

## The 1964-65 Apparition of Jupiter

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### Preface

The late appearance of this report is due in large part to the fact that time was spent getting duplicate material for the period under consideration. The primary data had been lost or misplaced by the then Asst. Jupiter Recorder. Prominent observers were approached in July of 1967 by the present Asst. and asked to resubmit material for this period. The response was favorable enough to justify the present report. The present staff has a deep desire to maintain continuity of reportage. We are thus collectively indebted and thankful to the extraordinary efforts of the following observers of Jupiter: P. W. Budine, C. F. Capen, V. Capen, A. W. Heath, P. S. McIntosh, E. J. Reesa, R. Schorn, and J. Young.

This report concerns the qualitative appearance of Jupiter in 1964-65 including changes in belt and zone structure, belt and zone activity (of a certain magnitude), intensities, and colors. Observations begin on August 3, 1964; go through opposition (November 13, 1964); and end on February 2, 1965.

### List of Visual Contributions:

		Verbal	Full Strip disc	Sketch	
(1)	P. W. Budine; Binghamton, N.Y.; 4" refrac.;	-	2	9	11 6 1
(2)	A. W. Heath; Nottingham, U.K.; 12" reflex.;	5	1	-	
(3)	P. S. McIntosh; Sunspot, N.H.; 6" reflex.;	-	-	1	

### List of Photographic Contributions:

(1)	C. Capen; Wrightwood, Calif.; 16" reflex.;			11
(2)	C. Capen & V. Capen; Wrightwood, Calif.; 16" reflex.;			5
(3)	C. Capen & J. Young; Wrightwood, Calif.; 16" reflex.;			6
(4)	R. Schorn; Fort Davis, Texas; 82" reflex.;			1
(5)	J. Young; Wrightwood, Calif.; 16" reflex.;			2

All in all a grand total of 48 observations were made excluding transits of smaller features. 18 of these were made visually and 26 were photographic in nature. All of the photo positives received were in color.

### Distribution of Contributions:

August	September	October	November	December	January	February
4	4	19	6	2	7	1

A distribution of the observations indicates that the month of October was covered best with 19 observations. The average number of days between successive observations is six. In general the continuity was quite good.

## Qualitative Aspects of Jupiter

North Polar Region - In August it was fairly extensive and reported by Heath on the 10th (167° 11) to be bordered by the N.T.B. Photos on dates preceding and following August 10 show it to be separated from the N.N.T.B. by a narrow N.N.Te.Z. The color of the N.P.R. was brown but cooler and purer than the central region. This appearance was maintained throughout September and early October when on the 7th (227° 11), a C. Capen photo indicates that it was connected to the N.N.T.B. On October 12 (343° 11) Budine noted a N.N.N.T.B. situated in the N.P.R. Its normal August appearance resumed in late October and carried through early January. On the 15th (154° 11), called the N.N.N.N.T.B. in the N.P.R. a "belt-like streak" and noted it again on January 16 (214° 11). Budine noted the N.N.N.N.T.B. again on January 19 (32° 11). In general the N.P.R. was of the same color and intensity as the S.P.R.

North North North Temperate Zone - It was suggested on photos on August 3 (278° 11); September 2, 12, 17, and 26 (R.S. region); October 1, 2, 3, and 4 (R.S. region); October 15 (282° 11); November 4 (88° 11); December 23 (R.S. region); and February 2 (R.S. region). It was not noted in visual observations. This is not surprising, though, because the N.N.N.Te.Z. was a very thin faint dusky zone.

North North North Temperate Belt - This belt was commonly seen as a border on the N.P.R. and was well observed by everyone throughout the apparition in every longitude. In general it was as dark as the N.N.T.B. On occasion it being somewhat darker but more often fainter than the N.N.T.B. Its color was similar to the N.N.T.B. and the N.P.R.

North North Temperate Zone - This zone was obvious throughout the apparition and was uniformly white, and sometimes slightly shaded according to Heath, in all longitudes except on October 7 (227° 11) when it was wholly obscured with dark material. Various festoons, columns, and notches were seen to extend into it from the N.N.N.T.B. and the N.N.T.B. Activity of this sort occurred from October to early November in the R.S. region (20° 11) on several evenings. White spots were noted in the N.N.Te.Z. by C. Capen on September 17 and by C. Capen and Young on October 1. Again in the R.S. region.

North North Temperate Belt, North Temperate Zone - This belt was a good deal darker than the N.N.N.T.B. and the N.T.B. on numerous occasions in most longitudes. Its color was similar to the N.P.R. and saturation was constant throughout the belt. Although its intensity was very uniform its width was variable. Its structure and uneven edges resembled the S.S.T.B. By September 26 (20° 11) it appeared to be composed of so many nodules of varying diameters extended on either side of the meridian. Various festoons, faint hooks, white spots, and wispy elements predominated on the

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South side of the N.M.T.B. being most noticeable in October near opposition. The north side was less active. The activity was rather changeable from night to night indicating a very unstable N.T.Z. In early November the activity died down a bit and the edges of the N.M.T.B. became more distinct once again. This trend continued through December and January. Three small features lasted till March.

The N.Te.Z. was very obvious throughout the apparition except when N.M.T.B.s. activity was increasing. In general the activity along the N.T.B.n. did not obscure the zone. It was clear and bright in all longitudes according to Heath and generally white. On November 22 (20° II) McIntosh noted a definitely dusky N.Te.Z.

North Temperate Belt - In August the N.T.B. was noticeable as a fairly thick orange line across the disc of Jupiter particularly in the vicinity of the R.S. longitude. The belt must have formed during conjunction with the sun. It retained its darkness throughout the apparition. In other longitudes it darkened so that by early October it was fairly consistent in every longitude. C. Capen called it "bright orange" on October 7 (227° II) and on October 15 (202° II). By early November two dark marks were noted in the NTBs with rotation periods of 9h 49m 17s. Such a rate has been noted several times before 1950 with an average rotation period of 9h 49m 17s in 1929-30 in which a larger number of marks were involved. A third mark appeared in early February with a rate three seconds faster than the first two. On November 4 (20° II) C. Capen called the N.T.B. a "remarkable red." Significantly the R.S. color was also noted to change from orange to red like the N.T.B. from September 12 to November 4. This difference is hard to make out on the Capen prints but is clearly indicated on a photo taken by R. Schorn on December 23 with the 82" McDonald reflector. On this, one can note that the NTB is a red-orange color. At this time it also appeared to be more heavily saturated than at any other time. N.T.B. activity extended into the N.Tr.Z. at 31° II on the 26th of January and at 25° II on the 31st of the same month according to Budino. Rotations were not <sup>obtained</sup> unfortunately. A February 2 photo shows the N.T.B. dark and red orange at about 20° II.

North Tropical Zone - It was generally of the same white intensity and clarity as the N.Te.Z. A great deal of N.E.B. activity extended into the zone but no dusky was seen to develop as a consequence of this. It was a good deal narrower than it has been in the recent years with the absence of the N.T.B.

North Equatorial Belt - This belt was extremely active continuing to be the most conspicuous feature on the planet as was also the case in 1963-64 but divergent in the sense that it was not double throughout the apparition but amorphous, wide, and single. Its color was also brown having lost its redness noted by Dick Wand in the 1963-64 apparition report. However, the N.E.B. was reddish in places. 66 spots were noted in all three N.E.B. currents in

1963-64 by Elmer Reese and 60 spots in 1964-65 by Phil Budino. A curious slow current was picked up again in 1964-65 in the NEBs extending into the EZs and was confirmed by the S.A.A. in their section report.

In early August the N.E.B. was double as seen on a Young photo of the 3rd (296° 11). This was confirmed by Heath on August 10 (167° 11), the N.E.B.s. being considerably darker than the N.E.B.n. The intensity of the N.E.B.n. was quite variable. From 170° 11 to 200° 11 it was very dark. At about 20° 11 in August for some considerable distance the N.E.B.n. was nearly gone and this was captured on a Young photo. By August 21, on another Young photo in the same region, the double aspect of the N.E.B. was no longer evident and there was little sign of the N.E.B.Z. From then on the N.E.B. became more intense and reverted to its single component aspect. It formed from the N.E.B.s. and various fragments of the N.E.B.n. The border was full of dents. Preceding the S.S. in longitude the NEBZ was reduced by early September into large white ovals separated by columns and festoons. On several other photos of C. and V. Capen's in September the NE.B., as a single component, becomes more and more obvious. In early October this aspect progressed with ~~the~~ N.E.B.Z. no longer evident in this longitude. By this time it was also clear that the southern half of this new N.E.B. was obscured by an overcast of orange extending over the entire E.Z. and the northern half of the S.E.B. Most of the photos taken on Table Mountain show this orangish hue in the central regions of Jupiter becoming more and more noticeable as the apparition transpired. This cover varied in its extent latitudinally throughout early October over various longitudes. By December 23 R. Schorn's photo shows it reaching a maximum northern and southern extension. At the same time its intensity was decidedly weaker and disappearing. The intense region was concentrated over the E.Z.s. Such veils or covers which do not wholly obscure structure underneath have been noted by this recorder over the northern hemisphere of Jupiter in the early 1960's. Such observations have been noted more rarely by the S.A.A. in the past.

Activity in the N.E.B. was characterized by N.Tr.Z. hooks, festoons, wisps, and bright spots plus E.Z.n. festoons/wisps, and bright spots. In general activity along the E.Z.n. was on a grander scale than activity along the N.Tr.Z.

Equatorial Zones - In early August the E.Z. was rather clear and white in the central position but fairly orangish and dusky on the northern and southern borders. It became wholly orangish coincidentally with the N.E.B. and the S.E.B. and more saturated as opposition was approached. Before opposition it reached its peak darkness. Already by November 22 McIntosh shows the E.Z.n. somewhat lighter than the E.Z.s. and this divergence became more and more accentuated throughout December and January when on February (20° 11) the EZs. is shown to be white and the E.Z.s. orange on C. Capen photo. On January 16 Heath called the E.Z. "mottled"

containing "bridges" between the N.E.B. and the orange E.Z.s.  
(229° 111)

South Equatorial Belt - This belt revived from late August to late December of 1964 being very inconspicuous in 1963-64, the S.E.B.n. being inactive with well defined edges, and the S.E.B.s. barely visible at all. Wispy detail extended into the S.E.B.Z. (278° 11) on August 9 on a Young photo. By August 21 the S.E.B.s. following the R.S. darkened on another Young photo. Conceivably this activity was associated with the major S.E.B. disturbance which broke out at 250° 11 on June 10, 1964, according to Elmer J. Reese. Throughout September the S.E.B.Z. appeared more concentrated in C. Capon's photos. Again following the R.S. Added to all this was the outbreak of a minor S.E.B. disturbance on October 20, 1964, at 40° 11 according to Elmer J. Reese. Rotation periods of S.E.B.Z. features were <sup>obtained</sup> as early as June and July through August and September. Other features appeared sporadically across the globe in this region throughout the apparition. By early October the S.E.B.s. had revived completely and the SEBZ was extremely overcast following the R.S. for at least 60° on an October 2 Young photo. And preceding the R.S. some 60° on a C. and V. Capon photo of October 9. It was considerably whiter preceding the R.S. On the 4th of October the S.E.B.Z. was still dusky following the R.S. By October 7 on a C. Capon photo the S.E.B.s. is clear and well defined on the following half of the disc but on the preceding half there is much activity and the S.E.B.s. was so diffuse that it even influenced the S.Tr.Z. On October 12 Budine noted a dusky S.E.B.Z. preceding the R.S. at 345° 11. Complex activity had died down in this region and was taking place in the region following the R.S. at the same time that the minor disturbance was about to erupt. Through October 18 this state of affairs remained. The SEBZ became a solid dark brown for some 60° or so following the R.S. as recorded on photos. Both the S.E.B.s. and the S.E.B.n. could barely be distinguished. At 282° 11 the zone was quiet although dusky. Well before and beyond the 40° 11 point in late October the S.E.B.Z. was well covered over with dark material. In this the photos concur with Budine's strip sketches. This dark region was noted as far as 111° 11 on one of Budine's strip sketches made on November 22. The December 23, 82" photo, indicated a two component S.E.B.n. preceding the R.S. for some distance and gradually merging together on the preceding limb. By December 31 the major disturbance region had lightened up a bit and more detail could be seen in small reflectors.

What we must endeavor to determine in the future is whether or not the S.E.B. revival is wholly due to multiple eruptions over time from a single geographical point or whether some other sources contribute to its darkening--perhaps single eruptions from many geographical points over time. Indeed such additional complex activity was suspected in this apparition in this region and has been noted subsequently in the STrZ. Thus negative observations in portions of the zone are just as valuable as positive ones in that

any subsequent dark spot is liable to be a singularity or eruption point and not merely subsumable as a spot having drifted from some one eruption point located quite a distance away from the initial observation of it long after it has been formed. If such complex eruptions could be shown to take place in the S.E.B.Z. then it is likely that taken altogether--minor and major disturbances of complexes--contribute to reviving the S.E.B. as a major belt on the planet Jupiter. This seems clear enough to me in light of the fact that the S.E.B. did not revive permanently after the 1962 major S.E.B. disturbance.

South Tropical Zone - This zone was the brightest throughout the apparition and several wisps and markings were noted here. [Twice as frequently as in 1963-64.] Most of these were irregular white patches or small ovals. One dusky column was noted by Budino on February 16 at 227° ll. The color of the zone was white. Heath called it "clear and bright" throughout the apparition.

The Red Spot Hollow came into prominence this year concurrently with the S.E.B.s. It seemed to be very stable in spite of the S.E.B. disturbance activity.

The Red Spot had been decreasing in length since 1962 according to M. Gordon Solberg, Jr., and his results for 1964 concur extraordinarily well with ours. On May 31, 1964, A.L.P.O. observers put it at 26° in length and by the end of the apparition 23°. In 1963-64 the intensity of the R.S. had seemed to increase in spite of the decrease in length. But in 1964-65 the intensity faded too as the southern half of the R.S. became very light and lost considerable saturation. This is well shown on the December 23 photo by Schorn. Over this same period it lost its orange color and became reddish. This correspondence is very intriguing indeed. The amount of accumulated change was difficult to make out in September when only a small notch in the preceding part of the R.S. showed signs of weakness or saturation loss. [Particularly on a photo taken by C. and V. Cohen on September 23.] It was still conspicuous then. Finally, towards the end of the apparition several points were losing saturation in the R.S. Consequently overall intensity was reduced. The center was near 20° ll throughout the most part of the apparition. (R.S.g. near 8° ll and R.S.f. near 32° ll with a mean drift of ± 0.50° ll per thirty days.)

South Temperate Belt - There was a notable gap in this belt as of August but otherwise it was quite dark and prominent. It was not in its double aspect but single and mottled as usual. There was no sign of a lighter S.T.B.c. or S.T.B.z. In between a darker S.T.B.a. and S.T.B.n. Its color was not quite so warm as the S.E.B. or the N.E.B. but generally of the same hue except where the equatorial belts were overcast by the E.Z. The gap was covered completely by photos taken on Table Mountain. Its beginning was captured by Young on August 3 (128° ll) for some 30° in the following direction. It extended all the way to 92° and all the way from 86. BE was at about 267° ll on August 3.

In 1963-64 the S.T.B. had been wider and darker with some discontinuities over longitude but no gaps. On October 4 (171° 11) the gap was again evident on a photo taken by C. Capen. This is quite a photo because the entire southern hemisphere looks subdued as if overcast by a milky white haze. Finally the following one near DC was captured on a photo taken on October 7 (227° 11) by C. Capen. Preceding this gap the S.T.B. was very dark throughout the apparition. On January 16 (259° 11) Heath asserted that the S.T.B. was the darkest feature on the disc. Curiously the long enduring spots--BC, DE, and FA--were rather dull this year.

South Temperate Zone - This zone was similar in intensity to the N.N.T.Z. and on occasion shaded. [January 15 (154° 11), Heath.] It was white like the other temperate zones. It was never very bright. The general region between FA and the R.S. was rather excited from late August through early October in which several wisps issued from the S.T.B. into the S.Te.Z. There seemed to be small nodules in the S.T.B. from which these wisps originated. [September 12 (20° 11), C. Capen.]

South South Temperate Belt, South South Temperate Zone - The belt was not distinct from the S.P.R. but flush with it and could only be distinguished from it by its intensity which exceeded the surrounding regions in darkness in most longitudes throughout the 1964-65 period. A hard to detect S.S.Ta.Z. can be glimpsed on the 82" photo taken on December 23. This zone is shown to be very slightly lighter than the S.P.R. in hue on a strip sketch made on December 22 by McIntosh. It was like the N.N.T.Z. in intensity, color, and saturation but not in its structure or activity which was decidedly less noticeable. Some white spots were picked up.

South Polar Region - It was very much like the N.P.R. but without any definite hint of the S.S.S.T.B. or the S.S.S.S.T.B.