JUPITER IN 1964-65: ROTATION PERIODS

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

The highlights of the apparition were: the development of a SEB Disturbance, a revival of the NTBS, the current, the continued observational evidence for the abnormally slow portion of the N. Equatorial Current, the prominence of the three long-enduring white South Temperate Zone ovals continues and the Red Spot is prominent.

Some data pertinent to the apparition follow:

Date of Opposition: 1964, November 13.
Dates of Quadrature: 1964, August 17; 1965, February 6.
Declination of Jupiter: +16° S (at opposition).
Equatorial Diameter: 49.1 seconds (at opposition).
Zenocentric Declination of Earth: +3°.3 (at opposition).
Magnitude: 2.4 (at opposition).

This report is based on 2,786 visual central meridian transit observations submitted by 5 observers. Sixty-nine per cent of these transits (1,925) form usable drifts for 142 Jovian spots distributed in 13 different atmospheric currents. The contributing observers are listed below by name and number of transits submitted, along with station of observation and telescope (s) employed.

Budine, Phillip W.	Binghamton, N.Y.	4-in. refr.	445t.
Heath, Alan W.	Long Eaton, Nottingham, England	12-in. refl.	12t.
Mackal, Paul K.	Mequon, Wisc.	6-in. refl.	18t.
McIntosh, Patrick S.	Sunspot, New Mexico	6-in. refl.	7t.
Reese, Elmer J.	New Mexico State University Obser.	8-in. refl.	2304t.

The distribution of transit observations by months is as follows:

1964,	June	24	1964,	October	571	1965, February	268
	July	110		November	616	March	57
	August	164		December	338	April	26
	September	321	1965,	January	291		

In the tables which follow, the first column gives an identifying number or letter to each object. The second column indicates whether the object was dark (D) or bright (W) and whether the preceding end (P), center (C) or following end (f) was being observed. The third column gives the first and last dates of observation; the fourth column, the longitudes on those dates. The fifth column gives the longitude at opposition, November 13, 1964. The sixth column gives the number of 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 shows the rotation period in hours, minutes and seconds.

S. S. Temperate Belt, System II

No.	Mark	Limiting Dates	Limiting L.	L.	Transits	Drift	Period
1	Wc	Dec. 21 - Jan. 19	61° - 40°	--	4	-21°.7	9:55:11
2	Wc	Dec. 4 - Jan. 17	101 - 62	--	5	-26.6	9:55:04
3	Dc	Dec. 21 - Jan. 22	95 - 65	--	4	-28.1	9:55:02

No.	Mark	Limiting Dates	Limiting L.	L.	Transits	Drift	Period
4	Wc	Dec. 28 - Feb. 15	141° - 101°	—	8	-24°.5	9:55:07
5	Dc	Dec. 21 - Mar. 23	193 - 117	—	10	-24.8	9:55:07
6	Wc	Dec. 21 - Jan. 18	346 - 323	—	4	-23.0	9:55:09
7	Wc	Dec. 22 - Jan. 20	321 - 303	—	5	-18.0	9:55:16
				Mean rotation period: (Without No. 7)			9:55:06

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

No.	Mark	Limiting Dates	Limiting L.	L.	Transits	Drift	Period
F	Wp	Jun. 19 - Apr. 16	49° - 222°	315°	51	-18°.7	9:55:15
1	Wc	Jun. 19 - Apr. 16	58 - 230	324	47	-18.8	9:55:15
A	Wf	Jun. 19 - Apr. 16	67 - 240	333	43	-18.7	9:55:15
2	Dc	Oct. 13 - Nov. 21	0 - 335	340	8	-19.2	9:55:14
B	Wp	Jun. 20 - Mar. 24	169 - 7	80	47	-17.6	9:55:17
3	Wc	Jun. 20 - Mar. 24	177 - 15	88	49	-17.6	9:55:17
C	Wf	Jun. 20 - Mar. 24	186 - 24	97	44	-17.6	9:55:17
D	Wp	Jun. 5 - Mar. 20	304 - 125	204	38	-18.6	9:55:15
4	Wc	Jun. 5 - Mar. 20	312 - 132	212	44	-18.8	9:55:15
E	Wf	Jun. 5 - Mar. 20	321 - 134	221	48	-19.5	9:55:14
5	Df	Jul. 28 - Nov. 28	338 - 233	246	5	-25.6	9:55:06
				Mean rotation period: (Without Nos. 7 and 11)			9:55:15

The three long enduring white ovals of the STeZN remained prominent throughout the apparition. The mean length of the ovals was as follows: FA - 18°, BC - 17° and DE - 17°.

The center of the Red Spot was in conjunction with the center of FA on August 19, 1964 at longitude 17° (II); see graph. Heath noted BC as "bright and well defined" on January 15 and DE as "not especially bright" on January 16.

Middle STB, System II

No.	Mark	Limiting Dates	Limiting L.	L.	Transits	Drift	Period
1	Wp	Jul. 15 - Aug. 6	216° - 203°	—	6	-17°.7	9:55:16
2	Wc	Jul. 15 - Sep. 3	229 - 198	—	6	-18.6	9:55:15
3	Wf	Jul. 15 - Aug. 18	241 - 220	—	8	-18.5	9:55:15
4	Dp	Oct. 8 - Nov. 15	85 - 58	59°	6	-20.8	9:55:12
5	Dp	Jan. 3 - Mar. 23	165 - 111	—	5	-20.5	9:55:13
6	Wc	Sep. 22 - Jan. 16	311 - 231	274	6	-20.7	9:55:12
7	Wc	Oct. 9 - Jan. 25	318 - 244	295	8	-20.6	9:55:12
8	Df	Nov. 17 - Mar. 29	57 - 335	—	16	-18.6	9:55:15
				Mean rotation period:			9:55:14

No. 1, 2 and 3 was a bright small nodule preceding the long-enduring oval BC.

No. 4 was the preceding end of a very dark section of the STB preceding the long-enduring oval BC.

No. 7 was a bright small oval in the STB near the preceding end of the long-enduring oval DE.

No. 8 is a dark mass of material located on the border of the long-enduring oval FA. It was usually located between the preceding end and center of the long-enduring oval; see graph.

Red Spot Region, System II

Mark	Limiting Dates	Limiting L.	L.	Transits	Drift	Period
RSp	May 31 - Apr. 20	2° - 11°	8	83	+0.83	9:55:41.8
RSc	May 31 - Apr. 20	15 - 22	20	93	+0.65	9:55:41.5
RSf	May 31 - Apr. 20	28 - 34	32	82	+0.56	9:55:41.4
			Mean rotation period:			9:55:41.6

The Red Spot was generally dark and appeared as a dark ellipse throughout the apparition. Most of the time it was recorded as a uniform shaded ellipse with no dark border. Some observers reported the center slightly lighter in shade at times.

A. W. Heath had an excellent series of color filter comparisons of the Red Spot on October 27. He reports the following: "The Red Spot appears to be a fawn color or a warm tone, but I cannot see any definite red, orange or pink colors. The intensity of the Red Spot is nearly the same as the NEB with no filter. It is barely visible with a red filter, but is dark and well defined in the blue filter, being as dark as the NEB. At times I felt it may even have been darker than the NEB in the blue filter, but this may have been a contrast effect with the bright South Tropical Zone."

S. Component S. Equatorial Belt, System II

No.	Mark	Limiting Dates	Limiting L.	L.	Transits	Drift	Period
1	Dc	Nov. 14 - Jan. 29	74° - 107°	--	15	+13.0	9:55:58
2	Dc	Dec. 17 - Jan. 22	121 - 133	--	5	+10.0	9:55:54
3	Dp	Aug. 11 - Oct. 27	232 - 219	--	8	- 5.1	9:55:34
4	Dp	Aug. 6 - Oct. 3	242 - 242	--	6	0.0	9:55:41
				Mean rotation period: (Without nos. 3 and 4)			9:55:56

The major highlight of the 1964-65 apparition was the development of a SEB Disturbance which was first observed by Elmer J. Reese at 232° (II) on June 14, 1964. Extrapolated back on the drift charts Mr. Reese says "the initial outbreak must have taken place on June 10, 1964 at 250° (II)." It is assumed this disturbance originated from a small dark spot in the SEBZ between the two components of the SEB. Nos. 3 and 4 in the table above were near the source of the SEB Disturbance. The table below represents the two dark spots marking the SEBs retrograding branch of the SEB Disturbance.

S. Component S. Equatorial Belt, System II
Retrograding Branch of SEB Disturbance

No.	Mark	Limiting Dates	Limiting L.	L.	Transits	Drift	Period
1	Dc	Aug. 25 - Sep. 4	252° - 285°	--	3	+100°.6	9:57:59
2	Dc	Oct. 3 - Oct. 8	259 - 275	--	3	+ 92.4	9:57:48
				Mean rotation period:			9:57:53

S. Edge SEBn, SEBZ Branch of Disturbance, System II

No.	Mark	Limiting Dates	Limiting L.	L.	Transits	Drift	Period
			° °			°	
1	Dc	Jun. 14 - Aug. 30	233 - 313	--	10	-109.1	9:53:12
2	Wc	Jun. 21 - Aug. 19	218 - 59	--	4	- 80.8	9:53:50
3	Wc	Jun. 19 - Aug. 5	233 - 116	--	10	- 74.7	9:53:59
4	Dc	Jul. 24 - Aug. 19	152 - 99	--	7	- 61.2	9:54:17
5	Dp	Jun. 19 - Jul. 22	241 - 162	--	8	- 71.8	9:54:03
6	Dc	Jun. 19 - Aug. 5	245 - 138	--	10	- 68.3	9:54:07
7	Wc	Jul. 15 - Aug. 15	199 - 125	--	4	- 71.6	9:54:03
8	Dc	Jul. 15 - Aug. 15	209 - 135	--	8	- 71.6	9:54:03
9	Wc	Jul. 6 - Jul. 27	251 - 209	--	4	- 60.0	9:54:19
10	Dc	Aug. 19 - Sep. 22	50 - 341	--	5	- 60.9	9:54:17
11	Dc	Aug. 19 - Oct. 15	67 - 323	--	11	- 54.7	9:54:26
12	Dc	Jul. 24 - Sep. 19	133 - 30	--	8	- 54.2	9:54:27
13	Wc	Aug. 15 - Oct. 13	95 - 0	--	13	- 48.3	9:54:35
14	Dc	Aug. 29 - Sep. 29	75 - 40	--	6	- 33.9	9:54:54
15	Wc	Aug. 29 - Oct. 6	80 - 36	--	5	- 34.7	9:54:53
16	Dc	Aug. 19 - Oct. 6	99 - 45	--	6	- 33.8	9:54:54
17	Wc	Aug. 29 - Oct. 16	102 - 40	--	4	- 38.7	9:54:48
18	Dc	Jul. 20 - Nov. 7	236 - 94	--	9	- 38.7	9:54:48
19	Wc	Sep. 20 - Nov. 7	167 - 102	--	9	- 40.6	9:54:45
20	Dc	Sep. 18 - Nov. 8	175 - 106	--	10	- 40.6	9:54:45
21	Wc	Jul. 27 - Oct. 21	240 - 141	--	14	- 34.5	9:54:53
22	Wc	Oct. 29 - Dec. 6	134 - 101	121°	7	- 26.1	9:55:05
23	Dc	Aug. 6 - Nov. 8	233 - 130	--	12	- 32.9	9:54:56
24	Wc	Sep. 18 - Nov. 8	191 - 138	--	6	- 31.2	9:54:58
25	Dc	Nov. 8 - Dec. 5	144 - 112	136	9	- 35.6	9:54:52
26	Wc	Aug. 13 - Oct. 10	235 - 181	--	8	- 27.9	9:55:02
27	Dc	Aug. 13 - Oct. 27	240 - 167	--	10	- 29.2	9:55:01
28	Dc	Oct. 29 - Dec. 4	167 - 142	157	9	- 20.8	9:55:12
29	Wc	Sep. 30 - Nov. 20	211 - 157	165	9	- 31.8	9:54:57
30	Wc	Sep. 30 - Nov. 25	227 - 157	173	8	- 37.5	9:54:49
31	Wc	Nov. 6 - Dec. 6	5 - 2	4	14	- 3.0	9:55:37
32	Df	Sep. 17 - Oct. 16	92 - 83	--	7	- 9.3	9:55:28
33	Wc	Dec. 21 - Feb. 5	99 - 79	--	8	- 13.0	9:55:23
34	Wc	Nov. 13 - Dec. 7	143 - 135	143	8	- 10.0	9:55:27
35	Wc	Dec. 28 - Feb. 20	132 - 114	--	8	- 10.0	9:55:27
36	Dc	Nov. 6 - Jan. 5	197 - 161	192	12	- 18.0	9:55:16
37	Df	Nov. 11 - Dec. 15	202 - 182	202	5	- 17.6	9:55:17
38	Wc	Dec. 21 - Jan. 10	182 - 162	--	8	- 30.0	9:55:00

Mean rotation period: 9:54:34
(Without nos. 31-38)

Mean rotation period: 9:55:22
(Nos. 31-38)

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

No.	Mark	Limiting Dates	Limiting L.	L.	Transits	Drift	Period
1	Dc	Dec. 30 - Feb. 21	9° - 9°	--	13	0°.0	9:50:30
2	Wc	Dec. 28 - Feb. 14	22 - 17	--	7	- 3.1	9:50:26
3a	Dc	Nov. 21 - Jan. 29	45 - 26	--	8	- 8.3	9:50:19
3b	Dc	Jan. 29 - Apr. 3	26 - 34	--	5	+ 3.8	9:50:35
4	Wc	Dec. 28 - Mar. 7	47 - 43	--	7	- 1.7	9:50:28
5	Dc	Dec. 21 - Feb. 26	56 - 65	--	5	+ 4.0	9:50:35
6a	Wc	Jun. 15 - Sep. 17	357 - 44	--	16	+15.0	9:50:50
6b	Wc	Sep. 17 - Apr. 15	44 - 90	60°	22	+ 6.4	9:50:39
7a	Dc	Jun. 15 - Oct. 25	10 - 67	--	16	+13.0	9:50:48
7b	Dc	Oct. 25 - Apr. 22	67 - 105	70	21	+ 6.4	9:50:39
8	Dc	Jun. 27 - Jul. 22	39 - 41	--	5	+ 2.4	9:50:33
9	Wc	Jun. 27 - Jul. 20	50 - 52	--	6	+ 2.6	9:50:34
10	Dc	Jun. 18 - Jul. 27	85 - 69	--	4	-12.3	9:50:13
11	Wc	Jun. 18 - Sep. 29	110 - 86	--	9	- 7.0	9:50:21
12	Dc	Jun. 25 - Sep. 29	116 - 95	--	5	- 6.6	9:50:21
13	Wc	Jun. 25 - Sep. 6	121 - 110	--	7	- 4.5	9:50:24
14	Dc	Jun. 25 - Oct. 13	129 - 126	--	12	- 0.8	9:50:29
15	Dc	Jul. 2 - Sep. 29	136 - 139	--	10	+ 1.0	9:50:31
16	Wc	Jun. 30 - Oct. 9	148 - 150	--	7	+ 0.6	9:50:31
17	Dc	Jun. 14 - Sep. 18	179 - 162	--	6	- 5.3	9:50:23
18	Dc	Dec. 22 - Feb. 6	157 - 164	--	8	+ 4.6	9:50:36
19	Wc	Oct. 16 - Mar. 3	211 - 208	216	12	- 0.7	9:50:29
20	Dc	Oct. 16 - Mar. 3	222 - 218	224	17	- 0.9	9:50:29
21a	Wc	Jun. 14 - Nov. 13	195 - 240	240	28	+ 8.9	9:50:42
21b	Wc	Nov. 13 - Mar. 15	240 - 248	240	15	+ 2.0	9:50:33
22a	Dc	Jun. 21 - Nov. 13	212 - 251	251	20	+ 8.1	9:50:41
22b	Dc	Nov. 13 - Mar. 31	251 - 261	251	17	+ 2.2	9:50:33
23	Wc	Aug. 6 - Oct. 23	242 - 250	--	6	+ 3.1	9:50:34
24	Dc	Jul. 21 - Oct. 23	269 - 257	--	8	- 3.8	9:50:25
25	Wc	Jun. 26 - Oct. 30	282 - 272	--	13	- 2.4	9:50:27
26	Dc	Jun. 17 - Jan. 10	294 - 275	287	21	- 2.8	9:50:26
27	Wc	Jul. 26 - Nov. 18	305 - 296	296	13	- 2.3	9:50:27
28	Dc	Jul. 3 - Feb. 4	324 - 291	305	26	- 4.6	9:50:24
29	Wc	Jun. 8 - Aug. 18	328 - 345	--	5	+ 7.2	9:50:40
30	Dc	Jun. 15 - Aug. 11	340 - 349	316	15	- 8.1	9:50:19
31	Dc	Sep. 17 - Dec. 11	335 - 312	316	15	- 8.1	9:50:19
32	Dc	Feb. 18 - Apr. 12	350 - 354	--	9	+ 2.3	9:50:33
33	Dc	Jul. 17 - Aug. 18	0 - 4	--	5	+ 3.8	9:50:35

Mean rotation period: 9:50:29
(Without Nos. 6a, 7a, 21a and 22a)

Mean rotation period: 9:50:45
(Nos. 6a, 7a, 21a and 22a)

During the previous 1963-64 apparition of Jupiter an abnormally slow current was observed in the North Equatorial Current of Jupiter for the first time. In 1963-64 the "slow" current had a mean rotation period of 9:50:48. During the 1964-65 apparition the "abnormally slow" current had a mean rotation of 9:50:45.

Observers in 1964-65 who also had observed the slow current in 1963-64 were Reese and Mackal. Congratulations to Paul Mackal on his fine observations of this "current" from 1963-1965. Comparing the graphs for these two apparitions, we find that #30 (bright spot) of the 1963-64 apparition is still observed in 1964-65 as #6a (bright spot), while feature #31 (dark spot) of the 1963-64 apparition is still observed in 1964-65 as #7a (dark spot).