End of Apparition report: Jupiter -2010-2011

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Start Date: 2010 June 5th
End Date: 2011 February 12th

Opposition: 2010 September 21st

Total Number of Drawings/Observations: 49

Instruments used:

- 203mm (8 inch) Newtonian Reflector *(Leicester, UK)*
- 381mm (15 inch) Newtonian Reflector *(Selsey, West Sussex)*
- 508mm (20 inch) Schmidt Cassegrain *(Leicester University Observatory, Leicester UK)*

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1. Introduction

This is a short end of apparition report which summarizes the observations made by the author of the planet Jupiter during the apparition of 2010 and 2011. This apparition was much better than the previous three for observers within UK latitudes; the planet has now finally climbed out of the deep South constellations. During this apparition, the planet was situated in the constellation of Pisces and reached a reasonable altitude.

The apparition started with rather a bang; observations by the author began on 2010 June 5th when a general alert was put out by the BAA Jupiter Section Director, Dr. John Rogers. On 2010 June 3rd Anthony Wesley (Australia), reported an impact flash. This was quickly confirmed by Chris Go (Philippines) who videoed the flash. The flash occurred at 20:31:29 UTC and was undoubtedly the result of a small cometary body colliding with the planet. It was about 2 seconds in duration and initial measurements gave a longitude λ_1= 342.7°, λ_3= 159.4°, Latitude of 16.1 deg S.

Nothing resembling an impact scar was seen in the 30 minutes or so before it vanished off the proc. Limb, and when it appeared in the morning at 0330UT, observers in England, France and Italy looked for an impact scar but nothing definite was recorded. The author was able to use the University of Leicester's 508mm (20 inch) Planewave Schmidt Cassegrain telescope on the night of 2010 June 4-5, and he along with Andrew Button and Hugh Sasse made plans to examine the impact region. Alas, the planet was obscured by buildings and trees until 0344UT, by which time the impact site had long since passed off the disk. In any case, further observations by other astronomers indicated that there was no impact scar to be seen!

As well as attaining a reasonable altitude, the planet also reached perihelion on 2010 June 20th

and was only 368 million miles away; the last such close approach occurred in 1963. As a result the planet subtended a large disk size; almost 50".

All observations made by the author during the apparition were done so visually using the instruments indicated. Observations were made by first making a rough drawing at the telescope. Various notes were also made about the appearance, colour of the planet and the various features. These were then transferred in neat (and in colour) to the Jupiter Log book afterwards. Times recorded in observations were made using a radio controlled clock. Colour and intensity estimates were also made and these are given in Sections 4 and 5. Section 6 gives some observed satellite phenomena. All observations were forwarded on to the BAA Jupiter Section, and both the ALPO of Japan and US and also to the OAA.

2. The Planet.

The appearance of the various observed features is now summarized. The observations of the features were made in unfiltered light, and it was found that powers ranging between x111 and x250 were the most effective. Later in the apparition, both David Gray and Alan W. Heath suggested the use of an apodizing screen. The screen (which was made of plastic gauze, with square holes of 1.55mm thickness) was indeed most effective in increasing the contrast of the various belts.

So, starting from the Southern Polar Region and working northwards, we have the following features:

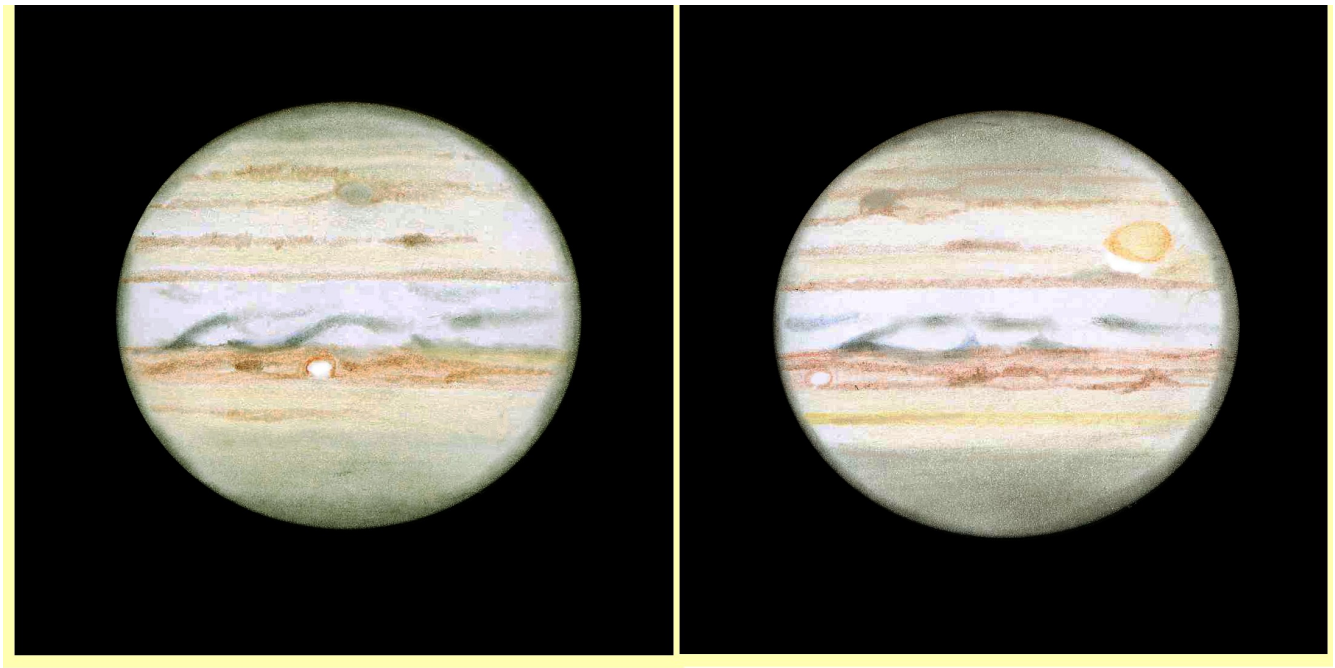
Southern Polar Region [SPR]: When seeing was very good, some faint mottlings could just be made out. The region appeared to be greyish-yellow in colour and varied very little in intensity.

South South Temperate Zone [SSTZ]: This is the brightest southernmost zone which could be observed on a regular basis. Occasionally a S^3TZ could be discerned in the moments of good seeing. The SSTZ was normally a yellowish colour and did seem to vary a bit with longitude. At it's brightest it was of intensity 1.75, at its darkest 2.5.

South South Temperate Belt [SSTB]: In general, the SSTB took the form a thin light brown belt. It was not always complete however and frequently appeared fractured. It appeared to be interacting with BA Oval as can be seen in Figure 1.

South Temperate Zone [STZ]: This zone was usually rather bright, although its brightness did vary during the course of the apparition. The zone was normally a light yellowish colour, but occasionally a light brownish/pink colour could also be detected.

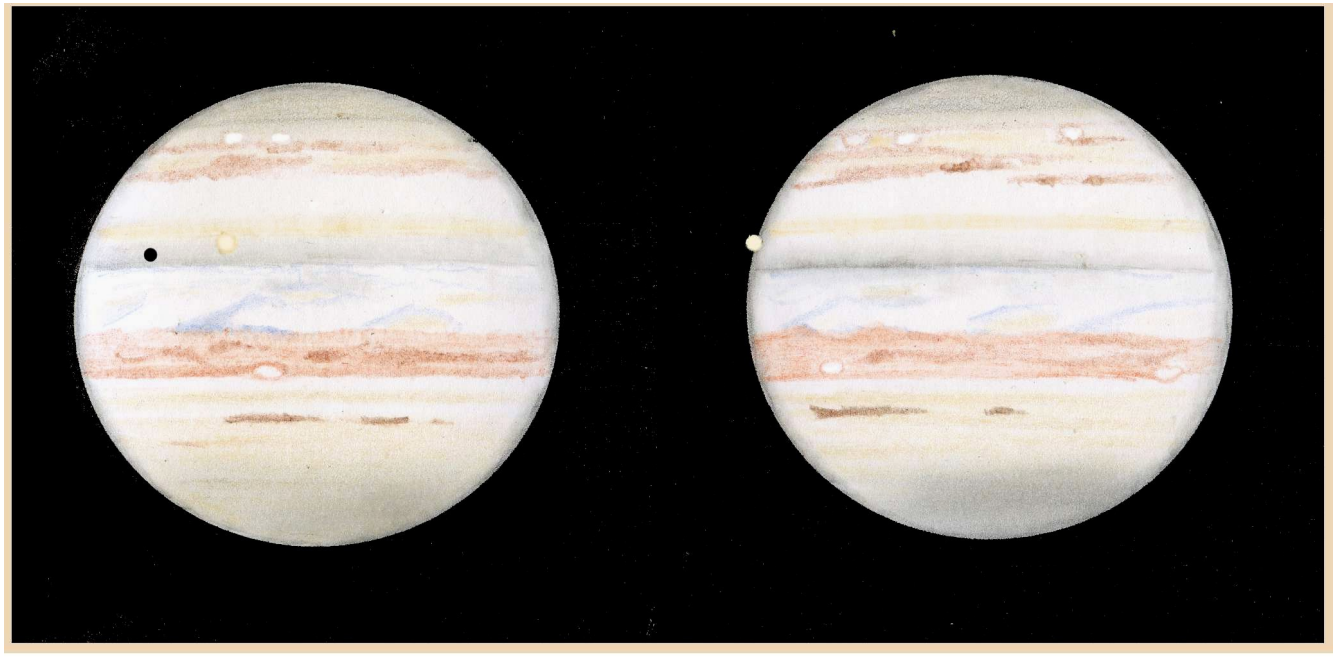
South Temperate Belt [STB]: This belt was interesting as it was not uniform in longitude. In some regions it appeared as a thin brownish coloured belt, while in other longitudes it was clearly fragmented. On the night of 2010 September 2nd, it seemed that the SEB was composed of darker fragments and that the belt was separated into two parts at $\lambda_2 = 12.8$ (see Figure 2)



Drawing 1: 1747UT, 167x, S=AIII
CM1: 220.7 CM2: 84.5 CM3: 329.5

Drawing 2: 1902UT, 167x, S=AIII
CM1: 266.5 CM2: 129.9 CM3: 4.9

Figure 1: *Two drawings made on 2011 January 8th with a 203mm Newtonian showing BA Oval interacting with the SSTB.*



Drawing 1: 2324UT, 250x
CM1: 220.5 CM2: 346.8 S= AII

Drawing 2: 0007UT, 111x
CM1: 246.7 CM2: 12.8 S=AII

Figure 2: *Two drawings made by the author on 2010 September 1-2 with 203mm Newtonian Reflector, the split in the STB is shown (Io & it's shadow are in transit)*

South Tropical Zone [STropZ]: Another very bright zone. Although CCD images showed to it be a white zone, visually it also seemed to be of a yellowish -rose colour. The zone also contained the Great Read Spot which was visible during the whole apparition.

Great Red Spot & Red Spot Hollow [GRS & RSH]: The GRS and RSH was visible during the whole apparition. At the start of the apparition, the GRS was rather prominent and appeared to be of a strong light orange-salmon colour. It was clear that there was a ring of darker material which surrounded the lighter core. Towards the end of the apparition, after the SEB revival had started, both the orange colour in the GRS and the structure of the spot seemed to be far less striking. The last observation of the spot was made on 2011 Januray 20th and appeared quite faint and noticeably harder to pick up visually (see Figure 3).

The RSH was also visible during the whole apparition, though it could only be well observed during average seeing or better. In nearly all cases it seemed to take on the same intensity and colour as the STropZ.

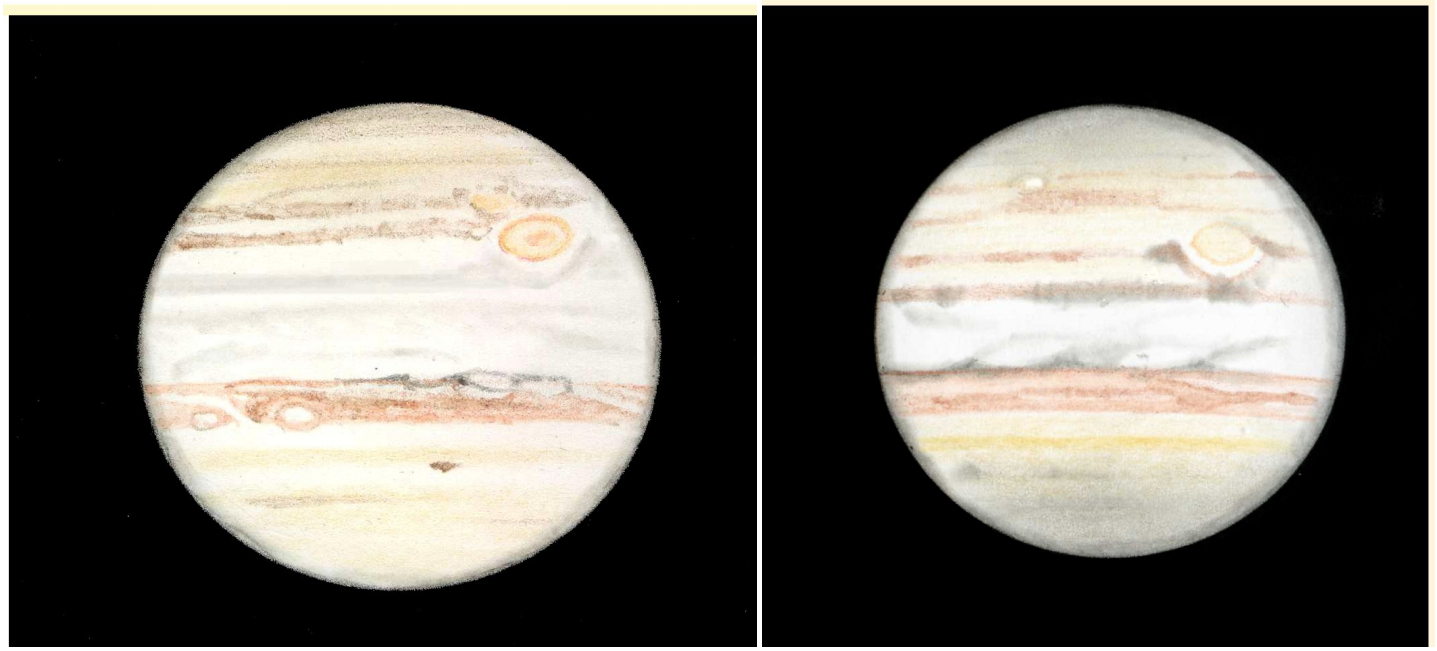
South Equatorial Belt, South Component [SEB(S)]: For most of the apparition, both components of the SEB was vague features until the start of the SEB revival (See Section 3). Although the belt was difficult to trace, it was not completely absent. Usually the SEB(S) appeared to be a light yellow colour, and contained the RSH. After the SEB revival, the SEB(N) the SEB(S) appeared to be a Grey colour.

South Equatorial Belt Zone [SEBz]: This zone was a light region, sometimes very light yellow sometimes cream, and was much easier to see after the SEB revival. This was probably due to the increased contrast between the two components of the SEB.

S**outh Equatorial Belt, North Component [SEB(N)]:** Before the SEB revival this belt appeared to be a greyish coloured band, not always well defined. After the revival, it seemed to become a light brownish colour and became noticeably darker. On the night of 2011 January 20th, there seemed to be some darker Grey components present within the belt (see figure 3)

Equatorial Zone [EZ]: The brightest zone on the planet. Although the region was predominantly white in colour, there were occasions when darker regions of a yellowish colour were present. Also visible in the zone were various festoons. A particularly small dark festoon was observed on 2010 August 11th and appeared to be impacting on the NEB (see figure 4).

North Equatorial Belt [NEB]: This was one of the most dynamic and active belts on the planet almost always appearing to be turbulent and of a mix of colours and intensities. Early on in the apparition there appeared to be a long turbulent rift in the NEB which appeared white (or yellow-white) in colour and was quite complex in nature. It was recorded in good detail on 2010 August 8th (Figure 5). Later on in the apparition the rift seemed to become less prominent.. Very often the NEB appeared to be composed of two thin dark belts which were separated by irregular long white rifts.



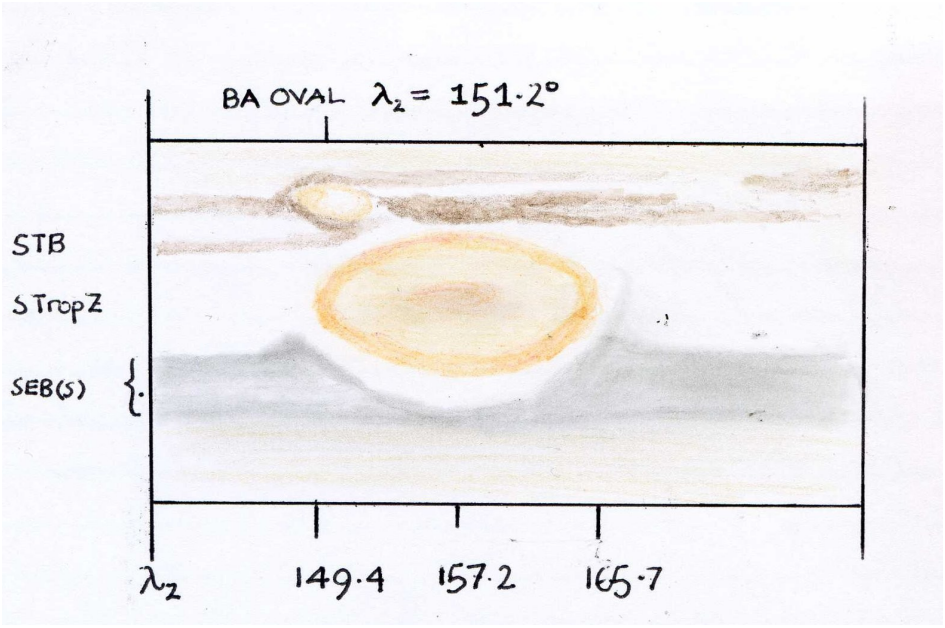


Figure 3: *The GRS during the apparition.* ***(Top)*** *The left-hand drawing was made on 2010 September 12 at 0112UT, x200 AII (CM2: 116.1). The GRS has a clear well defined structure and is a strong orange colour. By the time of the right hand drawing, 2011 January 20th at 1932UT x167 (CM2: 148.4), the spot is now quite weak in colour and hard to pick up. Both drawings made with a 203mm Newtonian Reflector.* ***(Bottom)****: Close up of the GRS drawing in very good seeing on 2010 September 12th, 0204UT-0212UT, 203mm Newtonian @ 250 & 312x. BA Oval is near by.*

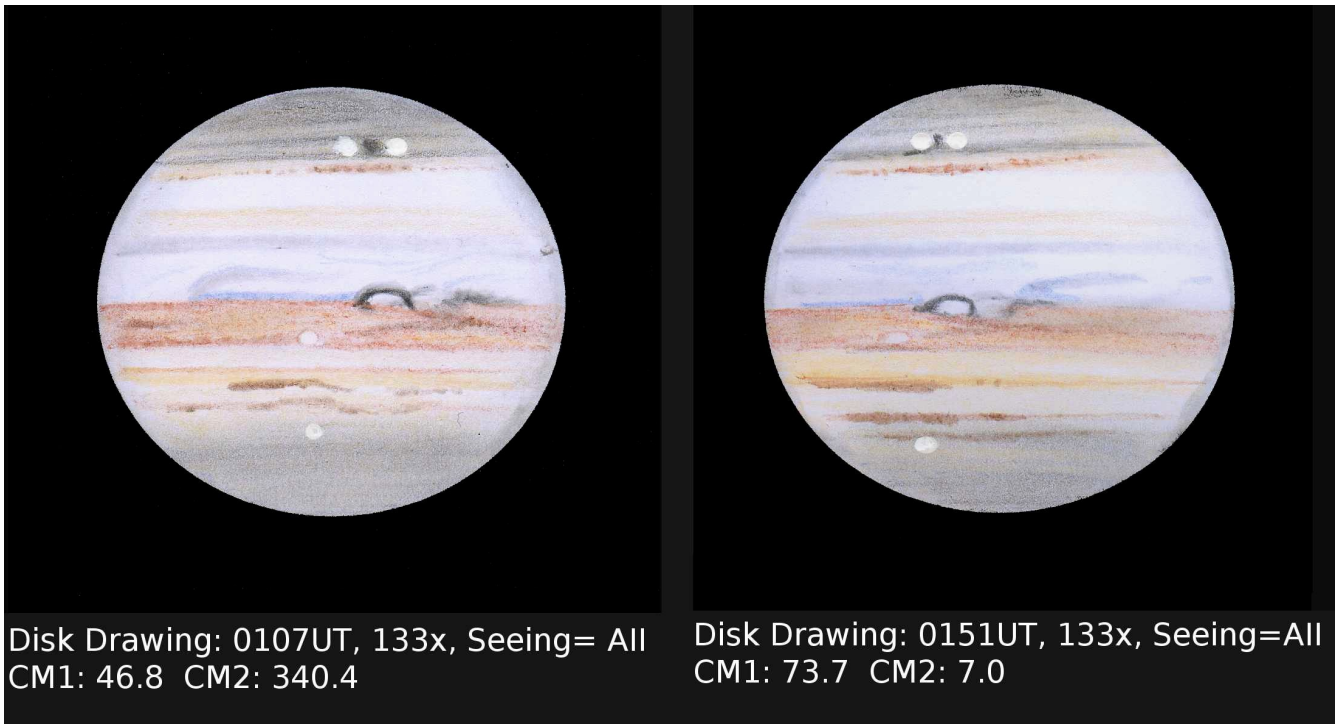


Figure 4: *Two drawings made on 2010 August 11 with 203mm Newtonian Reflector. An usually dark festoon is shown in the EZ and is interacting with the NEB.*

North Tropical Zone [NTropZ]: Another rather bright zone which normally appeared to be a light yellowish colour. The colour was not uniform along the whole of the zone, some regions seemed to contain more yellowish colour than others.

North Temperate Belt [NTB]: A rather interesting belt. It was always present on the disk but seemed to vary in colour, intensity and structure. On many occasions it took the appearance of a thin yellow-gold belt, while at other times, darker brown sections could be made out within the yellow-gold band. Sometimes the dark section were rather wide in longitude, at other times they took the form of very thin sections or points (see figure 4).

North Temperate Zone [NTZ]: A bright yellowish-white zone. There was a little variation in brightness of this zone.

North North Temperate Belt [NNTB]: This belt was not always visible; in less than average seeing the NTZ-NPR appeared to be one vague ill defined region. When the belt was present, it took the form of a yellowish-gold band. Like the NTB it too sometimes contained darker sections within.

North Polar Regions [NPR]: The NPR took the form of a greyish-brown shading at the bottom of the disk (south up, telescopic view). The NPR was not completely homogeneous, often vague mottled structures could be made out (see figure 7) . A white oval seemed to be present on the night of 2010 August 11 (see figure 4).

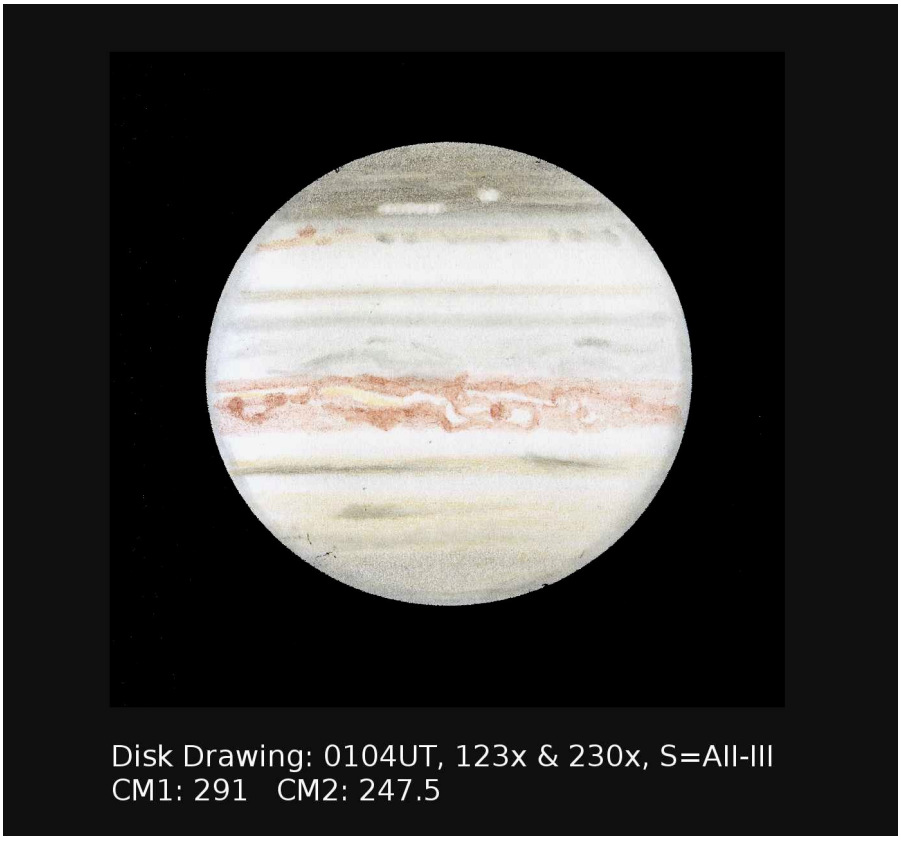
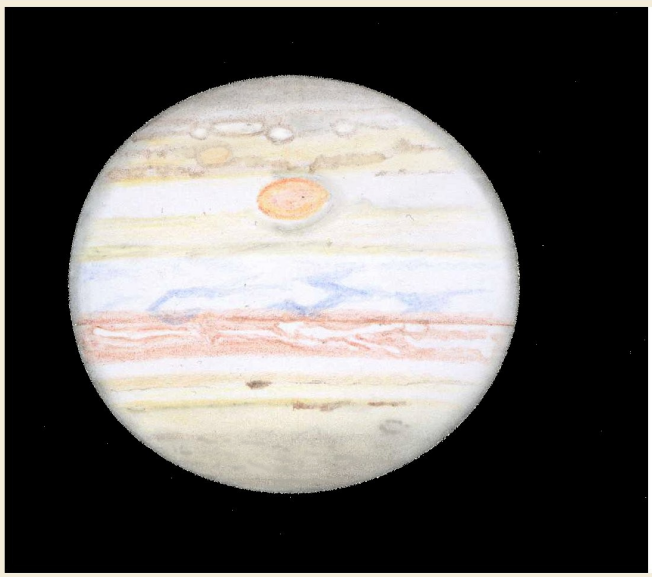
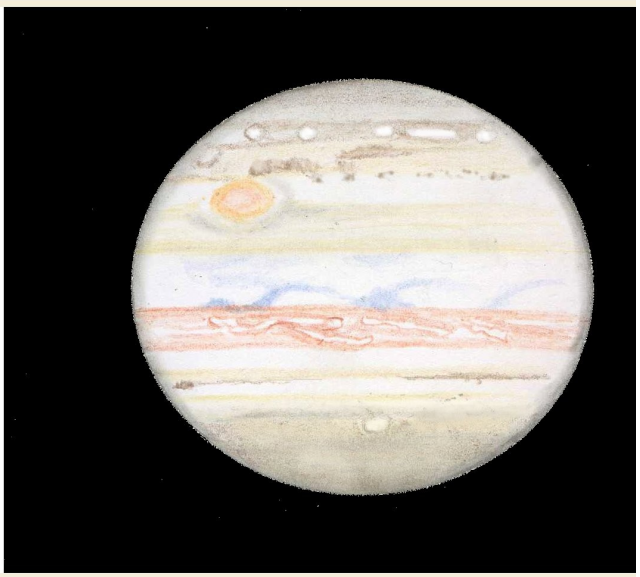


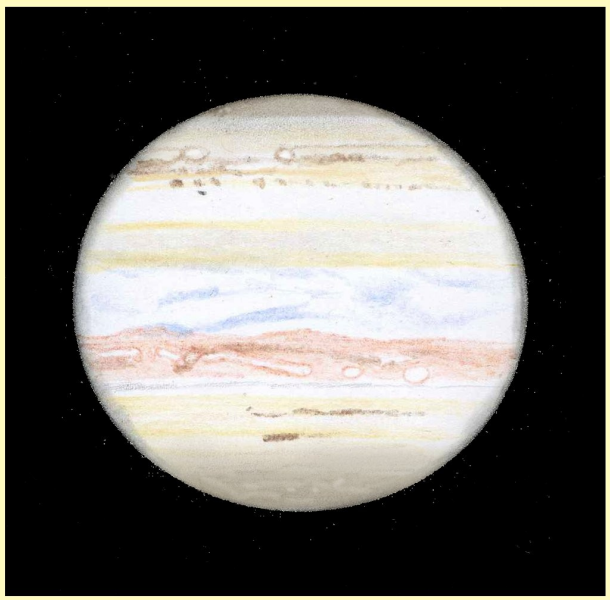
Figure 6: *A drawing made by the author on the night of 2010 August 8th with the University of Leicester's 508mm (20 inch) Planewave Cassegrain Reflector (with Hugh Sasse). The irregular rift and turbulence in the NEB is much in evidence.*



Drawing 1: 2201UT, x250, S=AII-III
CM1: 300.8 CM2: 160.5



Drawing 2: 2259UT, x250, Seeing= AII-III
CM1: 336.2 CM2: 195.5



Drawing 3: 0014UT, 133x, Seeing=AI-II
CM1: 21.9 CM2: 240.9

The features in the three disk drawings have been exaggerated in contrast.

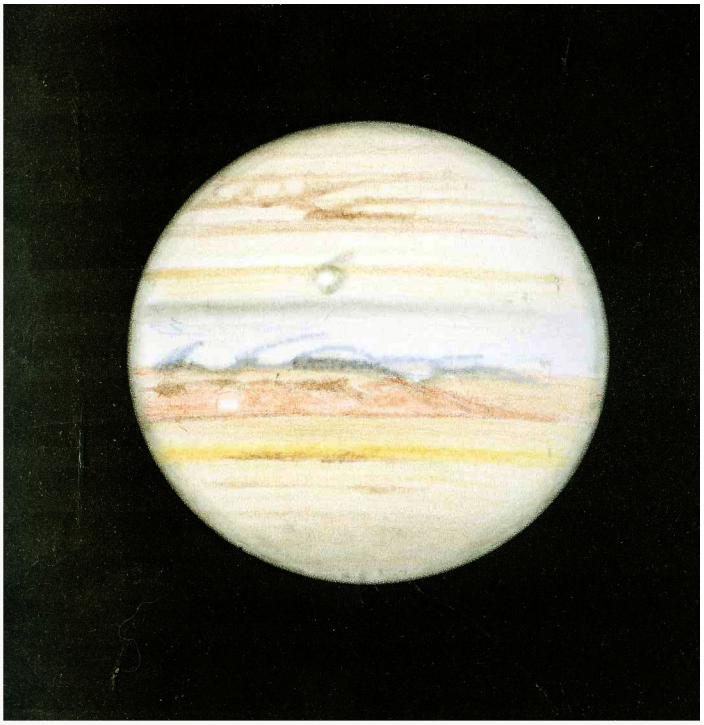
Figure 7: *A series of drawings made on the night of the 2010 October 6-7 between 2135UT to 0030UT with a 203mm Newtonian Reflector. The mottling and faint structures in the NPR are in evidence in the very good seeing.*

3. SEB Revival

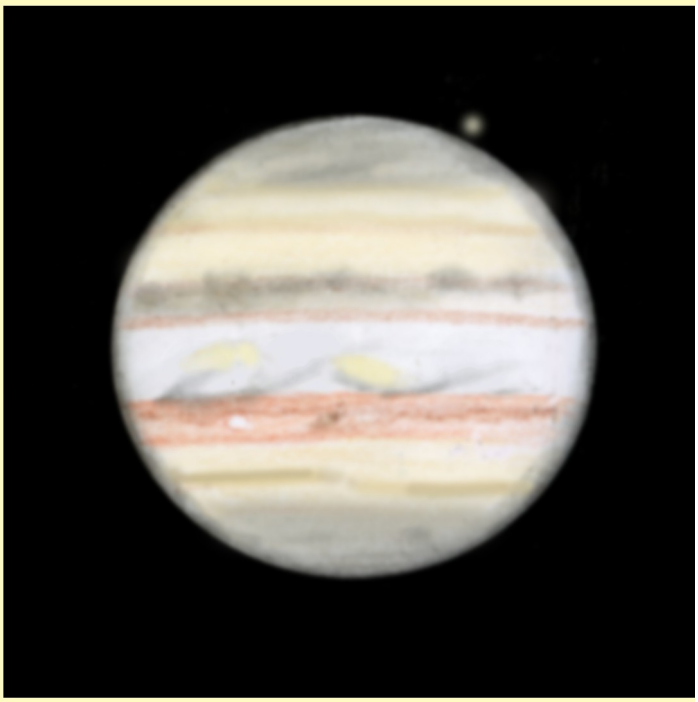
For much of the apparition, the SEB was very feint and hard to trace. At no time however did the belt appear to be completely absent; always it was possible to trace a light SEB(s) and a darker (normally light Grey) SEB(N), sometimes with a light yellow SEBz present. On the 2010 November 10th, the author received an alert from Dr. John Rogers of the BAA Jupiter section. Chris Go of the Philippines had imaged a small white spot in the SEB which was suspected to be the start of the SEB revival.

The spot was indeed the start of the SEB revival and on the 2010 November 10th, the skies in Leicester were clear and the author was able to observe the planet. Alas, seeing conditions were really rather poor, and only a fleeting glimpse of the bright spot was caught. On the night of 2010 November 15th, the author used the University of Leicester's 508mm telescope to view the spot. Again seeing was poor, but the white spot could be made out (figure 8). The initial impressions of the white spot was that it was not as bright and as conspicuous as expected, this may have been due to the poor seeing but it seemed to the author that the spot was not as bright as other SEB revival spots.

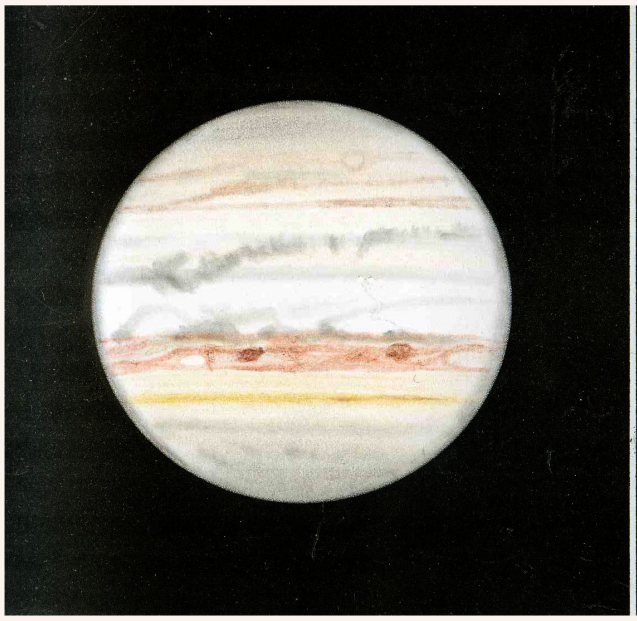
After this, a series of cloudy nights and poor weather meant that the SEB revival was not seen again until 2010 December 10th. By this time, the SEB was noticeably different, a diagonal Grey belt of a rather irregular structure could be seen extending from the white spot through the SEBz and into the SEB(s), where dark Grey sections continued in longitude in the following direction (see figure 8). The SEB revival continued, but by this point Jupiter was becoming increasingly harder to observe as it was nearing the trees which border the author's garden in the SW. The last two observations made on 2011 February 8th and 2011 February 12th respectively. By this time, both components were now much more prominent and on the night of the final observation of the planet, the SEB(s) appeared to be composed of dark Grey sections, while the SEB(n) seemed to be a light brown colour in the longitudes observed.



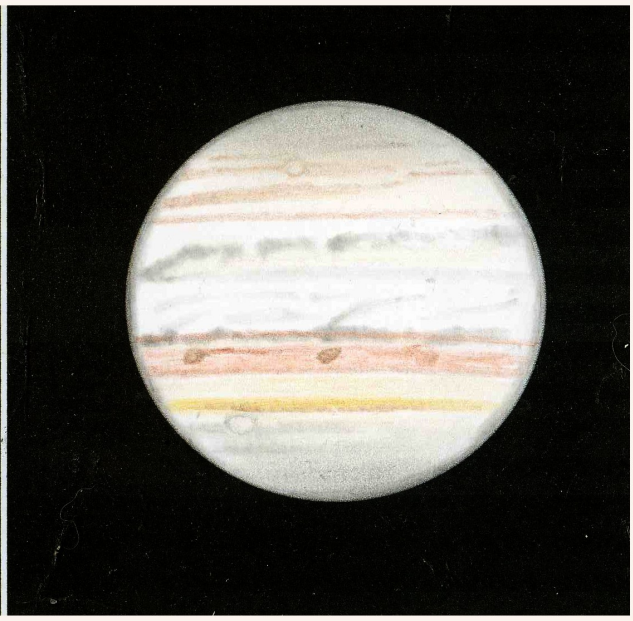
Drawing: 1837UT, x250 Seeing= AIII
CM1: 13.5 CM2: 289.1 CM3: 149.6



Disk Drawing: 1819UT, x167, S=AIV
CM1: 358.2 CM2: 314.8 CM3: 199.1



Drawing 1: 1922UT, x200, S=AII
CM1: 289.9 CM2: 328.4 CM3: 197.2



Drawing 2: 2025UT, x133, S=AII-III
CM1: 251.5 CM2: 290.3 CM3: 159.1

Figure 8 SEB Revival. Top: *LHS First proper observation of the SEB outbreak on 2010 November 15 (203mm Newtonian). RHS: last view of Jupiter, SEB(S) very turbulent.* ***Bottom:*** *Two drawings made on 2010 December 16th (203mm Newtonian) showing the dramatic SEB revival.*

THE BAA JUPITER SECTION: VISUAL INTENSITY REPORT FORM

OBSERVER: Paul G. Abel **LOCATIONS:** **Leicester:** 52° 36.6'N, 1°7.7' W
YEAR 2010-2011

Month	June	June	July	August	August	August	September	September	October	October	December	Jan (2011)	January		
DAY	15	28	4	11	18	24	2	12	7	13	17	8	11		
UT	02:48	03:17	03:01	01:18	00:40	00:50	00:24	01:50	00:24	21:45	19:47	18:20	18:40		
INSTR	203 Refl	203 Refl	203 Ref	203 Refl	203 Refl	203 Refl	203 Refl	203 Refl	203 Refl	203 Refl	203 Refl	203 Refl	203 Refl		
MAGNIFICATION	x137	x200	x111	x133	x111	x111	x111	x200	x133	x133	x133	x167	x167		
FILTER	-	-	-	-	-	-	-	-	-	-	-	-	-		
SEEING	AIII	AIII-IV	AIII-IV	AII	AIII	AII-III	AIII	AII	AII	AI-II	AII	AIII-IV	AIII		
CM1	106	16.2	233.9	53.5	56.4	290.7	251.1	89.9	28	316.9	266.7	240.8	6		
CM2	114	284.8	96.8	347.1	296.8	125.1	23	139.1	246.9	123.3	305.47	104.5	206		
CM3	293.6	107.9	281.5	181.8	133.4	323.4	223.7	342.4	96.9	335.1	174.2	339.4	82.4		
INTENSITY OBSERVATIONS														INTENSITY AVERAGE FOR THE APPARITION	NUMBER OF ESTIMATES
THE PLANET															
SPR	3.75	3.75	3.75	4.5	4	3.5	4.5	3.5	3.5	4	4	4	4	3.9	14
SSTZ	1.75	2	1.25	2	1.75	1.75	2.5	1.75	2.5	2	3	2	1.75	2	14
SSTB	4.25	3.75	4	3	3.25	3.75	3.75	4.75	3.75	4.75	3.75	3	3.5	3.79	14
STZ	1.75	1.75	1	1.25	1.5	1.75	2	1.5	2	1.5	2.5	2	1.75	1.71	14
STB	4	4.5	4.25	4	3.25	4	4	4	3	4.5	5	4	3.75	4.02	14
STropZ	0.75	0.5	0.75	0.5	1	1	0.5	0.5	1	0.5	1	1.5	1.5	0.85	14
GRS	3	-	-	-	-	3	-	4.5	-	5	-	-	-	3.88	5
RSH	-	-	-	-	-	1	-	0.5	-	0.5	-	-	-	0.67	4
SEB(S)	-	1.75	-	2	2.5	2.75	3	3	2.75	3.25	2	3.75	-	2.68	11
SEBz	-	0.5	-	-	-	-	1	1.5	-	1	-	1.5	1	1.08	7
SEB(N)	3.5	3	2	2	2.5	3	2.75	3	3.75	2.75	3	3.75	3.75	2.98	14
EZ	1	0.5	0.5	0.5	0.5	0.5	0.5	0.75	0.5	1	0.5	0.5	0.5	0.6	14

5. Colour Estimates

Below are the colour estimates made during the apparition. The colour abbreviations are given in the table, the colour which appears first was the most dominant colour.

THE BAA JUPITER SECTION: VISUAL COLOUR REPORT FORM

OBSERVER: Paul G. Abel **LOCATIONS:** **Leicester:** 52º 36.6'N, 1º7.7' W
YEAR 2010-2011

Month	June	July	August	August	August	September	September	October	October	December	Jan (2011)	January		
DAY	15	10	11	18	24	2	12	7	13	16	8	11		
UT	03:06	02:14	01:51	01:34	01:28	00:07	01:12	00:14	21:29	20:25	19:02	18:09		
INSTR	203 Newt	203 Newt	203 Newt	203 Newt	203 Newt	203 Newt	203 Newt	203 Newt	203 Newt	203 Newt	203 Newt	203 Newt		
MAGNIFICATION	x137	x250	x133	x111	x133	x111	x200	x133	x133	x133	x167	x167		
FILTER	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NOEN		
SEEING	AII-III	AII-III	AII	AII	AII	AII	AII	AII-II	AII-II	AII-III	AIII	AIII-IV		
CM1	117	72.7	73.7	89.4	313.8	246.7	66.7	21.9	307.2	289.9	266.5	347.1		
CM2	124.9	250.1	7	329.4	148.1	12.8	116.1	240.9	113.6	328.4	129.9	188		
CM3										197.2	4.9	63.7		
INTENSITY OBSERVATIONS													INTENSITY AVERAGE FOR THE APPARITION	NUMBER OF ESTIMATES
THE PLANET														
SPR	Grey	lt brw -gry	Grey-brw	gry	lt gry yell	Gry-yell	lt yel brw	Lt gry yell	lt brw yell	lt yell brw	lt yell gry	Lt gry yell	lt gry yell	12
SSTZ	Yell-White	Yell-gry	lt yell gry	lt yell gry	yellow	lt yell	lt yell	lt yell	yell	lt yell	lt yell	lt yell	lt yell	12
SSTB	Light-brow n	lt brw	lt brw	lt brw	lt brw	lt brw	lt brw	lt brw	lt brw	lt brw	lt brw	lt brw	lt brw	12
STZ	Yell-w hite	lt yel	lt yell	lt yell	lt yell	lt yell	lt yell	lt yell	lt yell	lt yell	lt yell	lt yell	lt yell	12
STB	light brow n	lt brw	lt brw	lt brw gry	lt brw	lt brw	lt brw	lt brw	lt brw	lt brw	lt brw	lt brw	lt brw	12
STropZ	light yell	w hite	w hite	Yell-w hite	w hite	w hite	lt yell	w hite	cream	lt yell-w hite	lt yell w hite	w hite	White-yell	12
GRS	orange	-	-	-	Ora-pink	-	orange	-	orange	-	lt oran	very lt oran	Oran-pink	12
RSH	-	-	-	-	w hite	-	White-yell	-	Yell-w hite	-	w hite	yell gry	white	12
SEB(S)	yellow	gold	gold	gold	Gold-yell	gold	Gry-yell	gold	lt gry yell	lt grey	lt yell brw	lt gry	lt yell-gry	12
SEBz	yellow	lt yell	lt yell	lt yell	w hie	White-yell	lt yell	lt yell	lt yell	lt yell	lt yell	lt yell	lt yell-white	12
SEB(N)	light brow n	lt brw	lt gry	lt gry	grey	grey	Gry-yell	Gold-brw	lt gry yell	lt gry	lt brw	gry	Gry-yell	12
EZ	w hite	w hite	w hite	w hite	w hite	w hite	w hite	w hite	w hite	w hite	w hite	w hite	white	12
EB	-	-	-	-	-	-	-	-	-	-	-	-	-	12
NEB	light red-ora	lt brw -ora	lt brw -oran	lt ora-brw	lt ora brw	lt oran brw	Orange-brw	ora brw	lt ora brw	Ora-brw	lt brw ora	lt ora brw	Lt oran brw	12
NTropZ	lt yel	lt yell	yell	lt yel	lt yell	w hite	w hite	lt yell	w hite	lt yell	lt yell	lt yell	White-yell	12

6. Satellite Phenomena

A total of three satellite events were recorded, and the diary of vets recorded is given below:

2010 August 23-24: Io transits the disk, Ganymede passes into shadow. Observations made with 203mm Newtonian, in good seeing:

23h41m: Ganymede brighter than Io. Io is distinctly yellow-orange in colour

00h22m: Ganymede now of equal (or very similar) brightness to Io

01h06m: Io's shadow now on extreme edge of Jupiter's fol. Limb

01h41m: First contact of Io with Jupiter

01h46m: Io now on fol. Limb, Ganymede very faint

01h49m: Ganymede now invisible- it has passed into Jupiter's shadow

2010 September 1-2: Transit of Io. Observations made with 203mm Newtonian Reflector, seeing good to average:

23h15m: Io transit will soon be over! Shadow near proc. Limb

23h40m: Io's shadow now on the proc. Limb

00h06m: Io now extremely bright on proc. Limb

00h12m Io off the disk,t transit is over.

2010 September 16: Io passes into Jupiter's shadow. Observation made with a 203mm Newtonian reflector, seeing good to average, frequent passing cloud:

22h34m: Io noticeably dimmer

22h35m: Io vanished from view.