into the fields of monochromatic, photometric, and spectroscopic observing will come about as the time, interest, and abilities of the participating observers allow. There will be an emphasis on the photographic observations of solar phenomena which are in greater demand by the professional community. Drawings will play a secondary, but still important, role.

As the first order of business of the Section, a mailing of some 56 letters was sent to a number of professional solar researchers soliciting their thoughts on how best to make our observations of the greatest use to the professional community. For the most part, those professionals contacted have been very supportive of the Section, though several expressed doubts that the quality of the work of the Section would be good enough. From those photographs already submitted, it is obvious that the latter doubt is unfounded. The response from the letters and from some personal communications with other professional solar astronomers resulted in suggestions that can be divided into two basic categories:

1) MEDIUM RESOLUTION

Whole disc photography, and drawings, for the purpose of determining accurate heliographic latitude and longitude in order to assess drift and rotational variations. Whole disc photographs in both integrated and monochromatic light are of use to the Section.

2) HIGH RESOLUTION

Photography, and drawings, of individual sunspots and groups concentrating on utilizing the moments of best seeing. Also, photographs, and drawings, of internal umbral structure with respect to high resolution observations of the penumbrae and surrounding photosphere.

Visual observations, namely drawings, will be carried out by members of the Section; but the professional community has expressed only limited interest in these. Therefore, all observers are encouraged to participate in some form of photography. Solar photography, especially whole disc, is not terribly difficult and often does not even require an equatorial mounting of the instrument. Observers who are traditionally nonphotographic in their technique should not feel that such photography would be beyond their capabilities.

It is fully realized that each observer has different amounts and arrangements of time available for observing. However, there are different types of observations needed which make different and varying demands on the observer's time. There is a need for observers who can work a little each day as well as for those who can only devote a day or two each month.

For those who can observe each day, whole disc drawings and photography are the most important observations that can be made. One or two drawings or photographs of the entire solar disc each day will allow activity regions to be followed and studied throughout their passage across the face of the Sun. Additionally, these drawings and photographs will be used by Section members and professionals for the determination of accurate heliographic latitude and longitude for the activity regions. This information will enable researchers to check proper motions of these regions and to assess differential rotation rates at different latitudes. There are many other studies presently going on which require accurate positions for these regions, data that can be supplied by the Section.

Other observers who, for example, have work schedules which do not allow regular and frequent solar observing can fill a much different demand for data. These observers are encouraged to participate in the high resolution photography and drawing of individual sunspots and spot groups. Doing so requires that an observer make a concentrated effort during the course of one or two days of monitoring the seeing and of utilizing those best moments. A number of high resolution photographs or drawings during the one or two day observing run will show internal changes in a group as well as the evolutions of transient features. This kind of observing is very time consuming and cannot usually be done by professional astronomers who are granted only a few days each year on any one instrument. A few amateurs working in the aforementioned manner can produce high quality results which can give that professional the data he needs to complete his research (especially if the few days he got to observe were cloudy!)

Eventually it is hoped that the Section will have enough observers around the world participating in the whole disc, and other, observing so that we will have continuous (one image per hour) coverage capabilities. Such a standardized patrol would be of great value to astronomy. From the preliminary questionnaires already received, the potential for this coverage already exists in the Section.

Once each rotation a bulletin called the Rotation Report will be published by the Section. It will list all data received during the previous rotation. The data will be listed by rotation number and SESC (Space Environment Services Center - NOAA) Region number. Other information will include qualitative notes about each observation. This report will be sent to various professional solar research institutions around the world so that they will be advised of the data available. Solar Section observers who wish also to receive the report should submit SASE's to the Recorder (please, no more than 10 at a time).

After enough observations have accumulated, and no sooner than January 1984, a catalog of the observations on file with the Section will be published. This too will be sent out to the same solar research institutions as the Rotation Report. Others wishing this catalog will be charged a modest fee to cover the costs of printing and mailing since all the costs of printing these publications must be borne by the Section Recorder. These publications are designed to give the Section as much exposure as possible, promulgating and disseminating the work of the Section to potential users of the data.

A Solar Section Handbook is available from the Recorder. Again, a small fee will have to be charged to cover the printing costs.* This Handbook also includes one copy each of the standardized Solar Section Report Forms. These are printed on heavy paper so that each observer can use them as masters and photocopy his own forms from these. This system has the advantages of being quicker, easier, and cheaper than if the forms were copies and mailed in bulk to observers. Those needing a copy of the Handbook should contact the Recorder.

The purpose of the Section is not only to coordinate the activities of amateur solar astronomers as they pursue their hobby, but also to provide the professional community with reliable high quality observations of solar phenomena made by these amateurs. In this way amateur astronomers, by pursuing their interest, make valuable contributions to science. These contributions can lead to new insights into the workings of our Sun and therefore of the other stars as well. We will be

*The price of the Handbook is $4.00. Place orders with Mr. Hill.

guided in all this by the needs of the professional community. However, it will take the diligent efforts of all of us, as observers, to make this plan work. The active participation of one and all is welcomed. Those who are interested and have not received any correspondence from the Section are invited to contact the Recorder. As has been shown, the demands in terms of time need not be great. However, because of the contributions to astronomy and the pure pleasure of observing, the rewards are great.

THE 1979-1980 APPARITION OF SATURN AND EDGEWISE PRESENTATION OF THE RING SYSTEM

By: Julius L. Benton, Jr., A.L.P.O. Saturn Recorder

ABSTRACT

Visual and photographic studies of the planet Saturn, its satellites, and ring system were carried out with instruments ranging in aperture from 7.6 cm. (3.0 in.) to 154.0 cm. (61 in.) from 1979, October 22 through 1980, August 12. A total of 261 observations was amassed during 1979-80, from which it was ascertained that only marginal activity was apparent on the globe of Saturn, reasonably consistent with the apparitions of 1977-78 and 1978-79. Of greatest significance during 1979-80 were the events surrounding the edgewise presentation of the ring system to our line of sight. Observers followed the rings to within a day of theoretical ring closure; and in isolated instances, reports emerged of the rings on the exact date of edgewise orientation. In the report are descriptions of the visibility of the rings by date and by aperture, bringing out interesting remarks concerning the appearance of the rings at times when they were theoretically visible and invisible, etc. Statistics pertaining to the number of successful to unsuccessful attempts to see the rings are presented in graphic and tabular form.

Numerous references are cited at the conclusion of the report for additional reading; and within the body of the text are illustrations, graphs, and tables to clarify the analytical material.

Introduction

The following analytical report covers visual and photographic observations of the planet Saturn, its ring system, and its accompanying brighter satellites from 1979, October 22 through 1980, August 12. Both the southern and northern hemispheres of Saturn's globe, as well as very limited portions of the northern and southern faces of the rings, were visible due to the unique events associated with the edgewise orientation of the ring system to our line of sight throughout the 1979-80 apparition. The numerical value of B, which denotes the planetocentric latitude of the Earth referred to the plane of the rings, varied within the limits of -1°579 to +1°729 during the period cited above.[1,2]

During the 1979-80 apparition, the Earth passed through the plane of the ring system on three separate occasions: on 1979, October 27; on 1980, March 12; and finally on 1980, July 23. On 1979, October 27, the Earth's passage through the ring plane took place only five weeks after the conjunction of Saturn with the Sun (conjunction taking place 1979, September 10); and observations were not particularly easy during this time. Just prior to this event, the south face of the rings was illuminated by the Sun; afterwards, the south face was still in sunlight, but the Earth, having passed through the ring plane, was on the darkened north side of the ring plane.[6]

The rings were open to a maximum value of +1°729 on 1980, January 2, and thereafter the numerical value of B decreased until the rings were again edgewise (B becoming 0° again) to the Earth on 1980, March 12. During this time, the rings were edgewise to the Sun on 1980, March 3; that is, the Sun passed from south to north of the ring plane, and from that date until 1980, March 12, the Sun and Earth together were on the north side of the plane of the rings. Thus, the northern face was illuminated; and the rings should have been visible to us.[1,2,6]

The second passage of the Earth through the ring plane on 1980, March 12 took place only two days prior to opposition. After 1980, March 12, the Earth was south of the ring plane, while the Sun was still to the north; and the unilluminated southern face of the rings was inclined toward Earth and was theoretically invisible. The southern portions of the ring system were open to a maximum numerical value of -1°579 on 1980, May 19, diminishing to 0° again when the Earth crossed the ring plane going north on 1980, July 23. Note that the Earth and Sun were then again together on the northern side of the ring plane. From this point on, until the next edgewise presentation in 1996, the northern face of the rings will be open progressively to a value of B of +27° and diminish back to 0° again.[1,2,6]

As indicated in the discussion above, opposition took place on 1980, March 14^d

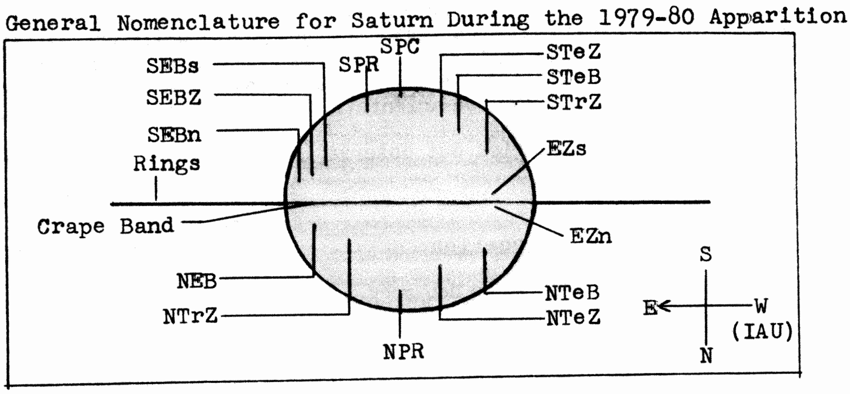


Figure 12. Diagram to show standard nomenclature of Saturn used in Dr. Benton's article on the 1979-80 apparition.

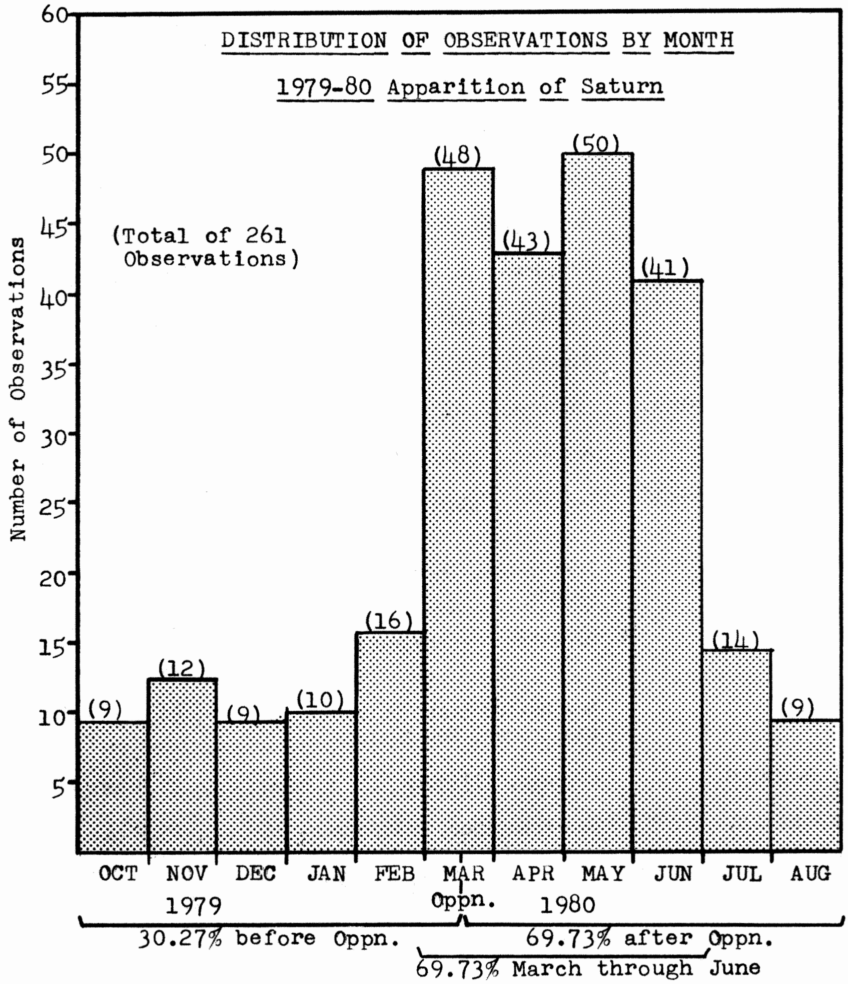


Figure 13. Histogram giving monthly frequency of observations by A.L.P.O. Saturn Section members during 1979-80 apparition.

02^h UT; and the apparent visual stellar magnitude of Saturn on that date was +0.8. The major axis of the ring system was 44".43 at opposition, while on the same date the minor axis was 0".04. Also on March 14th the equatorial and polar diameters of Saturn were respectively 19".73 and 17".65. The numerical value of B at opposition date was -0°.050, the second edgewise orientation of the rings having taken place only two days before.[1,2]

Nineteen individuals carried out observational studies of Saturn throughout 1979-80:

Observer	Location	No. of Observations	Instrumentation*
Aerts, Leo	Heist op den Berg, Belgium	3	10.2 cm. (4.0in.) RR
Benton, Julius L.	New Hope, Pennsylvania	4	7.6 cm. (3.0in.) RR 11.0 cm. (4.3in.) RR 15.2 cm. (6.0in.) RR
Boisclair, Norman J.	S. Glens Falls, New York	20	15.2 cm. (6.0in.) SC
Colarossi, Edward	Coraopolis, Pennsylvania	1	25.4 cm. (10.0in.)NEW
Dragesco, Jean	République Populaire du Bénin, West Africa	10	20.3 cm. (8.0in.) SC
Evans, Charles L.	Hampton, Virginia	13	25.4 cm. (10.0in.)CASS
Gardner, Bruce	Allentown, Pennsylvania	1	15.2 cm. (6.0in.) MAK
Haas, Walter H.	Las Cruces, New Mexico	1	15.2 cm. (6.0in.) NEW
Heath, Alan W.	Nottingham, England	31	30.5 cm. (12.0in.)NEW
Jet Propulsion Laboratory	Pasadena, California	1	Voyager I photograph
Larsen, Stephen	Tucson, Arizona	7	154.0 cm. (61in.) NEW
Lavega, Agustin Sanchez	Almeria, Spain	1	123.0 cm. (48in.) NEW
Lugue, Jesus R. Sanchez	Cordoba, Spain	1	21.7 cm. (8.5in.) NEW
McDavid, David	Helotes, Texas	9	35.6 cm. (14.0in.)SC
Pedrajas, José N. Alcalá	Cordoba, Spain	6	20.3 cm. (8.0in.) NEW
Robotham, Robert	Port Rowan, Ontario Canada	20	8.3 cm. (3.3in.) RR 15.2 cm. (6.0in.) NEW
Sabia, John D.	Scranton, Pennsylvania	16	10.5 cm. (4.1in.) RR 15.2 cm. (6.0in.) NEW 24.0 cm. (9.5in.) RR
Suggs, Robert	New Mexico State Univ. Las Cruces, New Mexico	5	61.0 cm. (24.0in.) CASS
Troiani, Daniel M.	Chicago, Illinois	20	25.4 cm. (10.0in.) NEW
Westfall, John E.	San Francisco, California	91	25.4 cm. (10.0in.) CASS

<u>Total Number of Observers</u>: 19 (plus Voyager I photograph)
<u>Total Number of Observations</u>: 261 (includes Voyager I photograph)

*RR-Refractor; NEW-Newtonian; SC-Schmidt-Cassegrain; MAK-Maksutov; CASS-Cassegrain

As the accompanying tabulation reveals, there were 261 observations submitted by a total of 19 observers plus the photograph taken by Voyager I. The distribution of observations by month throughout 1979-80 is presented in the form of a histogram (Figure 13), the inspection of which indicates that the largest percentage of observations came in during the months of 1980, March through 1980, June (69.73% of the total received for the apparition). A decline in the number of submitted reports took place on either side of the aforementioned peak period. Considering the dates prior to and following opposition more specifically, it is recognized that 30.27% of the data were received up to 1980, March 14 and 69.73% received after that time. Looking at past apparitions, similar percentages were recorded prior to and following opposition, indicating that, as a whole, observers tend to follow Saturn when observation is possible at a more convenient time in the evening.

The 1979-80 apparition came to a close as the planet Saturn entered the domain of the Sun, conjunction taking place on 1980, September 23^d02^h UT.[1,2]

The writer extends his very sincere gratitude to all colleagues in this country and abroad who participated faithfully in the observational programs of the A.L.P.O. Saturn Section during the 1979-80 apparition. New observers, as always, are welcome to join our efforts in coming apparitions.

The Globe of Saturn

The analytical, descriptive report which follows has been assembled after an exhaustive reduction and analysis of the collective observational data submitted to the A.L.P.O. Saturn Section throughout the 1979-80 apparition. The names of specific observers have been largely omitted from the discussion except where identification of individuals becomes pertinent to the meaning of the text material. Figure 12 shows the standard Saturnian nomenclature used in this report.

Instrumentation employed ranged from 7.6 cm. (3.0 in.) to 154.0 cm. (61 in.) in aperture, which obvious differences expected in optical design, quality, and functional capability, together with a variable incidence of practical observing experience and theoretical knowledge among the participants in the program. Excluding the Voyager I photograph, 93.5% of the observations were carried out with instruments ranging upward from 15.2 cm. (6.0 in) in aperture, the remaining 6.5% of the observations being carried out with apertures ranging from 7.6 cm. (3.0 in.) to 11.0 cm. (4.3 in.).

As noted in previous apparition reports, it is meaningful to note that, although our conclusions here remain reasonably consistent with previous observing seasons (with an additional continuity of methodology within certain limits), unavoidable subjectivity exists in the data sample and remains hopelessly beyond correction. Thus, the optimum that one can achieve is a reasonably accurate summary of variable phenomena common to the atmosphere of Saturn for any specific apparition. Supporting details concerning the conclusions reached herein are available upon request.

Graphs, numerical tables, and illustrations accompany the report; and reference to these is highly suggested for necessary understanding and clarity.

Southern Regions of the Globe. Reasonably consistent with the observational reports for the immediately preceding two apparitions, Saturn's southern hemisphere exhibited only marginal activity throughout 1979-80 in terms of visible atmospheric phenomena. Deviations from the otherwise quiescent condition were manifest as subtle darkenings (especially in the SEB) and associated elongated or amorphous features in the belts as well as intermittent brightenings, elusive mottlings, and diffuse festoon activity seen in the zones. It is meaningful, however, to summarize these southern hemispheric phenomena in the next few paragraphs, leaving the detailed treatment to the specific categories.

From a collective point of view, a few of the zones of the planet's southern regions in 1979-80 were slightly darker in comparison to the 1978-79 apparition. The Equatorial Zone (EZ) was presumably not so bright in 1979-80, but it should be recalled that it was used as the visual numerical relative intensity standard with an arbitrary assigned value of 7.0 for the period. Thus, we shall not assume that any change in the intensity of the EZ is valid.

The South Temperate Zone (STeZ) showed a diminution in brightness by a mean factor of 0.3 on the relative numerical intensity scale, while the South Tropical Zone (STrZ) and South Polar Region (SPR) were both elevated in brightness by a mean factor of 0.2 in each case, all during 1979-80. Since the South Equatorial Belt Zone (SEB Z) was not reported throughout the 1979-80 apparition, it could not be compared in mean intensity to 1978-79.

The belts of Saturn's southern hemisphere which were visible exhibited variations in mean intensity since 1978-79 as well. The South Component of the South Equatorial Belt (SEB_s) was brighter in 1979-80 by a mean intensity factor of

TABLE I

VISUAL NUMERICAL RELATIVE INTENSITY ESTIMATES OF MAJOR GLOBAL AND RING FEATURES FOR THE PLANET SATURN DURING THE 1979-80 APPARITION WITH ACCOMPANYING ABSOLUTE COLOR DATA

Global and Ring Features	Relative Intensity: No. of Visual Estimates	Mean Intensity and Std. Deviations	Absolute Color
<u>ZONES</u>:			
EZ_s	53	7.000±0.000	yellowish-white
EZ_n	3	6.830±0.047	yellowish-white
NTeZ	23	6.630±0.325	dusky yellowish-white
STeZ	23	6.540±0.191	dusky yellowish-white
STrZ	7	6.030±0.369	light yellowish-grey
NTrZ	13	5.860±0.320	light yellowish-grey
Globe between SEB and SPR	17	5.340±0.430	dusky yellowish-grey
Globe between NEB and NPR	17	5.320±0.223	dusky yellowish-grey
NPR	59	5.190±0.318	very dusky yellowish-grey
SPR	56	4.960±0.433	very dusky yellowish-grey
<u>BELTS</u>:			
NEB_n	14	4.630±0.363	greyish to greyish-brown
SEB_s	2	4.100±0.400	diffuse grey to brownish-grey
SEB (whole)	38	3.760±1.021	diffuse greyish-brown to reddish-brown
NEB_s	1	3.600	greyish to greyish brown
NEB	26	3.370±0.581	dark grey to greyish-brown
SEB_n	2	3.050±0.050	dark grey to brownish-grey
<u>RINGS</u>:			
Shadow Rings on Globe	44	1.960±0.625	very dark grey

Visual numerical relative intensity estimates (visual surface photometry) are based upon the A.L.P.O. Intensity Scale, where 0.0 denotes complete black (shadow) and 10.0 refers to the greatest brilliant white condition (very brightest Solar System reflectivity). The adopted scale utilized employs (for Saturn) a reference standard of 8.0 for the outer third of Ring component B, which appears to be fairly stable in intensity with time and most ring inclinations. Unfortunately, the normal standard could not be utilized during 1979-80, and another had to be chosen. For this apparition, the adopted standard was the EZ_s, which was given an assigned intensity value of 7.0. A detailed discussion of visual photometric work is to be found in <u>The Saturn Handbook</u>, available at cost from the author.[15]

0.4, while the North Component of the South Equatorial Belt (SEB_n) was very slightly darker than in 1978-79 by a mean factor of 0.1. The South Polar Cap (SPC), Equatorial Belt or Band (EB), South Temperate Belt (STeB), and South Polar Band (SPB) were all not reported during 1979-80, precluding any comparative studies with the 1978-79 period.

The southern hemispheric atmospheric region exhibiting the greatest, although subtle, brightness elevation, as derived from the mean numerical relative intensity relationships shown in Table I, was the SEB_s by a mean factor of 0.4. The feature showing the greatest mean diminution in brightness, aside from the aforementioned dubious case of the EZ, was the STeZ, with a factor of 0.3, still not a significant variation at all.

It is worthwhile to note, in passing, that the globe of Saturn between the SEB and SPR was of about the same mean intensity as that between the NEB and NPR during 1979-80.

The information which has been outlined in the preceding paragraphs is drawn from an in-depth comparative investigation of Saturnian zone and belt visual numerical relative intensity data which began with the 1966-67 apparition for selected global features and extended to include the data for the current apparition.[7] A comprehensive analytical report of comparative visual numerical relative intensities of Saturnian atmospheric phenomena since 1966-67 will appear in an upcoming issue of this Journal.

Saturnian Features	Mean Intensity[5] 1978-79	1979-80	Mean Intensity Change and Notes
ZONES:			
EZ	7.6	7.0	Darker (0.6)
STEZ	6.8	6.5	Darker (0.3)
STRZ	5.8	6.0	Brighter (0.2)
SEB Z	4.7	---	---
SPR	4.8	5.0	Brighter (0.2)
BELTS:			
SPC	5.2	---	---
EB	---	---	---
STeB	4.9	---	---
SEB_s	3.7	4.1	Brighter (0.4)
SEB_n	3.2	3.1	Darker (0.1)
SPB	3.9	---	---

A representative sketch of Saturn with its accompanying ring system (not visible in diagram) for a numerical value of B equal to 0°.000 is included with the apparition report, on which appears the proper representation of nomenclature (Figure 12).

South Polar Region (SPR). Reported as a very dusky yellowish-grey area, the SPR in 1979-80 was only slightly brighter than it had been in the 1978-79 apparition, according to the mean intensity data. As one approached the southern limb of the planet's globe, the gradation in overall intensity was insignificant, and no definitive South Polar Cap (SPC) was reported during 1979-80. No detail or intensity variations could be noticed in the SPR environs, and there was no glimpse of the elusive South Polar Band (SPB).

South South Temperate Zone (SSTeZ). No reports were received of the SSTeZ during the 1979-80 apparition.

South South Temperate Belt (SSTeB). There were no observations submitted which contained descriptions of the SSTeB throughout the 1979-80 apparition.

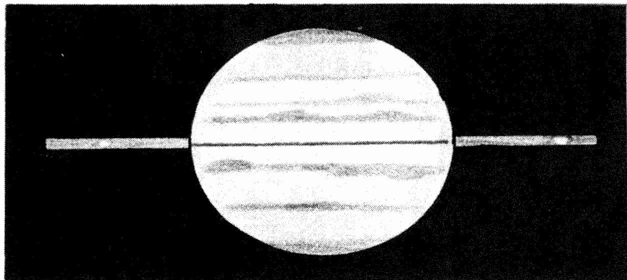
South Temperate Zone (STeZ). During the immediately preceding apparition the STeZ was fairly conspicuous, but in 1979-80, the STeZ was not as well defined. Observers described the STeZ as a dusky yellowish-white region, uniform in intensity, and devoid of detail other than occasionally suspected diffuse ovals, and exceeded in brightness only by the North Temperate Zone (NTeZ) and the Equatorial Zone's northern component (EZ_n).

South Temperate Belt (STeB). The STeB was not reported during the 1979-80 apparition by A.L.P.O. Saturn observers.

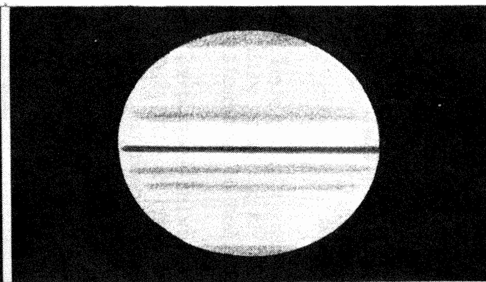
South Tropical Zone (STrZ). Throughout the whole of the 1979-80 apparition, the STrZ was very slightly brighter than it had been in the 1978-79 apparition. The STrZ was light yellowish-grey in color, showed uniformity in overall intensity, and exhibited no detail other than a few subtle shadings throughout the 1979-80 period. The STrZ was third among the southern hemispheric zones in mean intensity behind the aforementioned EZ_n and STeZ. Considering all global features, the STrZ was fourth in order of brightness behind the EZ_n, NTeZ, and STeZ, although still a fairly conspicuous feature.

South Equatorial Belt (SEB). During the 1979-80 apparition, the SEB was somewhat diffuse and greater in width than other belts on the globe of Saturn. The SEB was frequently seen as a single, undifferentiated belt; and when the southern and northern belt components (the SEB_s and SEB_n, respectively) were detected, the differentiation was more of a gradation in intensity than a true separation into components. The South Equatorial Belt Zone (SEB Z) was not at all obvious in 1979-80.

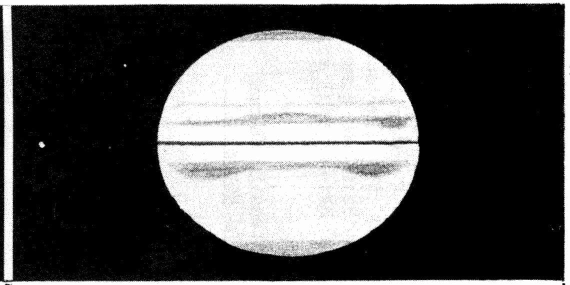
(text continued on page 245)



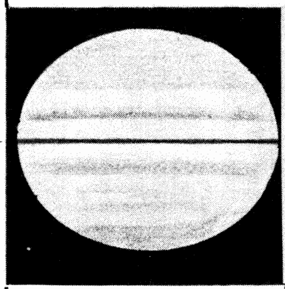
D. Troiani
1979 OCT 26, 11:05 - 11:30 U.T.
23 cm. Rl.; 283X, 395X.
S = 10, T = +6.0
CM(I) = 087-101°; CM(II) = 359-012°
B = -0°.03; B' = -1°.99



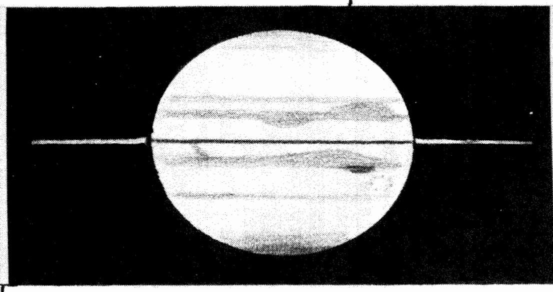
J. Westfall
1979 OCT 27, 13:00 - 13:26 U.T.
23 cm. Rl.; 220X, 330X.
S = 3; T = 5
CM(I) = 279-293°; CM(II) = 156-170°
B = +0°.02; B' = -1°.97



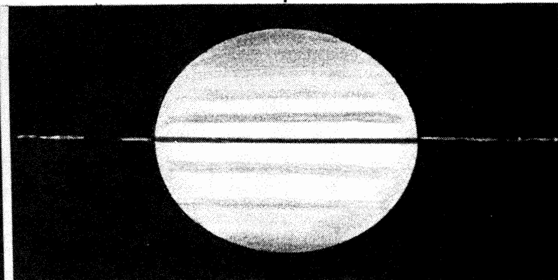
D. Troiani
1979 OCT 28, 11:23 - 11:40 U.T.
25 cm. Rl.; 283X
S = 8; T = +5.75
CM(I) = 345-355°; CM(II) = 192-201°
B = +0°.06; B' = -1°.96
Satellite Dione visible to left.



J. Dragesco
1979 NOV 09, 04:55 U.T.
20 cm.; 280X
S = Mod.; T = Mod.
CM(I) = 166°
CM(II) = 358°
B = +0°.57; B' = -1°.78



D. Troiani
1979 NOV 14, 11:43 - 11:58 U.T.
25 cm. Rl.; 223X
S = 9; T = +5.0
CM(I) = 305-313°; CM(II) = 327-335°
B = +0°.77; B' = -1°.70

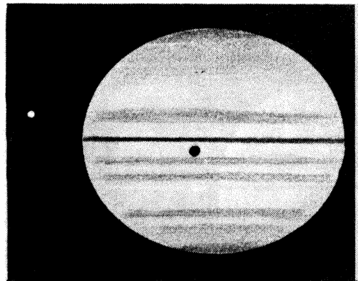


J. Dragesco
1979 NOV 25, 05:12 U.T.
20 cm.; 280X
S = Mod.; T = Mod.
C.M.(I) = 000°; CM(II) = 039°
B = +1°.14; B' = -1°.53

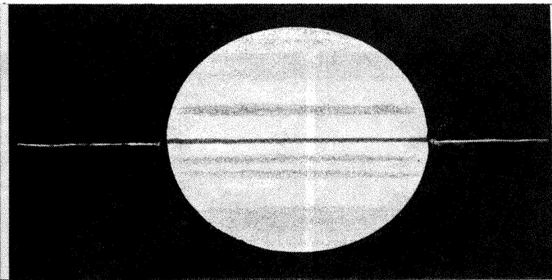
L. Aerts
1980 JAN 13, 02:46 U.T.
10 cm. Rr.; 216X,250X
S = 2-3; T = --
CM(I) = 232°
CM(II) = 147°
B = +1°.67; B' = -0°.77
Titan shadow on left.

Figure 14. Selected A.L.P.O. Drawings of Saturn During the 1979-80 Apparition

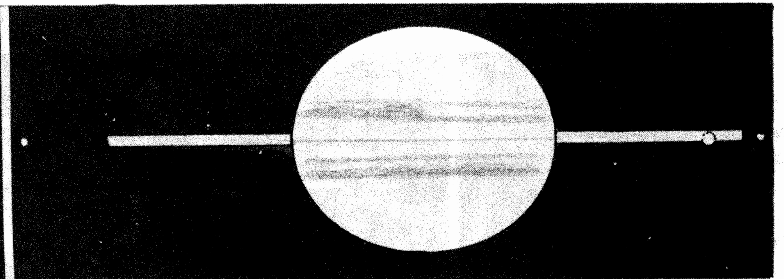
Figure 15. Selected A.L.P.O. Drawings and Photograph of Saturn During the 1979-80 Apparition.



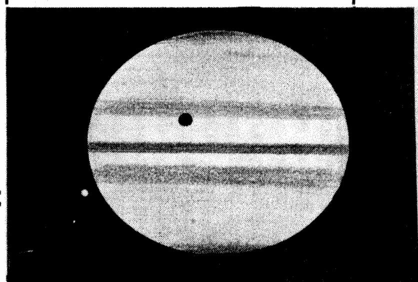
J. Dragesco
1980 JAN 28, 23:20 U.T.
20 cm.; 280X
S = Good; T = Excellent
CM(I) = 296°; CM(II) = 063°
$B = +1^{\circ}.42$; $B' = -0^{\circ}.53$
Titan off ball to left, with shadow near ball center.



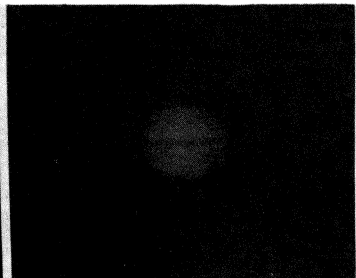
J. Dragesco
1980 MAR 05, 23:40 U.T.
20 cm.; 280X, 234X
S = Fair; T = Good
CM(I) = 219°; CM(II) = 242°
$B = +0^{\circ}.25$; $B' = +0^{\circ}.04$



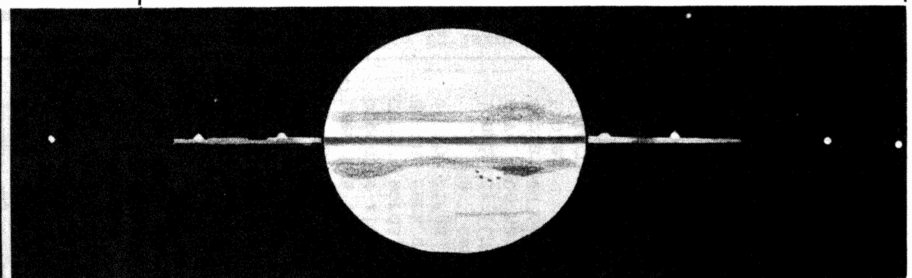
D. Troiani
1980 MAR 09, 08:20 - 08:38 U.T.
25 cm. Rl.; 283X
S = 7; T = +6.0
CM(I) = 177-187°; CM(II) = 091-102°
$B = +0^{\circ}.12$; $B' = +0^{\circ}.09$
Satellites: Titan on rings to right; Dione off rings to right; Enceladus off rings to left.



L. Aerts
1980 APR 17, 19:47 U.T.
10 cm. Rr.; 216X, 250X
S = 5-6; T = --
CM(I) = 017°; CM(II) = 109°
$B = -1^{\circ}.20$; $B' = +0^{\circ}.70$
Titan off ball to left, with shadow to upper left of ball center.

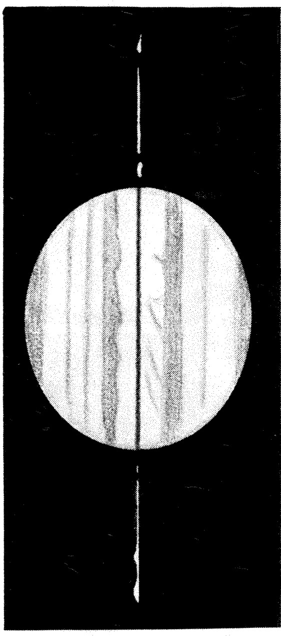


J. Sabia (Photograph)
1980 MAY 04, 01:30 U.T.
24 cm. Rr.; e.f/103.9
Plus-X, 5 Sec.
CM(I) = 042°; CM(II) = 334°
$B = -1^{\circ}.49$; $B' = +0^{\circ}.95$

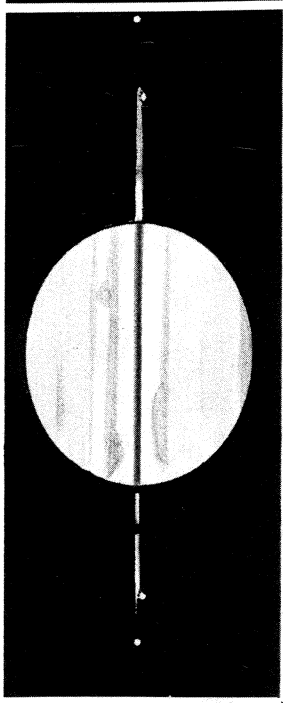


D. Troiani
1980 MAY 30, 03:47 - 04:10 U.T.
25 cm. Rl.; 283X
S = 9; T = +6.0
CM(I) = 104-118°; CM(II) = 281-295°
$B = -1^{\circ}.53$; $B' = +1^{\circ}.35$
Satellite identifications uncertain; satellites off rings to the right may be Tethys (on left) and Rhea (on right).

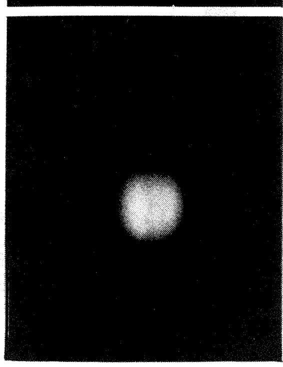
Figure 16. Selected A.L.P.O. Drawings and Photograph of Saturn During the 1979-80 Apparition.



A. Lavega
1980 JUL 23, 20:30 U.T.
123 cm. Rl.
CM(I) = 181°; CM(II) = 048°. B = $+0^{\circ}.03$; B' = $+2^{\circ}.18$
Bright ring condensations to left possibly Mimas (to left) and Dione (to right). Bright point near ball to the right is possibly Tethys.



D. Troiani
1980 JUN 17, 03:37 - 03:53 U.T.
41 cm. Rl.; 365X
S = 7; T = +6.0
CM(I) = $168\text{-}178^{\circ}$; CM(II) = $130\text{-}139^{\circ}$
B = $-1^{\circ}.24$; B' = $+1^{\circ}.62$
Satellites: To left of disk, Tethys off rings and Dione on rings; to right, Enceladus on rings, Rhea off rings.



J. Westfall (Photograph)
1980 JUN 07, 05:06 U.T.
25 cm. Rl.; e.f/45.3
Kodak 2415, 8 Sec.
CM(I) = 062°; CM(II) = 341°
B = $-1^{\circ}.43$; B' = $+1^{\circ}.47$

Notes on Saturn Images on Pages 242-244. All drawings and photographs are shown as simple inverted images with south at the top. The term inverted may seem a little inconsistent from page to page, but the printed captions on each page should show clearly what direction is regarded as erect.

When given in the captions, the seeing (S) is on a scale of 0 (worst) to 10 (perfect). It is perfectly true that this scale is subjective in use and that the two end points are poorly defined, though 10 does require a complete absence of detectable atmospheric blurring of the telescope image. Many other seeing scales have been proposed, and some of them attempt to measure the actual telescopic resolution at the time of observation. However, the scale described is the one most widely used by American amateur planetary observers.

The transparency (T) is the stellar magnitude of the faintest star visible to the naked eye. The estimate is for the position in the sky of Saturn, or whatever other object is being observed. When moonlight or twilight are present, the observer attempts to allow for their effects in making his estimate.

The quantity B is the tilt of the axis of Saturn toward the Earth, and B' is its tilt toward the Sun. The plus sign means north; the minus sign, south. The Earth and the Sun are on the same side of the plane of the rings when the signs of B and B' agree. If B and B' have unlike signs, then the Earth and the Sun are on opposite sides of this plane. In other words, we are then looking at the dark or unilluminated side of the rings.

The central meridians of longitude (CM) in Systems I and II have perhaps been sufficiently explained on pages 231-234. The tables used in computing 1979 Saturn CM longitudes are in Journal A.L.P.O., Vol. 27, Nos. 9-10, pp. 176-177, March, 1979. Those used for 1980 observations are in Journal A.L.P.O., Vol. 28, Nos. 3-4, pp. 66-67, January, 1980.

Drawing the varying outline of Saturn and its rings correctly is not easy. Forms to accomplish this task can be obtained from Saturn Recorder Julius Benton, 1100-A Vincent Road, Warrington, PA 18976. Their use will save time and insure improved accuracy.

(text continued from page 241)

Taken as a whole, the SEB was lighter in terms of overall intensity in 1979-80 than in 1978-79 (by a mean factor of 0.8); and its color was described as diffuse greyish-brown to reddish-brown. Looking at all the belt areas in 1979-80, the SEB (as a whole) was second in darkness only to the North Equatorial Belt (NEB) taken as a single belt (by a mean factor of 0.4).

The SEB_s was slightly brighter in 1979-80 by a mean factor of 0.4 than in 1978-79, and the SEB_n was always darker than the SEB_s throughout 1979-80 by a mean intensity factor of 1.0. The SEB_n, the darkest belt on the globe of Saturn during 1979-80, was described as being dark grey to brownish-grey, while the SEB_s was more diffuse grey to brownish-grey in hue.

As a single belt, the SEB showed more activity in 1979-80 than in 1978-79. Fairly long-lived dark condensations in the SEB (six used in subsequent computations) were followed by Westfall and yielded a mean rotation period of $10^h 15^m 08\overset{s}{.}8 \pm 2.7$.[14] No other observers submitted data to supplement the data supplied by Westfall for the SEB features.

<u>Equatorial Zone (EZ)</u>. The EZ_n led the list of Saturnian features in overall mean brightness throughout the 1979-80 period. Taking into account the fact that the EZ_s was utilized as the intensity reference standard for 1979-80 because of the virtual invisibility of the outer third of Ring B, the mean intensity of the EZ was difficult to evaluate with any degree of objectivity.

The coloration of the EZ was consistently yellowish-white in 1979-80, and the entire zone was usually regular, uniform in overall intensity, and featureless. Transient diffuse streaks and festoons were sometimes suspected, but the area was usually devoid of detail.

Comparatively speaking, the EZ_n was not so bright as the EZ_s throughout the 1979-80 period; but recall again that the EZ_s was used as the intensity standard at a fixed value of 7.0.

The Equatorial Belt (or Band), the EB, was not reported as a suspected or distinct feature during 1979-80.

<u>Shadow of the Globe on the Rings</u>. The shadow of the globe on the ring system was not reported during 1979-80. The rings, of course, were almost on edge.

<u>Shadow of the Rings on the Globe</u>. The projection of the ring shadow on the globe during 1979-80 was reported as a very dark greyish linear feature crossing the globe, usually of regular geometric configuration along its extent.

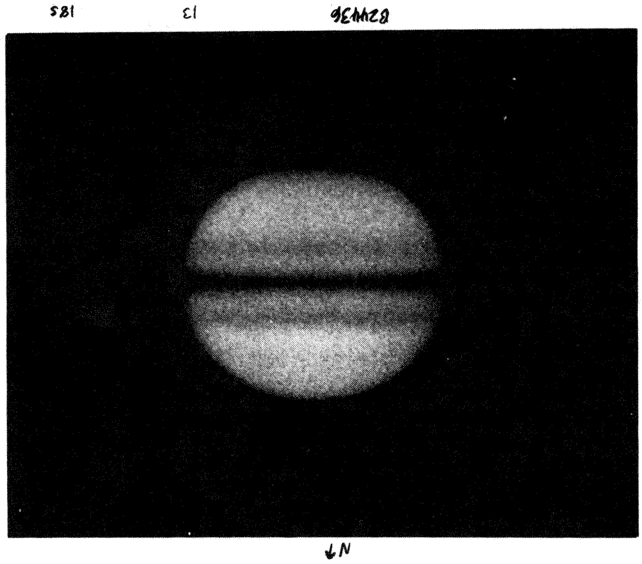
<u>Northern Portions of the Globe</u>. As early as the 1977-1978 apparition, more and more of the northern hemisphere of Saturn became visible to observers on Earth; and in the 1979-80 period it was possible to see approximately equal portions of the northern and southern hemispheres of Saturn. In much the same way as the analytical treatment of visual numerical intensity data has been carried out for southern hemisphere features since 1966-67, we shall begin here comparative investigations of Saturnian northern hemisphere phenomena.

Saturnian Features	Mean Intensities[3,4,5] 1977-78	1978-79	1979-80	Mean Intensity Change for 1978-79 and 1979-80
ZONES:				
NTeZ	---	6.9	6.6	Darker (0.3)
NTrZ	---	6.0	5.9	Darker (0.1)
EZ_n	---	---	6.8	---
NPR	5.2	5.2	5.2	Unchanged
NEB Z	---	---	---	---
BELTS:				
NTeB	---	4.5	---	---
NEB	---	3.9	3.4	Darker (0.5)
NEB_n	---	---	4.6	---
NEB_s	---	---	3.6	---

The only feature of comparable significance with previous apparitions and 1979-80 with respect to the northern hemisphere is the North Polar Region (NPR). In 1977-78, the mean intensity of this area was 5.2, in 1978-79 the recorded mean intensity was also 5.2, and in 1979-80 the mean intensity was again 5.2, showing a very stable mean intensity since 1977-78.

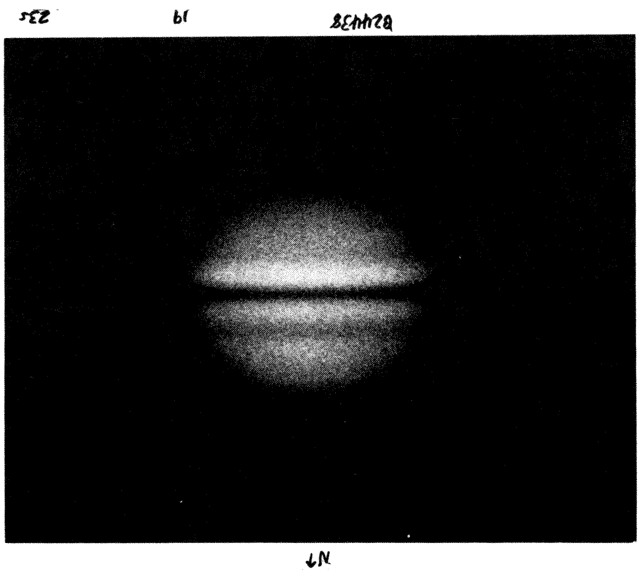
Looking at the intensity values above, it is noticed that the NTeZ (North Temperate Zone) and the NTrZ (North Tropical Zone) were slightly darker by

Figure 17. NEW MEXICO STATE UNIVERSITY OBSERVATORY PHOTOGRAPHS OF SATURN IN DIFFERENT WAVELENGTHS DURING THE 1979-80 APPARITION.



R. Suggs, New Mexico State University (Photograph)
1980 APR 27, 04:42 U.T.
61 cm. Rl.
Kodak III-0, 8 Sec.
Blue light, 4300 Å

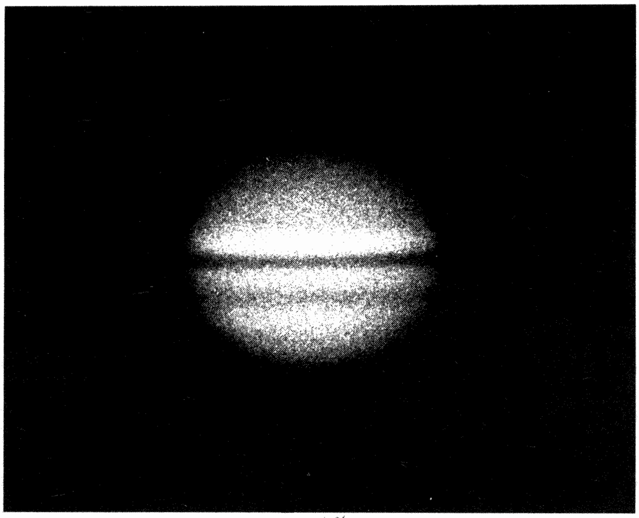
$CM(I) = 007^{\circ}$; $CM(II) = 159^{\circ}$
$B = -1^{\circ}.39$; $B' = +0^{\circ}.84$



R. Suggs, New Mexico State University (Photograph)
1980 APR 27, 05:01 U.T.
61 cm. Rl.
Kodak III-F, 10 Sec. Red light, 6200 Å

$CM(I) = 018^{\circ}$; $CM(II) = 169^{\circ}$
$B = -1^{\circ}.39$; $B' = +0^{\circ}.84$

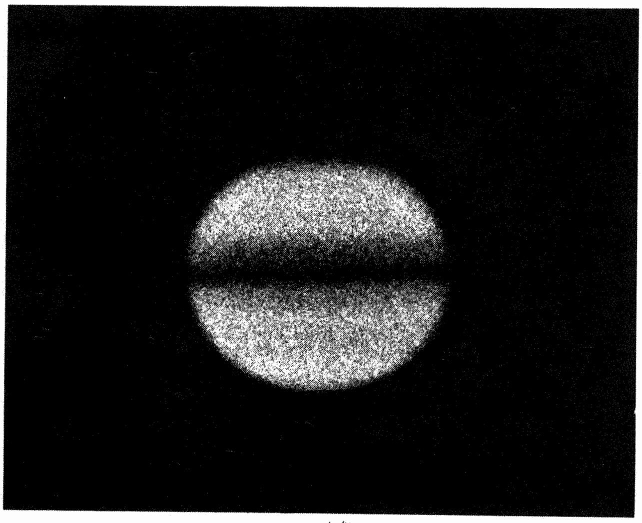
Figure 18. NEW MEXICO STATE UNIVERSITY OBSERVATORY PHOTOGRAPHS OF SATURN IN DIFFERENT WAVELENGTHS DURING THE 1979-80 APPARITION.



↓N

R. Suggs, New Mexico State University (Photograph)
1980 APR 27, 05:13 U.T.
61 cm. Rl.
Kodak I-N, 17 Sec.
Infrared light, 7600 Å

CM(I) = 024°; CM(II) = 176°
B = -1°.39; B' = +0°.84



↓N

R. Suggs, New Mexico State University (Photograph)
1980 MAY 14, 03:36 U.T.
61 cm. Rl.
Kodak 103a-O, 12 Sec.
Ultraviolet light, 3600 Å

CM(I) = 276°; CM(II) = 245°
B = -1°.57; B' = +1°.10

respective mean factors of 0.3 and 0.1 than in 1978-79. These northern hemisphere zones were about equal in mean intensity to their southern hemisphere counterparts in 1979-80.

Turning our attention to the belts of Saturn's northern hemisphere, we find that the NEB (North Equatorial Belt) was darker in 1979-80 than it was in 1978-79, with all other belts or belt components in the northern hemisphere not comparable at this point in time with past apparitions. As time passes, it will be possible to get a better idea as to how our comparative results will take form, particularly since it is usually customary to compare features that are seen from one apparition to the next. Comparing belts in the northern hemisphere of Saturn to those in the southern hemisphere which are suitable counterparts, the SEB_s was darker than the NEB_n by a mean factor of 0.5 (NEB_n and SEB_s have about the same numerical latitudes), while the SEB_n was darker than the NEB_s by a mean factor of 0.6.

Activity in the north resembled that in the southern hemisphere of the planet within certain limits. Faint mottlings, inconspicuous brightenings, and vague festoon activity could be suspected in the northern zones, while condensations, very diffuse spots, and amorphous markings were seen in the belts on occasion. As with the southern hemisphere, we shall deal with specific summary information on the various belts and zones of the northern hemisphere in the following paragraphs. Note that as we proceeded northward in our summary discussion of southern hemisphere phenomena, beginning in the extreme south at the polar limb, so shall we continue this procedure toward the north limb of the planet (north polar point).

<u>North Equatorial Belt (NEB)</u>. Throughout 1979-80 the NEB was seldom differentiated into components, very much like the case of the SEB to the south; and it exhibited a diffuse dark grey to greyish-brown hue. The NEB (as a whole) was somewhat greater in overall width than belts elsewhere in the northern hemisphere, and it was slightly darker (by a mean factor of 0.4) than the SEB (also considered as a single feature) during 1979-80. Fairly long-lived dark condensations were recorded in the NEB by Westfall equal in number to those he recorded in the SEB during 1979-80, yielding a mean rotation period for the spots in the NEB of $10^h14^m31\overset{s}{.}6$ ±4.7.[14] Other individuals reported only subtle nonuniformities in intensity along the extent of the NEB and very elusive disturbances during the 1979-80 apparition. The NEB (as a whole) was the darkest belt on the globe of Saturn throughout 1979-80. When the NEB was seen divided into the NEB_n and NEB_s, it was always the NEB_s which was the darker of the two components, by a mean factor of 1.0.

The North Equatorial Belt Zone (NEB Z) was not reported in 1979-80; and like the SEB when it was seen divided into components, there was a gradation toward a brighter intensity in the direction of the polar regions with no variation in uniformity or definition of boundaries within the belt.

<u>North Tropical Zone (NTrZ)</u>. The NTrZ was third behind the EZ_n and NTeZ in mean intensity in the northern hemisphere of Saturn in 1979-80, being described as having a light yellowish-grey color and being uniform in intensity along its entire global extent. The only feature in the southern hemisphere which closely resembled the NTrZ in mean intensity was the STrZ, the latter being brighter by a mean factor of 0.1, hardly a significant amount.

<u>North Temperate Belt (NTeB)</u>. During 1979-80 the NTeB was not reported by observers submitting reports to the Saturn Section.

<u>North Temperate Zone (NTeZ)</u>. With the exception of the Ez_n, the NTeZ was the brightest zone on the globe of Saturn. The NTeZ had constant intensity throughout its linear extent from limb to limb, and the coloration of the zone was reported to be dusky yellowish-white. In comparison with the STeZ, the brightness factor in favor of the NTeZ amounted to a mean value of 0.1, not significant at all and about the same as noted in 1978-79.

<u>North North Temperate Belt (NNTeB)</u>. No reports were received of the NNTeB during 1979-80.

<u>North North Temperate Zone (NNTeZ)</u>. Observational reports of a definite NNTeZ were lacking during the 1979-80 apparition.

<u>North Polar Region (NPR)</u>. The NPR remained unchanged in mean intensity since 1977-78 and 1978-79 into 1979-80; and the region was most frequently described as a very dusky yellowish-grey, undifferentiated area of relatively uniform intensity, showing no true gradient toward the northern polar limb in intensity that might yield a NPC (North Polar Cap). No indication of a NPB (North Polar Band) was apparent in 1979-80. The NPR was brighter than the similar SPR by a mean intensity factor of 0.2.

<u>Latitude Data</u>. Visual latitude values were entirely lacking in the 1979-80 observational data, and observers are strongly encouraged to follow up on this meaningful program in future apparitions. Details for carrying out latitude estimates and measurements for Saturnian belts and zone areas can be studied in <u>The Saturn Handbook</u>.[15]

(to be continued)

THE LUNAR ECLIPSES OF 1983: JUNE 24/25 AND DECEMBER 19/20

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

General

A.L.P.O. observers will be favored by two lunar eclipses in 1983, one partial and one penumbral. Both will be visible from the western hemisphere; and interested observers may obtain an A.L.P.O. "Lunar Eclipse Observation Form" by sending a stamped self-addressed envelope to the writer (address on inside back cover), who can also supply copies of the A.L.P.O. Lunar Eclipse Handbook (the latter for $1.50). Results of observations should be sent to Prof. Walter H. Haas (address on cover), with a copy of umbral contact timings to Sky and Telescope (49 Bay State Road, Cambridge, MA 02238-1290).

Partial Lunar Eclipse: June 24/25, 1983

Circumtances.--Portions of this eclipse will be visible throughout the Pacific and the Americas, with the best visibility on the United States west coast and Hawaii. Alaska and northwest Canada will be less favored because of the Moon's southern declination (24°1 S). The eclipse magnitude will be 0.339, with the northern third of the Moon in the umbra at mid-eclipse. The Universal and Local Daylight Times of the eclipse events are given below:

	1983 JUNE 25				JUNE 24		
	U.T.	ADT	EDT	CDT	MDT	PDT	AHDT
Moon enters penumbra	05:43.0	02:43.0[a]	01:43.0	00:43.0	23:43.0	22:43.0	20:43.0[a]
Moon enters umbra*	07:14.4	04:14.4[c]	03:14.4	02:14.4	01:14.4	00:14.4	22:14.4
Middle of the eclipse	08:22.3	05:22.3[s]	04:22.3[n]	03:22.3	02:22.3	01:22.3	23:22.3
Moon leaves umbra*	09:30.1	06:30.1[s]	05:30.1[c]	04:30.1[n]	03:30.1[a]	02:30.1	00:30.1
Moon leaves penumbra	11:01.6	08:01.6[s]	07:01.6[s]	06:01.6[s]	05:01.6[c]	04:01.6[a]	02:01.6

Notes: [s]Sun above horizon, Moon below. [c]Civil twilight. [n]Nautical twilight. [a]Astronomical twilight. Sky conditions are for 40°N, except for ADT (50°N) and AHDT (20°N).

*Position angles of umbral contact: First, 040°; Last, 329°.

Observations.--Even with a partial lunar eclipse, several forms of observations can be made, with the instruments ranging from the naked eye to a large telescope. Some such observations are:

1. Timed general observations of the appearance of the penumbra, the umbral edge, and the umbral interior, in the form of notes, drawings, and/or photographs.

2. Investigations of selected lunar areas for possible eclipse-induced LTP (Lunar Transient Phenomena). Observers with photoelectric photometers may wish to attempt to detect areas of lunar luminescence in the penumbra--for this eclipse, the craters Arsitarchus, Copernicus, and Kepler are possibilities. Near-simultaneous readings in R (or V) and B (or U) are recommended, in order to detect short-term enhancements in particular bands.

3. Umbral contact timings, for both ingress and egress. Besides the two limb contacts, crater timings are recommended. With craters, one should time (to 0.1 min.) the umbral contacts for opposite rims of the crater, and then take the mean. The approximate Universal Times (to the nearest 5 minutes) of umbral immersion and emersion, respectively, of the six craters recommended, are:

Aristarchus (07:30/08:30)
Plato (07:30/09:10)
Timocharis (07:45/08:45)
Aristoteles (07:45/09:20)
Pytheas (07:50/08:35)
Eudoxus (07:50/09:15)

Penumbral Lunar Eclipse: December 19/20, 1983

Circumstances.--Most or all of this eclipse will be visible throughout Europe, Africa, South America, and most of North America (however, the Sun will not have set on the west coast of North America when the eclipse begins). The Moon's northerly declination (24°.5 N) will favor northern hemisphere observers. With a penumbral magnitude of 0.914, most of the Moon will be within the penumbra; and shading should be quite evident near the Moon's south limb, which will be only 4 arc-minutes north of the umbral edge, and illuminated only about 11 percent as brightly as in full sunlight. The Universal and Local Standard Times of this eclipse's stages are given below:

1983 DECEMBER 19

	U.T.	AST	EST	CST	MST	PST	AHST
Moon enters penumbra*	DEC 19 23:45.9	19:45.9	18:45.9	17:45.9[a]	16:45.9[c]	15:45.9[s]	13:45.9[s,s]
Middle of the eclipse	DEC 20 01:49.0	21:49.0	20:49.0	19:49.0	18:49.0	17:49.0[a]	15:49.0[s,c]
Moon leaves penumbra*	DEC 20 03:52.3	23:52.3	22:52.3	21:52.3	20:52.3	19:52.3	17:52.3[n,-]

Notes: s, c, n, a as before. Sky conditions are for 40°N, except for AST (50°N) and AHST (20°N, 60°N).
*Position angles of penumbral contact: First, 127°; Last, 220°.

Observations.--With a penumbral lunar eclipse, the range of useful observations is more limited, but the following are possible:

1. Timed general observations of the visibility and appearance of the penumbra, in the form of notes, drawings, and/or photographs.

2. Using a photoelectric photometer, searches for lunar luminescence as described for the previous eclipse. Given the conditions of this eclipse, the crater Tycho is a likely candidate.

1983 LUNAR PHYSICAL EPHEMERIS

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

Introduction

Lunar observers require the values of several variable lunar quantities in order to plan and interpret their observations. Most frequently, they need the Earth's selenographic longitude and latitude, and the Sun's selenographic colongitude and latitude. These quantities are given for 0 hours, U.T., for each day of the year, in The Astronomical Almanac, prepared by the U.S. Naval Observatory. Unfortunately, the price of this publication increases each year, as its date of availability becomes later and later. Thus, for use in the Luna Incognita program, the writer has written a BASIC-language Apple-II computer program to generate these data; and they are presented here for use by A.L.P.O. lunar observers in general who may not have access to The Astronomical Almanac for 1983. It is hoped that the A.L.P.O. will publish such ephemerides each year.

Quantities

The Earth's selenographic longitude and latitude specify the position on the Moon where the Earth's center is overhead (these are also called "geocentric librations"). Their sign conventions are that positive longitudes are lunar east (i.e., toward Mare Crisium) and negative longitudes are lunar west. With latitude, positive indicates north; and negative indicates south. The values of these librations are useful, for example, in determining which limb areas are best visible on a given date. Observers should note, though, that these values are strictly accurate only when the Moon is in one's zenith. The apparent (topocentric) librations at a site may be as much as one degree different from the geocentric (i.e., if the Moon is on one's horizon): the procedure for making this correction is given on pages

(text continued on page 254)

MON.	DAY	EARTH'S SELEN. LONG.	LAT.	SUN'S SELEN. COLONG.	LAT.
JAN	01	+1.99	-3.09	109.44	-0.17
JAN	02	+3.84	-4.55	121.56	-0.21
JAN	03	+5.40	-5.68	133.69	-0.24
JAN	04	+6.60	-6.43	145.83	-0.28
JAN	05	+7.37	-6.77	157.97	-0.31
JAN	06	+7.71	-6.73	170.12	-0.34
JAN	07	+7.63	-6.34	182.27	-0.37
JAN	08	+7.18	-5.64	194.44	-0.40
JAN	09	+6.42	-4.68	206.61	-0.42
JAN	10	+5.41	-3.53	218.78	-0.45
JAN	11	+4.22	-2.22	230.96	-0.47
JAN	12	+2.91	-0.82	243.14	-0.49
JAN	13	+1.52	+0.61	255.33	-0.52
JAN	14	+0.10	+2.01	267.52	-0.54
JAN	15	-1.30	+3.32	279.70	-0.56
JAN	16	-2.65	+4.49	291.89	-0.58
JAN	17	-3.91	+5.46	304.08	-0.60
JAN	18	-5.05	+6.19	316.26	-0.62
JAN	19	-6.03	+6.65	328.44	-0.64
JAN	20	-6.81	+6.80	340.61	-0.66
JAN	21	-7.33	+6.64	352.78	-0.68
JAN	22	-7.56	+6.14	004.94	-0.70
JAN	23	-7.44	+5.30	017.09	-0.72
JAN	24	-6.94	+4.15	029.24	-0.75
JAN	25	-6.03	+2.72	041.38	-0.78
JAN	26	-4.72	+1.08	053.51	-0.81
JAN	27	-3.05	-0.66	065.64	-0.84
JAN	28	-1.13	-2.38	077.77	-0.87
JAN	29	+0.92	-3.93	089.90	-0.90
JAN	30	+2.93	-5.19	102.02	-0.93
JAN	31	+4.74	-6.09	114.15	-0.96
FEB	01	+6.19	-6.57	126.28	-0.99
FEB	02	+7.19	-6.63	138.42	-1.02
FEB	03	+7.70	-6.32	150.57	-1.04
FEB	04	+7.72	-5.68	162.72	-1.06
FEB	05	+7.29	-4.78	174.88	-1.09
FEB	06	+6.49	-3.67	187.04	-1.11
FEB	07	+5.41	-2.42	199.21	-1.13
FEB	08	+4.12	-1.07	211.39	-1.15
FEB	09	+2.72	+0.32	223.57	-1.16
FEB	10	+1.29	+1.69	235.76	-1.18
FEB	11	-0.13	+3.00	247.95	-1.19
FEB	12	-1.47	+4.18	260.15	-1.21
FEB	13	-2.70	+5.19	272.35	-1.22
FEB	14	-3.79	+5.97	284.54	-1.23
FEB	15	-4.73	+6.48	296.74	-1.24
FEB	16	-5.50	+6.69	308.93	-1.25
FEB	17	-6.09	+6.57	321.12	-1.26
FEB	18	-6.49	+6.13	333.31	-1.27
FEB	19	-6.66	+5.37	345.49	-1.28
FEB	20	-6.60	+4.31	357.66	-1.29
FEB	21	-6.25	+2.98	009.83	-1.31
FEB	22	-5.59	+1.46	021.99	-1.32
FEB	23	-4.59	-0.19	034.15	-1.34
FEB	24	-3.26	-1.85	046.30	-1.35
FEB	25	-1.65	-3.40	058.44	-1.37
FEB	26	+0.15	-4.73	070.58	-1.39
FEB	27	+1.99	-5.74	082.72	-1.41
FEB	28	+3.73	-6.34	094.86	-1.42

MON.	DAY	EARTH'S SELEN. LONG.	LAT.	SUN'S SELEN. COLONG.	LAT.
MAR	01	+5.20	-6.52	107.00	-1.44
MAR	02	+6.28	-6.29	119.14	-1.45
MAR	03	+6.89	-5.70	131.29	-1.46
MAR	04	+7.00	-4.83	143.45	-1.48
MAR	05	+6.66	-3.74	155.61	-1.49
MAR	06	+5.91	-2.51	167.77	-1.50
MAR	07	+4.85	-1.18	179.95	-1.50
MAR	08	+3.57	+0.17	192.13	-1.51
MAR	09	+2.18	+1.52	204.32	-1.52
MAR	10	+0.75	+2.80	216.51	-1.52
MAR	11	-0.62	+3.97	228.71	-1.53
MAR	12	-1.88	+4.98	240.92	-1.53
MAR	13	-2.96	+5.78	253.13	-1.53
MAR	14	-3.86	+6.32	265.34	-1.53
MAR	15	-4.55	+6.58	277.55	-1.53
MAR	16	-5.03	+6.51	289.76	-1.53
MAR	17	-5.32	+6.11	301.97	-1.53
MAR	18	-5.43	+5.38	314.18	-1.52
MAR	19	-5.37	+4.34	326.38	-1.52
MAR	20	-5.14	+3.05	338.58	-1.52
MAR	21	-4.73	+1.57	350.77	-1.52
MAR	22	-4.13	-0.02	002.96	-1.51
MAR	23	-3.31	-1.63	015.14	-1.51
MAR	24	-2.27	-3.16	027.31	-1.51
MAR	25	-1.02	-4.50	039.48	-1.51
MAR	26	+0.38	-5.55	051.64	-1.51
MAR	27	+1.83	-6.23	063.80	-1.51
MAR	28	+3.22	-6.51	075.96	-1.51
MAR	29	+4.42	-6.37	088.11	-1.51
MAR	30	+5.32	-5.84	100.27	-1.51
MAR	31	+5.82	-5.00	112.43	-1.51
APR	01	+5.90	-3.91	124.59	-1.50
APR	02	+5.56	-2.66	136.76	-1.50
APR	03	+4.85	-1.31	148.93	-1.49
APR	04	+3.83	+0.07	161.11	-1.49
APR	05	+2.60	+1.42	173.30	-1.48
APR	06	+1.24	+2.70	185.49	-1.48
APR	07	-0.14	+3.87	197.69	-1.47
APR	08	-1.46	+4.88	209.90	-1.47
APR	09	-2.63	+5.69	222.11	-1.46
APR	10	-3.60	+6.27	234.33	-1.45
APR	11	-4.33	+6.57	246.55	-1.44
APR	12	-4.79	+6.55	258.78	-1.43
APR	13	-4.98	+6.20	271.01	-1.41
APR	14	-4.94	+5.51	283.23	-1.40
APR	15	-4.68	+4.50	295.46	-1.38
APR	16	-4.25	+3.21	307.69	-1.37
APR	17	-3.68	+1.72	319.91	-1.35
APR	18	-3.00	+0.10	332.13	-1.34
APR	19	-2.22	-1.53	344.34	-1.32
APR	20	-1.35	-3.08	356.54	-1.30
APR	21	-0.40	-4.44	008.74	-1.29
APR	22	+0.62	-5.52	020.94	-1.27
APR	23	+1.67	-6.27	033.12	-1.26
APR	24	+2.70	-6.62	045.30	-1.24
APR	25	+3.63	-6.56	057.48	-1.22
APR	26	+4.38	-6.11	069.65	-1.21
APR	27	+4.88	-5.31	081.82	-1.19
APR	28	+5.08	-4.24	093.99	-1.17
APR	29	+4.95	-2.97	106.17	-1.15
APR	30	+4.48	-1.59	118.34	-1.14

MON.	DAY	EARTH'S SELEN. LONG.	LAT.	SUN'S SELEN. COLONG.	LAT.
MAY	01	+3.71	-0.16	130.52	-1.12
MAY	02	+2.68	+1.25	142.71	-1.10
MAY	03	+1.46	+2.58	154.90	-1.09
MAY	04	+0.14	+3.78	167.10	-1.07
MAY	05	-1.21	+4.83	179.30	-1.05
MAY	06	-2.49	+5.67	191.51	-1.04
MAY	07	-3.62	+6.28	203.73	-1.02
MAY	08	-4.53	+6.63	215.95	-1.01
MAY	09	-5.17	+6.68	228.18	-0.99
MAY	10	-5.49	+6.40	240.42	-0.97
MAY	11	-5.49	+5.79	252.66	-0.95
MAY	12	-5.17	+4.85	264.90	-0.93
MAY	13	-4.57	+3.60	277.14	-0.90
MAY	14	-3.74	+2.10	289.38	-0.88
MAY	15	-2.75	+0.45	301.62	-0.85
MAY	16	-1.66	-1.25	313.86	-0.83
MAY	17	-0.52	-2.87	326.09	-0.80
MAY	18	+0.61	-4.31	338.32	-0.77
MAY	19	+1.68	-5.48	350.54	-0.75
MAY	20	+2.68	-6.30	002.75	-0.72
MAY	21	+3.54	-6.73	014.96	-0.69
MAY	22	+4.26	-6.75	027.16	-0.67
MAY	23	+4.78	-6.38	039.36	-0.64
MAY	24	+5.08	-5.66	051.55	-0.61
MAY	25	+5.14	-4.64	063.73	-0.58
MAY	26	+4.94	-3.39	075.92	-0.55
MAY	27	+4.48	-2.00	088.10	-0.53
MAY	28	+3.78	-0.53	100.29	-0.50
MAY	29	+2.86	+0.93	112.47	-0.47
MAY	30	+1.75	+2.32	124.66	-0.45
MAY	31	+0.50	+3.59	136.86	-0.43
JUN	01	-0.82	+4.70	149.06	-0.40
JUN	02	-2.15	+5.60	161.26	-0.38
JUN	03	-3.41	+6.27	173.47	-0.36
JUN	04	-4.54	+6.67	185.69	-0.34
JUN	05	-5.45	+6.79	197.91	-0.32
JUN	06	-6.09	+6.60	210.14	-0.30
JUN	07	-6.40	+6.09	222.38	-0.28
JUN	08	-6.33	+5.25	234.62	-0.26
JUN	09	-5.89	+4.10	246.87	-0.23
JUN	10	-5.09	+2.67	259.12	-0.21
JUN	11	-3.96	+1.04	271.37	-0.18
JUN	12	-2.59	-0.69	283.62	-0.15
JUN	13	-1.06	-2.39	295.87	-0.12
JUN	14	+0.51	-3.94	308.12	-0.09
JUN	15	+2.02	-5.23	320.36	-0.06
JUN	16	+3.38	-6.16	332.60	-0.03
JUN	17	+4.51	-6.70	344.83	+00.00
JUN	18	+5.37	-6.82	357.05	+0.03
JUN	19	+5.94	-6.54	009.27	+0.06
JUN	20	+6.19	-5.90	021.48	+0.09
JUN	21	+6.15	-4.96	033.68	+0.13
JUN	22	+5.84	-3.77	045.88	+0.16
JUN	23	+5.27	-2.41	058.08	+0.19
JUN	24	+4.50	-0.96	070.27	+0.22
JUN	25	+3.54	+0.52	082.46	+0.25
JUN	26	+2.43	+1.96	094.66	+0.28
JUN	27	+1.22	+3.29	106.85	+0.31
JUN	28	-0.08	+4.46	119.04	+0.33
JUN	29	-1.41	+5.42	131.24	+0.36
JUN	30	-2.73	+6.15	143.44	+0.38

MON.	DAY	EARTH'S SELEN. LONG.	LAT.	SUN'S SELEN. COLONG.	LAT.
JUL	01	-3.98	+6.62	155.65	+0.40
JUL	02	-5.10	+6.81	167.86	+0.42
JUL	03	-6.04	+6.69	180.08	+0.44
JUL	04	-6.73	+6.27	192.30	+0.45
JUL	05	-7.10	+5.55	204.53	+0.47
JUL	06	-7.11	+4.52	216.77	+0.49
JUL	07	-6.70	+3.21	229.01	+0.51
JUL	08	-5.87	+1.67	241.26	+0.53
JUL	09	-4.63	-0.01	253.51	+0.55
JUL	10	-3.05	-1.73	265.77	+0.58
JUL	11	-1.22	-3.35	278.02	+0.60
JUL	12	+0.71	-4.75	290.28	+0.63
JUL	13	+2.60	-5.82	302.53	+0.65
JUL	14	+4.29	-6.48	314.78	+0.68
JUL	15	+5.67	-6.72	327.02	+0.71
JUL	16	+6.66	-6.53	339.25	+0.74
JUL	17	+7.22	-5.97	351.48	+0.77
JUL	18	+7.37	-5.10	003.70	+0.80
JUL	19	+7.14	-3.98	015.91	+0.83
JUL	20	+6.58	-2.68	028.12	+0.86
JUL	21	+5.77	-1.27	040.33	+0.89
JUL	22	+4.75	+0.18	052.52	+0.92
JUL	23	+3.59	+1.61	064.72	+0.95
JUL	24	+2.34	+2.95	076.91	+0.97
JUL	25	+1.04	+4.16	089.10	+1.00
JUL	26	-0.29	+5.17	101.29	+1.02
JUL	27	-1.61	+5.96	113.49	+1.04
JUL	28	-2.88	+6.48	125.68	+1.05
JUL	29	-4.08	+6.72	137.88	+1.07
JUL	30	-5.17	+6.67	150.08	+1.08
JUL	31	-6.09	+6.32	162.29	+1.09
AUG	01	-6.81	+5.67	174.50	+1.10
AUG	02	-7.26	+4.73	186.72	+1.11
AUG	03	-7.37	+3.53	198.94	+1.12
AUG	04	-7.10	+2.11	211.17	+1.13
AUG	05	-6.40	+0.53	223.41	+1.14
AUG	06	-5.25	-1.13	235.65	+1.15
AUG	07	-3.68	-2.75	247.90	+1.17
AUG	08	-1.79	-4.21	260.15	+1.18
AUG	09	+0.30	-5.38	272.40	+1.20
AUG	10	+2.41	-6.17	284.65	+1.21
AUG	11	+4.34	-6.53	296.90	+1.23
AUG	12	+5.94	-6.45	309.15	+1.25
AUG	13	+7.10	-5.97	321.38	+1.27
AUG	14	+7.76	-5.14	333.62	+1.30
AUG	15	+7.93	-4.06	345.84	+1.32
AUG	16	+7.65	-2.80	358.06	+1.34
AUG	17	+7.00	-1.43	010.27	+1.36
AUG	18	+6.07	-0.02	022.48	+1.38
AUG	19	+4.92	+1.38	034.68	+1.40
AUG	20	+3.66	+2.71	046.87	+1.42
AUG	21	+2.32	+3.91	059.06	+1.44
AUG	22	+0.98	+4.94	071.25	+1.46
AUG	23	-0.33	+5.76	083.44	+1.47
AUG	24	-1.59	+6.32	095.62	+1.48
AUG	25	-2.77	+6.61	107.80	+1.49
AUG	26	-3.85	+6.60	119.99	+1.49
AUG	27	-4.82	+6.29	132.18	+1.49
AUG	28	-5.65	+5.68	144.37	+1.49
AUG	29	-6.30	+4.79	156.56	+1.49
AUG	30	-6.74	+3.65	168.76	+1.48
AUG	31	-6.91	+2.30	180.97	+1.48

		EARTH'S SELEN.		SUN'S SELEN.	
MON.	DAY	LONG.	LAT.	COLONG.	LAT.
SEP	01	-6.76	+0.80	193.18	+1.48
SEP	02	-6.22	-0.78	205.40	+1.47
SEP	03	-5.26	-2.35	217.62	+1.47
SEP	04	-3.89	-3.81	229.85	+1.47
SEP	05	-2.16	-5.03	242.09	+1.47
SEP	06	-0.19	-5.92	254.33	+1.48
SEP	07	+1.86	-6.39	266.57	+1.48
SEP	08	+3.81	-6.42	278.81	+1.49
SEP	09	+5.47	-6.02	291.04	+1.49
SEP	10	+6.72	-5.24	303.28	+1.50
SEP	11	+7.48	-4.17	315.51	+1.51
SEP	12	+7.72	-2.91	327.73	+1.52
SEP	13	+7.48	-1.53	339.95	+1.53
SEP	14	+6.85	-0.12	352.16	+1.54
SEP	15	+5.90	+1.28	004.36	+1.55
SEP	16	+4.73	+2.59	016.56	+1.56
SEP	17	+3.44	+3.79	028.75	+1.56
SEP	18	+2.10	+4.82	040.93	+1.57
SEP	19	+0.77	+5.64	053.11	+1.57
SEP	20	-0.50	+6.23	065.29	+1.58
SEP	21	-1.66	+6.55	077.46	+1.57
SEP	22	-2.69	+6.58	089.63	+1.57
SEP	23	-3.60	+6.30	101.80	+1.56
SEP	24	-4.36	+5.72	113.97	+1.55
SEP	25	-4.98	+4.85	126.14	+1.54
SEP	26	-5.44	+3.72	138.32	+1.52
SEP	27	-5.72	+2.39	150.49	+1.50
SEP	28	-5.80	+0.91	162.68	+1.46
SEP	29	-5.62	-0.65	174.86	+1.47
SEP	30	-5.15	-2.20	187.06	+1.45
OCT	01	-4.36	-3.64	199.26	+1.43
OCT	02	-3.23	-4.88	211.47	+1.42
OCT	03	-1.81	-5.82	223.68	+1.40
OCT	04	-0.17	-6.38	235.90	+1.39
OCT	05	+1.57	-6.52	248.12	+1.38
OCT	06	+3.26	-6.22	260.34	+1.37
OCT	07	+4.74	-5.51	272.56	+1.36
OCT	08	+5.88	-4.47	284.79	+1.35
OCT	09	+6.59	-3.18	297.01	+1.35
OCT	10	+6.84	-1.76	309.22	+1.34
OCT	11	+6.65	-0.29	321.43	+1.34
OCT	12	+6.07	+1.15	333.63	+1.33
OCT	13	+5.17	+2.50	345.83	+1.33
OCT	14	+4.04	+3.72	358.02	+1.33
OCT	15	+2.78	+4.77	010.21	+1.32
OCT	16	+1.46	+5.62	022.38	+1.32
OCT	17	+0.17	+6.23	034.56	+1.31
OCT	18	-1.04	+6.58	046.72	+1.30
OCT	19	-2.10	+6.65	058.88	+1.29
OCT	20	-3.00	+6.42	071.04	+1.27
OCT	21	-3.70	+5.88	083.19	+1.25
OCT	22	-4.21	+5.05	095.34	+1.23
OCT	23	-4.53	+3.94	107.50	+1.20
OCT	24	-4.67	+2.60	119.65	+1.18
OCT	25	-4.63	+1.09	131.80	+1.15
OCT	26	-4.42	-0.50	143.96	+1.11
OCT	27	-4.02	-2.08	156.12	+1.08
OCT	28	-3.43	-3.56	168.29	+1.05
OCT	29	-2.63	-4.84	180.46	+1.02
OCT	30	-1.65	-5.83	192.64	+0.99
OCT	31	-0.50	-6.47	204.83	+0.97

		EARTH'S SELEN.		SUN'S SELEN.	
MON.	DAY	LONG.	LAT.	COLONG.	LAT.
NOV	01	+0.76	-6.70	217.02	+0.94
NOV	02	+2.05	-6.50	229.22	+0.92
NOV	03	+3.28	-5.89	241.42	+0.89
NOV	04	+4.34	-4.92	253.63	+0.87
NOV	05	+5.14	-3.66	265.83	+0.85
NOV	06	+5.62	-2.22	278.04	+0.83
NOV	07	+5.73	-0.69	290.24	+0.81
NOV	08	+5.49	+0.83	302.44	+0.80
NOV	09	+4.91	+2.27	314.64	+0.78
NOV	10	+4.04	+3.57	326.83	+0.77
NOV	11	+2.96	+4.68	339.01	+0.75
NOV	12	+1.74	+5.58	351.19	+0.74
NOV	13	+0.45	+6.24	003.36	+0.72
NOV	14	-0.82	+6.64	015.53	+0.71
NOV	15	-2.00	+6.76	027.69	+0.69
NOV	16	-3.03	+6.60	039.84	+0.67
NOV	17	-3.84	+6.13	051.99	+0.65
NOV	18	-4.42	+5.37	064.13	+0.62
NOV	19	-4.72	+4.32	076.27	+0.59
NOV	20	-4.75	+3.01	088.40	+0.56
NOV	21	-4.52	+1.51	100.54	+0.53
NOV	22	-4.05	-0.11	112.67	+0.49
NOV	23	-3.38	-1.76	124.81	+0.45
NOV	24	-2.56	-3.32	136.95	+0.42
NOV	25	-1.61	-4.68	149.09	+0.38
NOV	26	-0.59	-5.76	161.24	+0.34
NOV	27	+0.47	-6.49	173.40	+0.31
NOV	28	+1.51	-6.81	185.56	+0.27
NOV	29	+2.50	-6.71	197.73	+0.24
NOV	30	+3.38	-6.20	209.90	+0.20
DEC	01	+4.12	-5.33	222.09	+0.17
DEC	02	+4.68	-4.15	234.27	+0.14
DEC	03	+5.01	-2.75	246.46	+0.11
DEC	04	+5.09	-1.22	258.65	+0.09
DEC	05	+4.92	+0.34	270.85	+0.06
DEC	06	+4.49	+1.85	283.04	+0.04
DEC	07	+3.80	+3.23	295.23	+0.02
DEC	08	+2.90	+4.44	307.41	-0.01
DEC	09	+1.82	+5.42	319.60	-0.02
DEC	10	+0.61	+6.15	331.77	-0.04
DEC	11	-0.66	+6.62	343.95	-0.06
DEC	12	-1.94	+6.81	356.11	-0.08
DEC	13	-3.14	+6.72	008.27	-0.10
DEC	14	-4.20	+6.33	020.42	-0.12
DEC	15	-5.04	+5.67	032.57	-0.14
DEC	16	-5.60	+4.72	044.71	-0.17
DEC	17	-5.84	+3.51	056.84	-0.20
DEC	18	-5.71	+2.08	068.97	-0.23
DEC	19	-5.22	+0.49	081.10	-0.26
DEC	20	-4.37	-1.17	093.22	-0.29
DEC	21	-3.24	-2.79	105.35	-0.33
DEC	22	-1.89	-4.26	117.47	-0.36
DEC	23	-0.44	-5.46	129.60	-0.40
DEC	24	+1.02	-6.30	141.73	-0.44
DEC	25	+2.37	-6.73	153.87	-0.47
DEC	26	+3.55	-6.73	166.02	-0.51
DEC	27	+4.48	-6.32	178.17	-0.54
DEC	28	+5.15	-5.54	190.33	-0.57
DEC	29	+5.55	-4.45	202.50	-0.60
DEC	30	+5.68	-3.13	214.67	-0.63
DEC	31	+5.57	-1.66	226.85	-0.66

(text continued from page 250)

322, 324, and 325 in The Explanatory Supplement to the Astronomical Ephemeris and the American Ephemeris and Nautical Almanac (London: Her Majesty's Stationery Office, 1961, Rev. 1977).

The selenographic coordinates of the Sun, describing the Moon's lighting conditions, are independent of the observer's position. Colongitude refers to the lunar longitude of the sunrise terminator (strictly speaking, its longitude on the Moon's equator). It is measured from 0 through 360 degrees westward starting at the mean center of the disk. Colongitude is approximately 0° at First quarter, 90° at Full Moon, 180° at Last quarter, and 270° at New Moon. The latitude of the Sun is measured in the same manner as the latitude of the Earth.

Interpolation and Accuracy

The data in this ephemeris are given for 0 hours, U.T., and should be interpolated for the time of observation; they are then normally rounded to 0°.1. Solar latitude changes so slowly that interpolation may be done by eye, but the other three quantities should be interpolated, using a calculator as follows:

1. Take the value for 0^h, U.T. on the next day and subtract from it the value for 0^h, U.T., on the day of observation. (If the calculator has a memory, store this difference; otherwise, write it down.)
2. Convert the hour and minute of observation to decimals of a day as follows: (i) Divide the minute by 60; (ii) Add the hour to the result of (i); (iii) Divide the result of (ii) by 24.
3. Multiply the final result of (iii) by the difference obtained in step 1.
4. Add the result of step 3 to the 0^h, U.T., value for the day of observation; this sum will give the desired result.

The above procedure may seem complicated at first; but, given a calculator, it is faster and more accurate than using tables. More advanced mathematicians may wish to apply second-order interpolation to librations, which do not vary linearly.

When one uses a microcomputer to duplicate the work of the U.S. Naval Observatory, the question of accuracy naturally arises. Probably the greatest source of error in the writer's ephemeris is in his use of a simplified model of the Moon's complex orbit in order to "fit" the equations into a microcomputer. When a trial run for 1981 was compared with that year's Astronomical Almanac's values, the following maximum differences were noted:

Earth's longitude and Sun's latitude = ± 0°.01;
Earth's latitude = ± 0°.06;
Sun's Colongitude = ± 0°.05.

Given the usual procedure of rounding results to 0°.1, the inaccuracies above appear acceptable.

NEW BOOKS RECEIVED

By J. Russell Smith

The Realm of the Nebulae, by Edwin Hubble. Yale University Press, 92A Yale Station, New Haven, Conn. 06520. 1982. 207 pages. Price, paperbound, $8.95; clothbound, $30.00. Notes by J. Russell Smith.

This book was first published in 1936. After an Introduction one finds the following chapters: "The Exploration of Space", "Family Traits of Nebulae", "The Distribution of Nebulae", "Distances of Nebulae", "The Velocity-Distance Relation", "The Local Group", "The General Field", and "The Realm of the Nebulae". There is a suitable Index; and if you are interested in nebulae, you will want this book on your shelf.

* * * * *

Astronomical Calendar 1983, by Guy Ottewell. Astronomical Calendar, Department of Physics, Furman University, Greenville, S.C. 29613. 1983. 61 pages. Illustrated and softbound. Price $10.00, postpaid. Size 11 x 15 inches. Notes by J. Russell Smith.

This has been an annual publication since 1974, and it is designed for the beginner as well as for the experienced observer. Basically, it is composed of twelve monthly star maps with explanations for each map. This part is followed by topics on Magnitude, Elongation, Moon, Tides and Perigee, Young Moon, Old Moon, Eclipses, Mercury and Venus, Mars, Jupiter and Saturn, Uranus and Neptune, Pluto, Meteors, Jupiter's Satellites, Asteroids, Comets, Halley's Comet, Space Exploration, and a Glossary from albedo to zodiac.

* * * * *

The View From the Earth 1983, by Guy Ottewell. Astronomical Calendar, Department of Physics, Furman University, Greenville, S.C. 29613. 33 pages. Paperbound. Notes by J. Russell Smith.

This is a yearly elementary guide to the night sky, and it is a shorter version of the Astronomical Calendar published yearly by the author. Principally, it consists of twelve monthly sky charts with explanations. It also gives the phases of the Moon for each month. The final pages consist of definitions of terms such as Solar System, planets, meteors, meteorites, meteor showers, greatest eastern and western elongation, and angle.

This is an excellent work for the beginner as well as for the elementary school student.

* * * * *

365 Starry Nights: An Introduction to Astronomy for Every Night in the Year, by Chet Raymo. Prentice-Hall, Inc., Englewood Cliffs, N.J. 07632. 1982. 225 pages. Price, softbound $12.95; clothbound $21.95. Notes by J. Russell Smith.

Here is an illustrated book for the beginner who wants to learn about elementary astronomy. After the Introduction, the author explains with the aid of drawings what to look for during each month of the year. The author also gives a short list of atlases and other books which one might like to have. There is a suitable glossary from altitude to zodiac. It was noticed that the author does not use the hyphen in the word "light-year".

* * * * *

Surveying Fundamentals, by Jack C. McCormac. Prentice-Hall, Inc., Englewood Cliffs, N.J. 07632. 1983. 522 pages. Hardbound. Price $24.95. Notes by J. Russell Smith.

This book has 25 chapters plus an Appendix and Index. The only chapter on astronomy is Chapter 18, pages 311 to 336; and it is entitled Surveying Astronomy. The topics covered are as follows: "Advantages of True or Astronomical Directions", "Celestial Bodies to be Considered", "Astronomical Tables Used by the Surveyor", "Introductory Definitions", "Latitude and Longitude", "Apparent Motion of the Celestial Sphere", "Circumpolar Stars", "Time", "Locating Polaris", "Choice of Sighting on Polaris or the Sun", "Observation of Polaris at Culmination", "Observations of Polaris at Any Time", "Observations of the Sun", "Index Error", "Parallax", "Refraction", "Azimuth Equation", "Example Observations of the Sun", "Solar Attachments", and "Problems".

If you are interested in surveying, here is a book for you. The chapter entitled Surveying Astronomy is excellent.

BOOK REVIEWS

Planets of Rock and Ice. From Mercury to the Moons of Saturn, by Clark R. Chapman. New York: Charles Scribner's Sons, 1982. xvii + 222 pages. Price $13.95.

Reviewed by John E. Westfall

The last two decades have seen the greatest exploration effort in history, with a wealth of knowledge brought back to Earth from missions involving two-thirds of our Sun's planets. Now that this flow of information has virtually ceased, it is important to do what Dr. Chapman has done in this book--to attempt to revive this exploration, and also to "digest" its results and to present them to the public in understandable form.

Planets of Rock and Ice concerns the solid bodies of the Solar System, from Mercury out to Saturn's moons and rings. In order, its thirteen chapters discuss: Planetary Science in general; cratering; uniformitarian and catastrophic theory; asteroids; Mercury; planetary interiors; the atmospheres of Venus, the Earth, and Mars; the Moon; the Galilean satellites of Jupiter; Saturn's satellites and rings; Mars; the Earth; and future prospects for planetary exploration. Although the chief emphasis is on the physical nature of these bodies, an important secondary theme is the persons and the devices which have done the exploring. This work's coverage in both areas is current through Voyager-2.

At the outset, Dr. Chapman describes well the nature of both planetary science and planetary scientists. Here, as throughout, his writing is clear and readable, and assumes very little prior background. Although the results of "Earthbased" research are frequently mentioned, considerably greater emphasis is given to space missions--particularly Apollo, Mariner, Pioneer, Viking, and Voyager. The intended market is clearly the well-known "intelligent layman."

A.L.P.O. members may wonder if they should purchase this book. One should not pass up Planets of Rock and Ice simply because one has the previous edition, The Inner Planets (1977). The nine chapters of the earlier edition have been heavily revised using the last five years' data. In addition, four entirely new chapters have been added: those dealing with the Galilean satellites, Saturn's system, the Earth, and, in the final chapter, "The Galileo Project and the Future of Planetary Science." Generally speaking, the present book will be most useful to amateurs still relatively new to planetary science, or to more advanced amateurs who wish to find out more about the history of the American planetary exploration program. Those who need more detailed and more technical information should look elsewhere (e.g., in Beatty, O'Leary, and Chaikin's The New Solar System).

It should be pointed out that, while the earlier The Inner Planets was enthusiastic, Planets of Rock and Ice is frequently pessimistic about the future of our planetary exploration program, and with good reason. The preface and the final chapter are "political" in tone, and quite critical of the budgetary disaster of NASA's planetary program. Dr. Chapman argues persuasively for the revival of American planetary exploration, so persuasively that one hopes that this book reaches a large audience.

Both elementary and more complex concepts are expressed in simple terms, using analogies frequently. Quantification is avoided; perhaps overly so, because even the diameters of major bodies are rarely mentioned. In line with this qualitative approach, there are no tables, diagrams, or graphs. The only maps are three small-scale topographic renditions of the Earth, Venus, and Mars. Although there are 47 photographic plates, these are not very satisfactory. Their reproduction is contrasty (the maps mentioned above are best described as murky); and the areal coverage of the frames, or the sizes of the features shown, is rarely given. Also, when only a portion of a body is shown, the region or the feature shown is often not named. Add to this the fact that the text rarely refers to the figures, and one concludes that the illustrations were an afterthought.

More positively, I have very few criticisms of the text. One such, already mentioned, is the rarity of even rather basic quantitative information. On page 57, a temperature of "a few hundred degrees" is mentioned; it might be significant if this were Kelvin or Fahrenheit! Also, the lunar chapter concentrates almost entirely on the Apollo missions, reversing the more frequent emphasis on unmanned missions, and largely ignoring the near-global photographic coverage of the Orbiter missions. Finally, the chapter on the Jovian satellites ignores the non-Galilean bodies (although at least Amalthea was imaged by Voyager), along with Jupiter's "new" ring.

These criticisms are minor, and would not disturb the lay reader--the book's intended market. Amateur astronomers, however, will not be pleased by the total neglect of their work. Amateurs can, and have, contributed to our knowledge of several of the bodies discussed, having studied asteroid rotations and occultations, lunar transient phenomena, and Mars' atmosphere, for example. The point here is that, whatever lamentable fate may happen to NASA's budget, or even to the finances of more traditional ground-based astronomy, some people--amateurs--will keep this field alive. Also, another aspect of amateur astronomy is ignored--personal telescopic observation simply for the sake of enhancing one's personal appreciation of the vastness and the splendor of our Solar System. This rather effective book would be yet more effective if it encouraged the reader to go outdoors and look at the fascinating bodies which it describes.

* * * * *

Webb Society Deep Sky Observer's Handbook, Vol. 5, "Clusters of Galaxies", edited by Kenneth Glyn Jones, written by George S. Winston, Enslow Publishers, Bloy St. and Ramsey Ave., Hillside, N.J. 07205, 1982. Paperback, 241 pages. Price $16.95.

Reviewed by Walter Scott Houston

This is the last volume of the Webb Society Handbook and undeniably the best, the most useful, and the one that breaks new frontiers for the amateur observer. It is unique.

It is designed for telescope from 12-inches to 30-inches, a range which previous handbooks do not cover. In the past such material was not needed, but the rise of the big Dobsonians makes reference material in this range imperative. But to make significant data available in the dimmer than 13th magnitude objects, the traditional location by right ascension and declination will not work. There often are several or several dozen galaxies in the same eyepiece field. Only marked photos or detailed finder charts will insure identification in the faint galaxy range. Furthermore, any guide to faint galaxies cannot encompass several hundred thousand objects. Some type of selection is required. The material must make a convenient sample.

The Webb Society Handbook does this by elaborate finder charts traced from large scale photos. In many cases several charts with decreasing scale are used for the same region. Sampling is accomplished in three ways: (1) A detailed survey of the Virgo cloud is elaborately given. It is the nearest and brightest galactic cloud, and its members are best known to amateurs. (2) This cloud is followed by 15 Abell clouds, with magnitudes of individual galaxies in the 14-16th magnitude spread. This range still includes many NGC objects. (3) Lastly, there is a catalog of 15 groups of faint objects which lie in the field of a fairly bright NGC object. Finding the bright spiral locates the field for the others. This last technique has been used at times, also, in the "Deep Sky Wonders" column in Sky and Telescope.

As with the other volumes in the series, the introductions are gems of lucid description; and the amateur is nicely brought up to date. The volume represents much blood, sweat, and tears on the parts of the collaborators; but their efforts are more than justified. At last the owner of a 16-24-inch scope has a practical guide to celestial adventure.

* * * * *

By Jupiter, by Eric Burgess. Columbia University Press, 562 West 113th Street, New York, N.Y. 10025. 1982, 149 pages. Price $24.95.

Reviewed by Randy Tatum

There have been several books written recently about the discoveries of unmanned space missions. This volume does not simply describe the results of the spacecraft encounters but gives the reader the story behind these unmanned programs.

Chapter one introduces the reader to the Jovian system. Included is a short history of Jovian discoveries prior to the space program. Models of Jupiter's interior and speculations about life in its atmosphere are looked at. Reasons for the exploration of Jupiter and the outer Solar System are also discussed.

Chapters two and four deal with the histories of the Pioneer and Voyager programs respectively. The two spacecraft's systems and experiments are discussed in great detail.

In chapters three and five the events and discoveries of the Pioneer and Voyager flybys are investigated. Here the dynamics of Jupiter's atmosphere and basic environment are examined. It is of interest to see how these spacecrafts survived the perils of the asteroid belt and Jupiter's radiation belts and are still functioning today.

Chapter six studies the remarkable Jovian satellite system with special emphasis on the differences among the four Galilean satellites. The strong interaction between Io and Jupiter's magnetosphere is a key to understanding the processes within the Jovian environment. The discovery of active volcanos on Io, a major discovery of Voyager, explained the presence of the torus of material encircling Io's orbit.

Chapter seven compares the ring systems of Jupiter, Saturn, and Uranus.

Chapter eight looks to the next phase of the exploration of Jupiter, Project Galileo. By orbiting Jupiter and dropping an entry probe into the Jovian atmosphere, we shall learn much more about the composition and evolution of Jupiter.

Burgess's personal involvement in the Pioneer program is demonstrated in his suggestion to Carl Sagan to place plaques on the spacecrafts as a message from mankind. In the remote chance that extraterrestrials find the spacecraft, they would learn something about the beings that sent it. The Pioneers and Voyagers are destined to become the longest lasting monument to mankind.

Unfortunately, little emphasis is given to Earth-based observations of Jupiter. It should be noted that each Voyager photographic phase lasted only about six months, and there will be no more spacecraft near Jupiter until 1987. The best way to understand the widespread changes in Jupiter's atmosphere between unmanned missions is to analyze Earth-based observations and photographs.

The text is clearly written in a non-technical style and is well illustrated with over 130 black and white photographs. This book would appeal to readers on all levels and is well recommended.

* * * * *

The New Face Of Mars, by V. A. Firsoff, Ian Henry Publication, Essex, Great Britain, 1980. 164 pages, hardcover. Price about $10.00, U.S.A.

Reviewed by C. F. Capen, Lowell Observatory, Flagstaff, AZ, and Institute of Planetary Research Observatories, Miami, FL.

While attending the 18th General Assembly of the I.A.U. at the University of Patras, Greece, last August, the reviewer learned from Patrick Moore of the death of Val Axel Firsoff, author of The New Face of Mars. This was indeed sad news! For over two decades the reviewer has corresponded with this experienced planetary observer and controversial author, and had always read his books with interest because Mr. Firsoff never feared to take a senior scientist to task in writing if he thought his technical evaluations or conclusions were deficient or unverified.

Since the invasions by the Viking Spacecraft, many technical papers and specialists' books have been published about the geology and atmosphere of Mars. The late V. A. Firsoff's little book, 7 1/2 x 5 inches, fills the gap for a "popular" explanation of the new data acquired recently with telescope, spacecraft, and lander weather station.

The author's Foreword is an excellent review of his book: "Mars is a fascinating little world in its own right. The issue of life in the present condition of the planet remains open, but the recent exploration by spacecraft. . . has shown that Mars had at one time vast river systems, possibly seas, copious rainfall, and a correspondingly dense atmosphere and relatively high surface temperatures necessitated by these. This situation appears to be recurrent and has a bearing on our own home planet, which too has experienced warm and cold periods. . . . The New Face of Mars is intended to present and discuss all this".

As usual, Firsoff does not shun controversial issues; and as usual, he presents his own well thought out ideas and interpretations, which are clearly indicated when they depart from the mainstream of opinion. Once again, V. Firsoff gives the reader a well documented work with adequate literature reference list and index. Classical and modern telescopic observations are compared in detail with the new spacecraft data, making this book most useful to the planetary observer; and the professional astrogeologist author could learn much from this discourse.

There is a list of 33 plates (illustrations), but not a list of chapter titles which is unfortunate because of their interesting subjects, such as: 1) Between Earth and Ganymede. 2) Three Hundred Years at the Telescope. 3) Enter Spaceship. 4) Geography of Mars. 5) Mars Inside Out. 6) Of Ash and Troughs and Blinding Flares and Why the Ice is Boiling Hot. 7) Floods, Chasms, and Rivers. 8) The Wind and Its Works. 9) Up in the Air and Down Below. 10) Where Have All the Maria and Canals Gone? 11) Pyramids and Disembodied Metabolism. 12) Thermometer Through the Ages. 13) The "Potato" Moonlets.

Several awkward syntax sentences and misprints and technical errors could have been avoided with proper editing. Mariner and Viking photos are reproduced fairly well considering the poor quality of paper. Firsoff's description of Martian terrain features was difficult to follow at times because of the lack of figure numbers on the illustrations, and a modern topographic map showing regional names was not included for ready reference.

Regardless of these discrepancies, The New Face of Mars is a valuable addition to a reference library; and the planetary astronomer who has a firsthand acquaintance with the Red Planet will find this book most educational and enjoyable reading.

* * * * *

Voyages to Saturn, by David Morrison. 1982, U. S. Government Printing Office, Washington, D.C. NASA SP-451. Price $9.50. 227 pages.

Reviewed by Julius L. Benton, Jr.

In his *Voyages to Saturn*, author Dr. David Morrison of the University of Hawaii and a member of the Voyager Imaging Team acquaints the reader with the detailed planning, execution, and monumental results of Voyagers I and II. Following a very useful historical perspective on naked-eye and telescopic observations of Saturn, Dr. Morrison discusses the Pioneer 11 mission and its flyby of the planet in 1979. A summary of the highlights of the Pioneer mission to Saturn in Chapter 2 forms a useful prelude to the detailed account of the Voyager missions, which occupies the remainder of the book.

We learn in Chapter 3 that the Voyager mission was conceived in the late 1960's, before the launch of the Pioneer spacecraft or the first manned Apollo landing on the Moon. Dr. Morrison describes the objectives of the Voyager mission, the principal scientific investigations to be conducted in the flights past Jupiter and Saturn. The story, which pertains chiefly to Saturn, continues in the next two chapters, where the author outlines the encounter phases of the mission from October 1, 1980 to November 12, 1980, the date when Voyager I was less than a million kilometers from Saturn, the most crucial day of operation. In similar form, the account continues as Voyager I proceeds past Saturn in late November, 1980. Throughout the sequence in Chapter 4, we share some of the tremendous excitement that overcame the group of scientists and technicians as they watched multitudes of pictures show up on their monitors of vistas never before seen so well or even imagined.

Chapter 5, entitled "The Last Picture Show", chronicles the Voyager II encounter with Saturn which began on June 3, 1981, leading up to the closest approach to Saturn by Voyager II on August 25, 1981.

The remainder of the book deals with interpretations, reactions, and theoretical considerations, all based on the wealth of data produced by Voyagers I and II.

The book is supplemented by numerous color and black and white photographs of Saturn, its satellites, and its ring system as viewed by Voyager I and II. Graphs and detailed diagrams make the text more interesting, and concepts are discussed in lucid enough language for the more general reader. The astronomical information about Saturn will certainly interest the individual who studies the planet with his telescope and who has wondered about what may lie beyond the resolution limits of Earthbased instruments. Pictorial maps of Saturn's satellites are presented in the appendices, of great interest to the comparative planetologist.

Voyages to Saturn also forms a useful companion to the earlier book *Voyages to Jupiter*, and certainly the amateur will want to have both books as part of his library. The present book is quite inexpensive; and because of its well-written and interesting content, it can be recommended to all who share an intense interest in the planet Saturn.

A GRAY MOON DIM IN THE UMBRA: THE TOTAL LUNAR ECLIPSE OF DECEMBER 30, 1982

By: Walter H. Haas

Abstract

Reports from 13 observers upon the total lunar eclipse of December 30, 1982 are summarized. These include notes on the color and brightness of the eclipsed Moon, timings of the four umbral contacts, searches for possible Lunar Transient Phenomena (LTP's), estimates of the integrated stellar magnitude of the Moon during totality, notes on the visibility of the penumbra, and photographs. The eclipse was very unusual because of the extreme darkness of the umbral shadow and the remarkable lack of the usual bright colors during totality. Both conditions presumably result from volcanic dust in the stratosphere in the Earth's North Hemisphere.

Introduction

The circumstances of this eclipse[1,2,3] are given below in Universal Time:

Moon enters penumbra	December 30,	8^h	$51^m.9$
Moon enters umbria		9	50.4
Total eclipse begins		10	58.2
Middle of the eclipse		11	28.7
Total eclipse ends		11	59.3
Moon leaves umbra		13	07.0
Moon leaves penumbra		14	05.5

Magnitude of eclipse = 1.188

It will be noted from the times that the eclipse occurred late in the night for observers in the continental United States and Canada. Indeed, in the eastern States the Moon was low in the sky by the beginning of totality. Moreover, the center of the Moon passed 23 minutes of arc north of the center of the umbral shadow. Hence, the illumination within the umbra depended largely on the atmospheric conditions north of the Earth's equator. The Moon's declination was +24° at mid-eclipse so that it crossed the meridian high in the sky in middle northern latitudes.

This article is based on reports from the 13 observers tabulated below. We thank them for their interest in contributing their observations, making this article possible. Most of the observers endured low winter temperatures in order to watch the eclipse. Mr. Louderback had the additional complication that his house was jacked up for a new foundation!

Table I. Observers of December 30, 1982 Lunar Eclipse

Name	Location	Instrument(s)
Mark S. Daniels	Wichita, KS	20-cm refl.
Walter H. Haas	Las Cruces, NM	32-cm refl., 3x48 binoculars, eye
Michael T. Kitt	Bronxville, NY	9-cm Maksutov
Daniel Louderback	South Bend, WA	8-cm refr., 10x50 binoculars
Herbert A. Luft	Oakland Gardens, NY	?, binoculars, eye
Toshihiko Osawa	Fukuoka, Japan	30-cm refl.
Kermit Rhea	Paragould, AR	10-cm refr., 4-cm refr.
Timothy J. Robertson	Simi Valley, CA	15-cm refl.
Rob Robotham	Springfield, Ontario	15-cm refl., eye
Don Spain	Fairdale, KY	9-cm Maksutov
R. Jeff Warren	McMinnville, TN	8-cm refl.
John E. Westfall	San Francisco, CA	25-cm Cassegrain, 7x50 binoculars, eye
Matthew Will	Herrin, IL	15-cm refl., 7x35 binoculars, eye

It should be encouraging to many of our readers that lunar eclipses are one project where small apertures are often actually an advantage.

All times in this article are given in Universal Time on December 30, 1982.

Lunar east and west are used here in the modern sense of the IAU definition. Thus, west is the hemisphere of the Oceanus Procellarum; east, that of Mare Crisium. Lunar observers should always clearly state how they use east and west.

Visibility of Penumbra

Haas suspected very slight dimming along the Moon's west limb at 9:09, only 17 minutes after the Moon's entrance into the penumbra, with a 32-cm reflector at 101X and a clear sky. By 9:15 he found the penumbra visible with the naked eye and binoculars and distinct in the telescope. Will first saw the penumbra at 9:13 with binoculars and at 9:15 with the naked eye. By 9:28 the penumbra was darker and yellow-gray in tone to Will. At 9:35, thus 15 minutes before First Contact, Haas called the penumbra conspicuous over the Moon's west hemisphere.

Robotham reported the penumbra to show a pale yellow fringe or border just outside the umbra. He notes: "I did not notice this effect too much during the July 6, 1982 total lunar eclipse; but I did observe a very similar effect during the July 17, 1981 partial lunar eclipse." A sketch suggests a width of one or two minutes of arc for his fringe.

Timings of Four Contacts

The reported observations of the four umbral contacts are as follows:

Table II. Observed Contacts for December 30, 1982 Total Lunar Eclipse

Contact	No. of Observers	Predicted Time	Observed Time	Standard Deviation
First	5	9:50.4	9:50.48	$\pm 0^{m}.30$
Second	4	10:58.2	10:58.45	± 0.24
Third	1	11:59.3	11:57.83	
Fourth	1	13.07.0	13:07.26	

Robertson alone timed the third and Fourth Contacts and was the only observer to record his timings to the nearest 0.01 minutes.

Haas had considerable difficulty in choosing the moment of First contact. If his observation is omitted, the observed time of First Contact becomes 9:50.75 $\pm 0^{m}.15$.

Crater Contact Timings and Shadow Enlargement

Times when selected lunar features are observed at the edge of the umbra can be used to compute how much the Earth's umbral shadow is enlarged by our atmosphere. This amount varies from eclipse to eclipse. *Sky and Telescope* has collected and reduced such observations for many years, and A.L.P.O. members contribute their crater immersion and emersion timings to *Sky and Telescope*. We hence do not report these observations here.

However, Mr. Toshihiko Osawa in Japan not only obtained "many" crater contact timings but himself reduced his own observations with a Least Squares method. If he had available only modest computational aids, his patience and perseverance merit our admiration! Assuming a spherical shadow, he found for its radius:

$r = 46'.11 \pm 0'.35$ (error of mean) from umbral immersions.
$r = 46'.09 \pm 0'.14$ from umbral emersions.
$r = 46'.10 \pm 0'.27$ from all data.
Enlargement = 1.0182 ± 0.0061.

The larger error for immersions may result from the fact that in Japan the Moon was lower in the sky before totality than after totality.

Assuming that the umbral shadow was an ellipse, Mr. Osawa found:

Major axis = $46'.18 \pm 0'.18$ (error of mean).
Minor axis = $46'.04 \pm 0'.32$.

The oblateness of the shadow is then about 1/300, which compares well with the Earth's known oblateness.

It will be interesting to compare these results with what *Sky and Telescope* will publish from all the crater timings submitted to them.

Lunar Transient Phenomena

These have often been recorded during past lunar eclipses. Spain reports for the December 30, 1982 eclipse: "No LTP phenomena were observed anywhere before, during, and after totality." He was using a 9-cm. Maksutov at 33X under very favorable conditions: seeing 6-8 on the scale of 0 to 10 with 10 best and sky clear enough to reveal 6th magnitude stars during totality. Louderback writes: "During totality I did check for a few minutes with the 10x50 binoculars for LTPs but saw nothing interesting. Not even Aristarchus was very visible! However, right after totality I made more LTP observations of my assigned features as they were coming out of the umbra. I used the 80-mm. refractor for this; and I did detect a small fluctuation in brightness in one feature, the bright spot in the crater Eimmart located near Mare Crisium. . . .All of my other assigned features had normal intensities."

Appearance and Color of Umbra

There is excellent agreement among the observers that the eclipsed Moon was remarkably lacking in its familiar red and orange colors. Descriptions include: "ashen with possibly a hint of blue" (Kitt), "real dark charcoal gray" (Louderback), "the Moon looks like a 'black hole' surrounded by a sea of stars" (Robertson), "generally greyish with possible reddish tinge" (Westfall with binoculars), and "bluish grey" (Will). At 11:00 (totally beginning) Will found the out-of-focus images of the Moon and the star Procyon to be the same color; Procyon is of spectral class F5[4]. Later at 11:15 Will found most of the umbra a ghost-grey, subtly shaded toward a medium blue pastel but with a marginal hint of red or orange-rust. Robertson found that on his photographs taken during totality "there is a very distinct red hue to the Moon," of which he had been able to see nothing. As one might expect, Westfall found slight reddish colors to fade into grey as the Moon advanced deeper into the umbra.

Of course, the whole Moon was not a uniform color. A narrow bright crescent along the east and northeast limbs persisted from the beginning of totality to mid-eclipse; according to Spain, in this interval it faded from the second stellar magnitude to the fifth stellar magnitude. Its color was variously described as light blue, dull white, pearly white, and pale blue-green. Late in totality there was a similar but dimmer crescent along the west and northwest limbs, about the fourth stellar magnitude just before Third Contact according to Spain. Its color was white to Spain and Westfall, aqua blue to Will. Near the beginning of totality the south limb looked faint orange-brown to Daniels and reddish to Rhea. Spain called the north limb "a very dull copper hue" near the middle of totality.

Mr. Daniels has contributed a beautiful drawing in natural colors of the Moon against a star background just before totality.

Eclipse observers roughly measure the darkness of an eclipse by the amount of detail visible on the Moon. This eclipse was very dark by that standard. The following statement by Robertson is typical: "No detail at all visible on lunar surface at any time during totality." Westfall and Will did remark the large *maria* and no other features during totality.

The edge of the umbra was extremely diffuse and poorly defined to Haas, so much so that timing crater immersions was difficult. Perhaps a 32-cm. reflector at 101X was too large an aperture and too high a power. Haas saw no darker edge to the umbra, an edge which he has recorded at some past lunar eclipses. Rhea found the umbra edge less jagged than in the July 6, 1982 lunar eclipse. At 9:55 Will remarked a scarlet red hue along the boundary where features were becoming invisible in the umbra. At 10:15 the umbral boundary had turned to greenish, yellowish gray, with the scarlet band still present.

Brightness of the Eclipsed Moon

There can be no doubt that it was an extremely dark eclipse. Luft reported that the Moon became completely invisible to the eye and in binoculars soon after totality began. It was his second such experience in a long lifetime of observing; the first lunar eclipse disappearance was during the very dark eclipse of December 30, 1963.[5] Other observers having the Moon higher in the sky than Mr. Luft and probably having clearer skies as well witnessed no disappearance. However, typical comments are "all but disappeared to the naked eye" (Daniels) and "almost invisible to the naked eye" (Robertson).

In recent years observers have rated lunar eclipses on the Danjon Scale of 0 (darkest) to 4 (brightest).[6] The two darkest values are defined as follows: 0, very dark eclipse, Moon almost invisible, especially at mid-totality; 1, dark eclipse, gray or brownish coloration, details distinguishable only with difficulty. Some of our observers could not make a Danjon estimate either because the sky was not clear enough or because the Moon was too near the horizon during totality. The mean of 7 estimates (all between 0 and 1, inclusive) is 0.25, with the standard deviation of this mean being 0.14. In his 15-cm. reflector at 30X Will estimated 1 on the Danjon Scale. We used above his lower estimate of 0 with eye and binoculars.

A more advanced procedure is to estimate the integrated stellar magnitude of the Moon by comparing it to stars of known brightness. Several methods are available, and for best results allowance should be made for atmospheric extinction as a function of altitude above the horizon.[7] All estimates received are tabulated in Table 3.

Table 3. Estimated Stellar Magnitude of Eclipsed Moon on December 30, 1982

Observer	U.T. Time	Stellar Magn. Moon	Notes
Will	10:59	0.4	
Haas	11:01	0.0	Sky very hazy
Will	11:05	2.0	
Will	11:09	2.8	
Haas	11:15	>0.4	Sky very hazy
Robertson	11:23	3.5	Good conditions
Westfall	11:23	3.5-4.0	Clear sky
Rhea	11:29	>2	
Spain	11:29	5(?)	
Will	11:34	3.0	
Westfall	11:46	4	Clear sky

A few of the estimates have been rounded to the nearest one-tenth of a magnitude. All estimates were with the naked eye except for Will's 11:34 estimate with binoculars. Some needed corrections for differential atmospheric extinction were applied. There may be some slight evidence that the Moon was dimmest a little after mid-eclipse at 11:29. Of course, the Moon and the out-of-focus comparison stars are always forced to be the same apparent size.

Mr. Will used the convex reflector method[7] to make 11 estimates of the Moon's brightness prior to totality.

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6. Roger W. Sinnott, "Observing July's Total Lunar Eclipse," Sky and Telescope, Vol. 63, No. 6, pp. 602-603, June, 1982.
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ANNOUNCEMENTS

New Lunar Selected Areas Program. This project is being revived under the leadership of a new Lunar Recorder, Dr. Julius L. Benton, Jr., 1100-A Vincent Road, Warrington, PA 18976. An article describing the nature and goals of the program will appear soon in this journal. Past observers are requested to send to Dr. Benton any unsubmitted reports, and even available copies of earlier reports. The major thrust of the Selected Areas Program will be to monitor regular and cyclical long-term variations during several lunations of specific designated lunar features. Visual, photometric, and colorimetric observations will all be included. Dr. Benton will welcome correspondence from interested persons.

Texas Star Party '83. Here is an ideal meeting for the observing amateur! The dates are June 8-12, 1983; and the place is the Prude Ranch near Fort Davis, Texas and only 12 miles from the McDonald Observatory. The registration fee is 16 dollars for one person and 5 dollars for each additional family member before March 19, 1983, when the price will increase. Minimal artificial lighting and mornings free of scheduled activities will help the observer, and the Moon will be near new. Invited astronomers include Walter Scott Houston and Geoffrey Burbidge. Send your registration check, payable to "Texas Star Party," and your inquiries to David K. Clark, TSP '83, 2709 Colonial Drive, Carrollton, TX 75007. Amateur papers are invited.

1983 A.L.P.O. Convention. This year we shall again share in the National Convention of the Astronomical League. The dates are July 26-30; and the place is the new Sheraton Hotel at St. John's Place in Jacksonville, Florida. Qualified readers are invited to submit papers for the program, corresponding with the Editor for that purpose. Material for the A.L.P.O. Exhibit is also needed. It will be handled by Julius Benton; note his address on the back inside cover. The General Chairman for this meeting is Mr. Mike Reynolds, 39 Sandra Drive, Jacksonville Beach, FL 32250, to whom inquiries should be addressed. We shall give more details in our next issue. There will be the usual paper sessions, tours, commercial exhibits, workshops, and professional speakers.

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