

End of Apparition Report: Mars Aphelic Apparition 2011-2012

Paul G. Abel FRAS

*Department of Physics & Astronomy,
University of Leicester,
Leicester UK. LE1 7RH*

Abstract

An end of apparition report summarizing observations made by the author of Mars during the 2011-12 apparition is presented. In Section 1 we have some introductory remarks, while Section 2 contains a summary of observations in blocks of 60° longitude. Section 3 discusses observations of the NPC while section 4 discusses white clouds activity. In Section 5 there is a brief comment on dust storms while in Section 6, an outline chart of the planet is given for the 2011-12 apparition.

Start: 2011 September 02

Finish: 2012 May 12th

Opposition: 2012 March 04

Number of Observations: 20

Number of Drawings: 31

D= 4.6" (minimum)

D= 13.9" (maximum)

Filters Used: W#80A, W#11

Instruments Used:

- [A] 203mm Newtonian Reflector [Knighton Observatory]
- [B] 508mm Dall-Kirkham [Leicester University Observatory]
- [C] 381mm Newtonian Reflector [Sir Patrick Moore's Observatory]

1. Introduction

The 2011-12 Mars was an aphelic one. As a result the planet was high in the sky, but its disk size remained small and never exceeded 13.9". Observations were started by the author on 2012 September 02 when the disk size was a small 4.9". Observations continued until 2012 May 12th with opposition occurring on 2012 March 04. Although the author was able to follow the planet for 8 months, frequent bad weather hampered observations. The adverse UK weather brought an end to observations early; normally the author follows the planet until it reaches a size of 6" however after after 2012 May 12th to the time of writing (2012 July 06) there have been no clear nights since then, and now the planet is obscured from view at

sunset.

All field observations were recorded in the Observatory log book (Vol. III). These included drawings (made on 50mm blanks) along with any notes and descriptions. These observations were then transferred to the Mars Observing book (Vol. II). Drawings made in neat were colourised. All observations were sent on to the Mars Section of the BAA and the ALPO.

2. The Planet

(a) Longitude λ : 0° to 60°

In this region the two dominant features are Acidalium in the north, and the Mare Erythraeum in the south. Since this was an aphelic apparition, the northern hemisphere was presented, and the author was able to get a number of drawings of the region showing some fine details in Acidalium and Baltia, and Erythraeum in the south.

At the start of the year, the North polar cap was large and so Baltia was not visible (see figure 1). Acidalium appeared much as it did in the 2009-10 apparition. In general it was a brownish region which appeared to contain various subtle brighter regions. Niliacus Lacus appeared as a darker section, not always uniform in intensity. Nilokeras was similarly a dark region and seemed to be composed of two darker spots with faint streaks connecting it to Acidalium.



Figure 1: Three drawings of Mars made by the author on 2012 January 12-13 with a 203mm Newtonian Reflector. Acidalium and Erythraeum are well placed, and the NPC is large and bright.

The Chryse region was normally very bright, indeed when it appeared on the morning or evening limb, the brightness was dazzling on occasions. Further south, Erythraeum showed a great deal of structure. There appeared to be a number of dark spots extending from Erythraeum into Chryse. Similarly Aurorae Sinus appeared as a dark spot with extensions into Tharsis. In moments of good seeing it appeared that Erythraeum was composed of many light and dark sections. In the far south, Argyre could be made out as it was frequently rather bright, the basin no doubt filled with clouds due to the thawing of the polar cap.

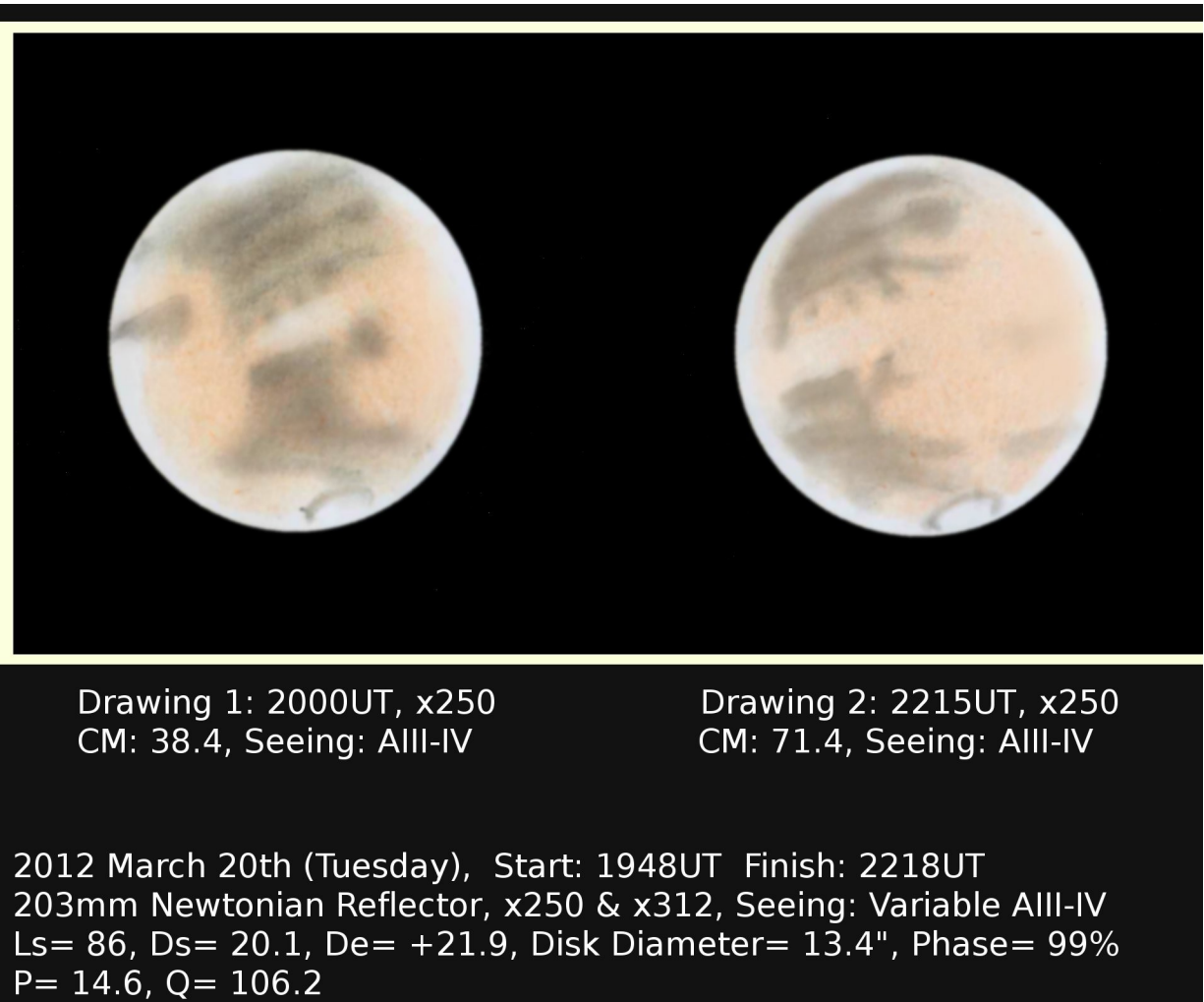


Figure 2: Two drawings of Mars made by the author on 2012 March 20th. The NPC has now greatly reduced in size and Ortygia and Baltia are now visible.

As the northern hemisphere passed from winter into spring, so the brilliant NPC shrank. As this happened more of Acidalium became visible along with the Baltia region and Ortygia. At times Baltia appeared to almost extend to the Lowell band which was surrounding the NPC. On 2012 March 24th it seemed that there was a bright region present just east of Baltia under the Mare Acidalium (see figure 3). The planet was examined at both x250 and

x312 and seemed to be present at both powers. Interestingly, the object did not persist and later seemed to fade and vanish, by the close of observations at 2224UT, it was no longer visible.

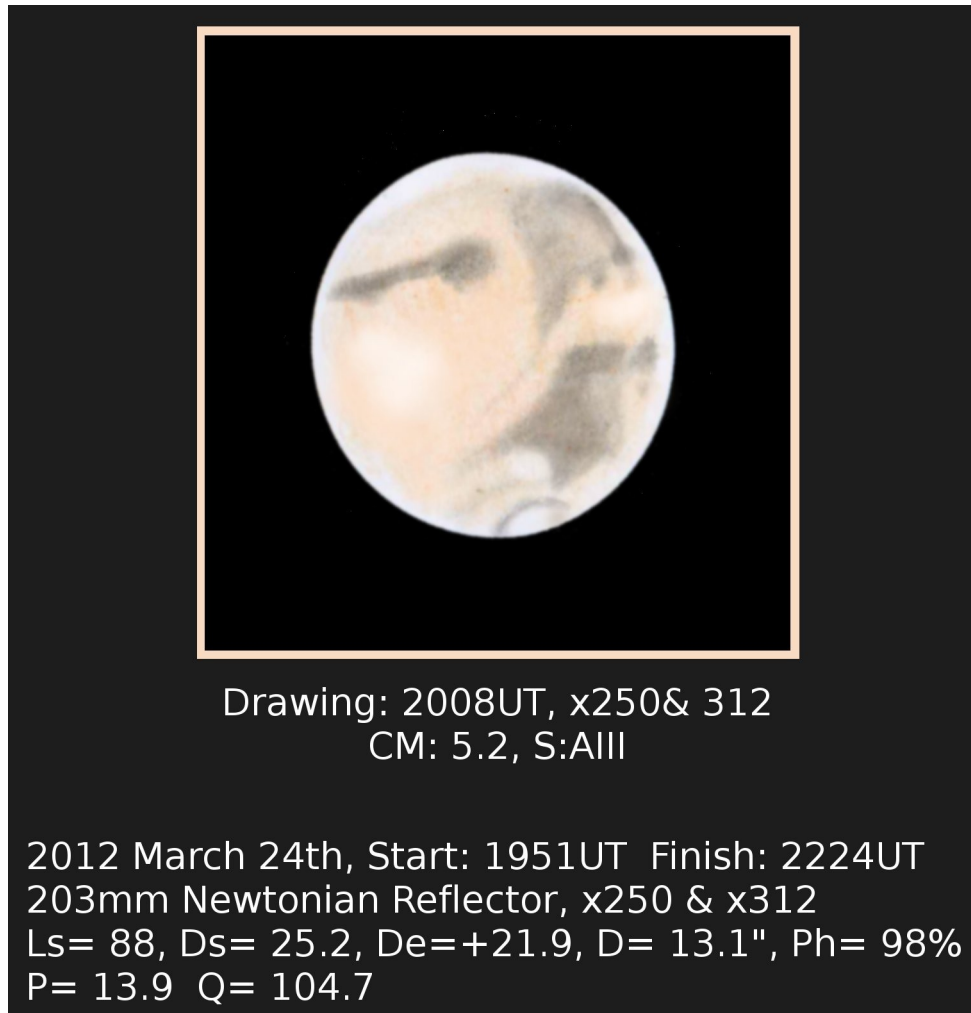


Figure 5: Drawing of Mars made on the 2012 March 24th. A bright region seems to be present in the region just east of Baltia.

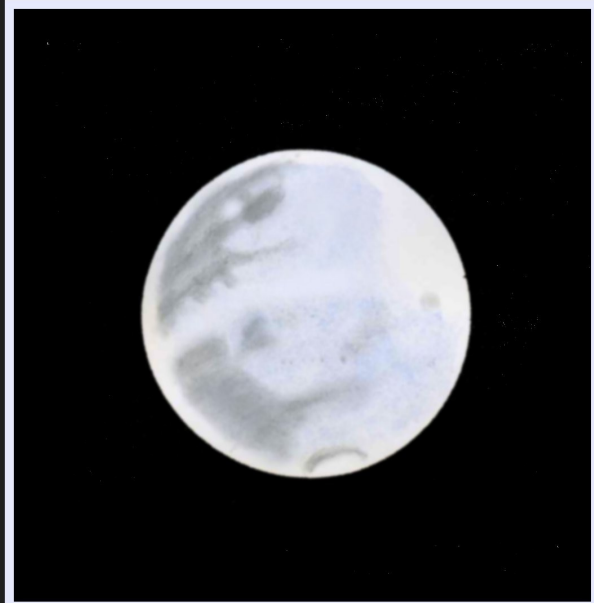
(b) Longitude λ : 60° to 120°

This region is dominated by the Solis Lacus region and three of the large volcanoes in the Tharsis complex (Ascraeus Mons, Pavonis Mons and Arsia Mons). Due to the poor weather conditions, this region was not observed that often and so there are few drawings covering this longitude. Figure 2 shows the general appearance of the region. Due to the northern inclination, Solis Lacus was placed right at the top of the disk, and unless seeing was

reasonable, it was hard to observe the fine details. It's appearance was similar to the previous apparition, a dark central spot, with darker (slightly irregular) spokes radiating out from Lacus into the nearby Aonius Sinus and Erythraeum. On occasions Thaumasia appeared to be bright.



Drawing 1 (IL): 0006UT, x230
CM: 80.8, Seeing: AIII-IV



Drawing 2 (W#80A): 0020UT,
x230, CM: 84.3, Seeing: AIV

2012 March 22nd-23rd, Start: 2335UT, Finish: 0158UT
508mm (20") Dall-Kirkham, x230 and x480, IL and W#80A,
Ls= 87, Ds= 25.2, De= +21.9, Diameter= 13.3", Phase= 98%
P= 14.2, Q= 105.3

Paul G. Abel, with Hugh Sasse, University of Leicester Observatory

Figure 6: Observation of Mars made by the author with Dr. Hugh Sasse using the University of Leicester's observatory. Solis Lacus is well placed and the following part of the disk is very bright. Olympus Mons can be seen poking above the white clouds.

An interesting observation of the region was made on the night of 2012 March 22nd - 23rd the author, with Dr. Hugh Sasse, observed the planet using the University of Leicester's 508mm (20 inch) DK Planewave telescope, and it appeared that much of the following part of the disk was covered in white clouds. A small dark point could be made out near the northern limb, and WINJUPOS identifies this as the great volcano *Olympus Mons*. It seems the top of this vast volcano was poking above the white clouds.

(c) Longitude λ : 120° to 180°

This region is aptly named 'the dull face of Mars' since there is little in the way of striking albedo features on this part of the disk. The region is dominated by the bright deserts of Arcadia and Amazonis in the north, and Memnonia in the south. The darkest feature is the Mare Sirenum region. Out of all of the regions viewed on Mars during the 2011-12 apparition, this was the one which was observed the least (again due to poor weather conditions in the UK). Olympus Mons was glimpsed on a few occasions with the author's 203mm Newtonian when white clouds collected around the volcano making it a bright feature,. Propontis I and II were also seen with Propontis I being the better defined of the two.

(d) Longitude λ : 180° to 240°

There are a number of interesting features in this region. In the far north we have the bright Elysium region, along the equator we have the bright deserts of Zephyria and Aeolis, then in the north we have the dark Mare Cimmerium, and to the far south Electris and Eridania. A number of good views of this region were obtained, but perhaps the best one occurred on the night of 2012 April 10th-11th (see figure 5)



Figure 7: Three drawings of Mars made by the author on the night of 2012 April 10-11. Some good views of the Mare Cimmerium and surrounding regions were obtained.

The Elysium region appears to be a bright feature with a whitish colour and roughly pentagon shaped. It is bordered by the dark Aetheria region to the west and Phlegra (also a dark feature) to the east. The deserts Zephyria and Aeolis appeared bright, and the region immediately north of the Mare Cimmerium appeared to be very bright, this brightness would

sometimes extend westwards, sometimes as far as Libya. The Mare Cimmerium showed subtle variations in structure and intensity, and a number of extensions (inn good seeing) could be seen extending northwards from Cimmerium. In the far south, the Electris and Eridania regions were frequently bright, and of a whitish colour.

(e) Longitude λ : 240° to 300°

This region of the planet is dominated by the most striking feature on the planet, Syrtis Major. This region was probably one of the best observed by the author during the 2011-12 apparition, and many of the drawings obtained over the apparition cover this region. Indeed, the author had one of his best ever view of Mars on 2012 March 02, during which time this region was presented. On this night the author was able to use powers of x400 and x500 to obtain some excellent views of Syrtis Major, Mare Tyrrhenum and Hellas basin (see figure 6)



Drawing A: 0112UT, x400
CM: 280.1, Seeing: AI-II

Drawing B: 0212UT, x500
CM: 294.8, Seeing: AI-II

2012 March 02, Start: 0055UT, Finish: 0215UT, Seeing: AI-II, Hazy skies
203mm Newtonian Reflector, IL only: x250, x312, x400 and x500
Ls= 78, Ds= 24.7, De= 22.2, Diameter= 13.9", Ph= 100%, P= 18.7, Q= 215.1

Figure 8: The author's best view of Mars to date occurred on 2012 March 02. It was possible to use powers of x400 and x500 to examine the fine detail on the planet.

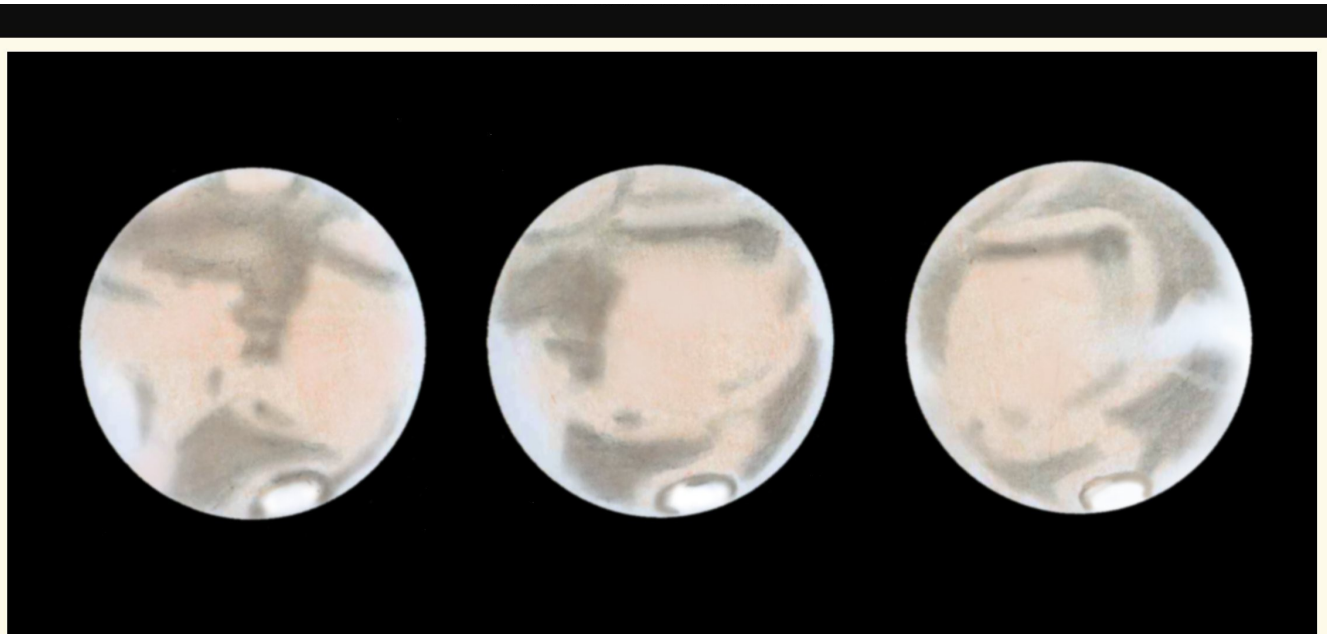
In the far north we have the Boreosyrtis region. Boreosyrtis is a dark, reasonably well

defined region which tapers to a point at around $\lambda: 275^\circ$. It did not appear uniform, there were subtle differences in intensity and structure along this long feature. A series of fine points and streaks were apparent extending from Boreosyrtis into Dioscuria.

Moving south we come to Syrtis Major. Syrtis Major showed much structure, darker and lighter regions were visible within it and it seems that the feature may have been darkest along its following side. During white cloud activity, the feature took on a slight bluish tone. Interestingly, on very good nights, a subtle greenish colour could be made out in Syrtis Major and Iapigia. To the East, the Mare Tyrrhenum was a dark feature, and like Syrtis Major, it contained some subtle structures. Hesperia was a brighter region, often quite distinct from Cimmerium to the East and Tyrrhenum to the west. In the far south, the Hellas basin could be seen, and was frequently a very bright object. To its east, the Mare Hadriacum was always visible and was normally very dark.

(f) Longitude $\lambda: 300^\circ$ to 0°

This region contains the long, curved feature Sinus Sabeus in the south, while the north contains the bright deserts of Cydonia, Eden and Moab. The far eastern party of Boreosyrtis can be seen in this region, along with the far eastern edge of Acidalium.



Drawing 1: 2131UT, x312
CM: 278.3 Seeing: All-III

Drawing 2: 2350UT, x312
CM: 312.3, Seeing: AllI

Drawing 3: 0142UT, x312
CM: 339.6, Seeing: AllI

2012 February 24th-25th, Start: 2112UT, Finish: 0146UT, Seeing: All-III, High cloud passing
203mm Newtonian Reflector, x250 & x312, Ls= 75, Ds= 22.4, De= 22.3, D= 13.7"
Phase= 100%, P= 20, Q= 252.

Figure 9: Three drawings of Mars made by the author in 2012 February 24th - 25th. The Sinus Sabeus region is presented during the course of the night.

A number of good views were obtained of this region, but perhaps the best occurred on the night of 2012 February 24th – 25th. There seemed to be some interesting dark features the deserts of Dioscuria and Cydonia. Sinus Sabeus was usually a well defined long dark feature ending in Dawes Bay (the point of 0 longitude on Mars). Above Sabeus in the south we have the dusky Pandora Fr, and the brighter Noachis region.

3. The North Polar Cap

At the start of the apparition, the NPC was large and brilliant due to the Northern hemisphere being in winter (see figure 8). As the apparition progressed, spring started, and the cap started to warm up and sublimate. As a result, the cap shrank in size and interesting details became visible within it. At the end of the apparition, the NPC was very small indeed and was bordered by a dark Lowell band (see figure 9).

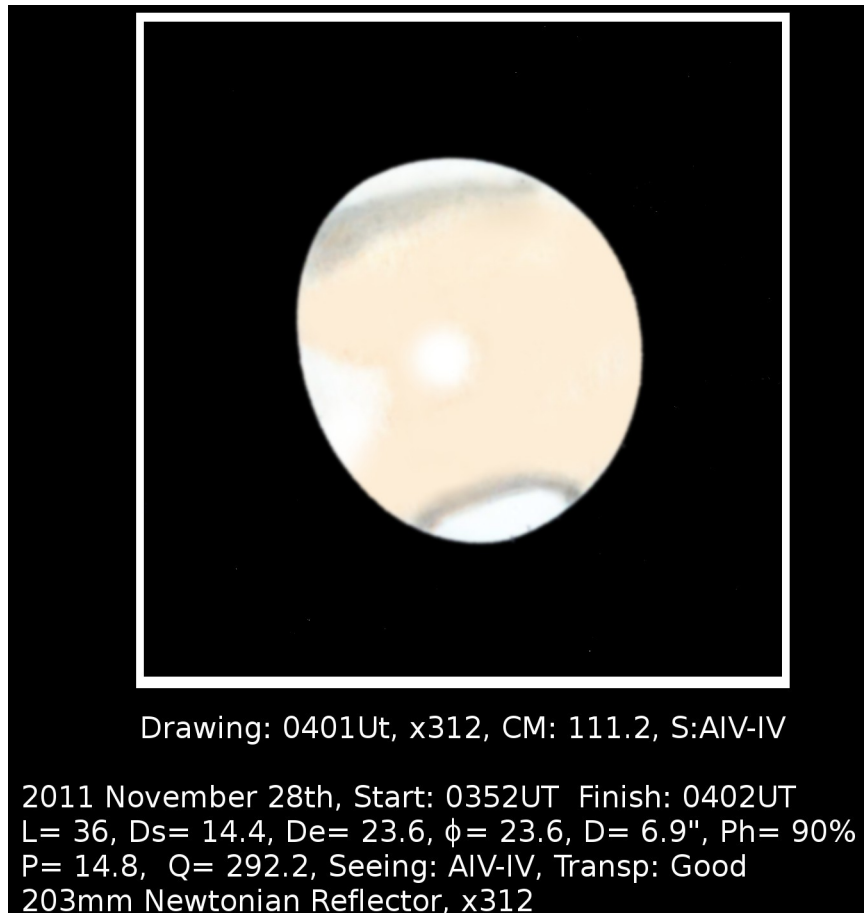


Figure 10: An drawing made near the start of the apparition, note the large NPC and broad Lowell band.

As the NPC started to reduce in size, changes occurred within the cap and in the immediate environment. The Lowell band became thinner and appeared less uniform, often containing darker and broader sections. As the apparition progressed, darker sections within

the cap extending from the Lowell band seemed to be visible (see figure 7).

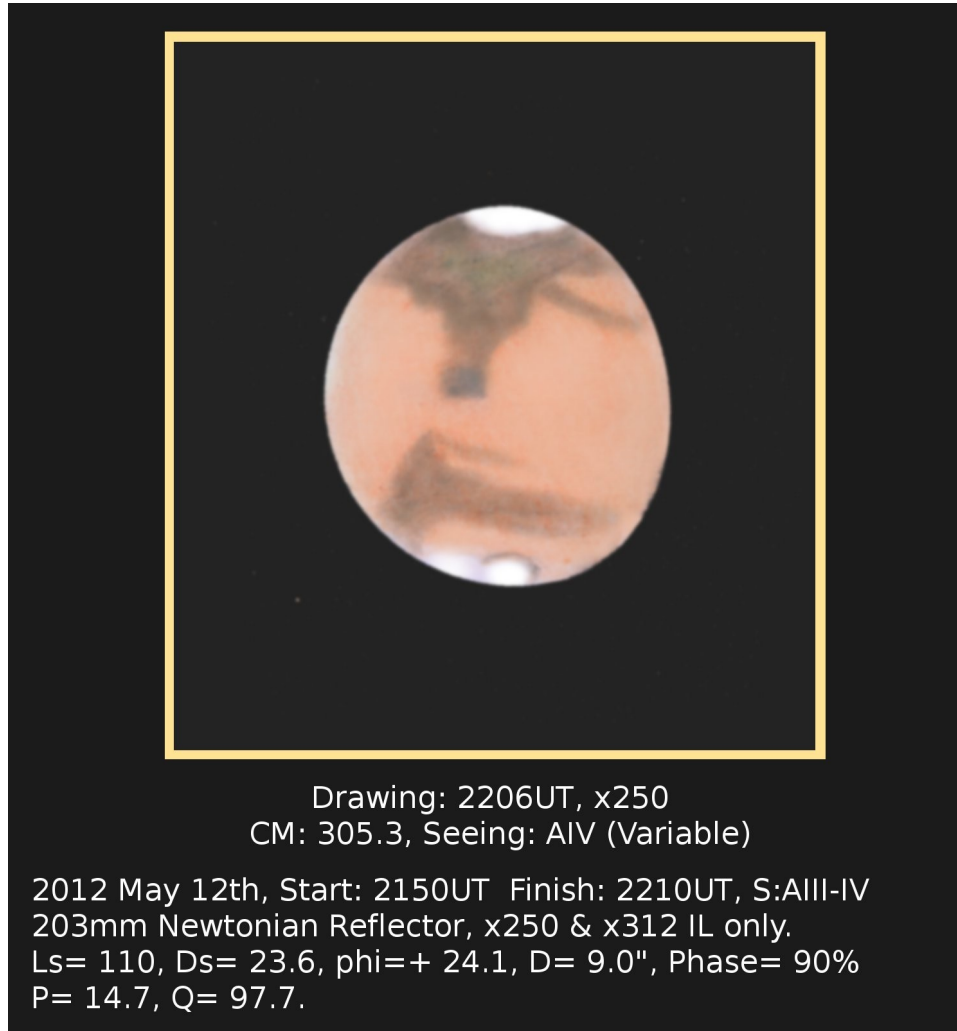
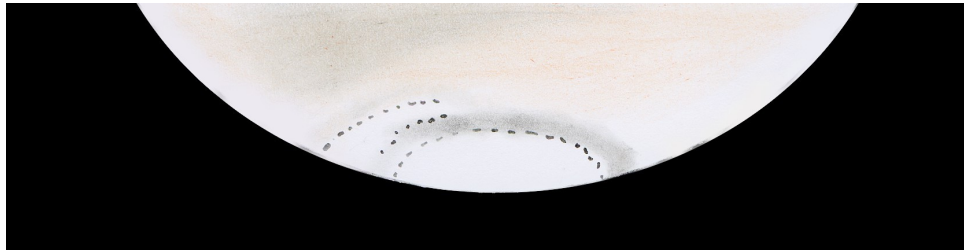


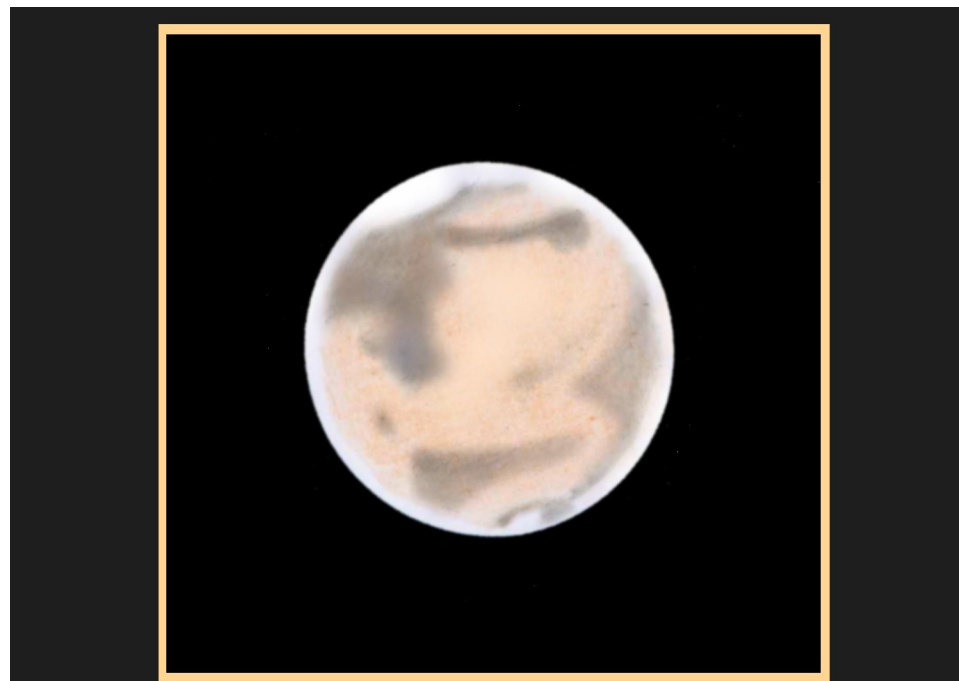
Figure 11: Last drawing of the 2011-12 apparition made on 2012 May 12th, the NPC is now very small.



North Polar Cap: 2012 March 02, 0125UT, x250 and x400, CM: 283.5
203mm Newtonian Reflector.

Paul G. Abel, Leicester UK.

Figure 12: Drawing of the NPC by the author on 2012 March 02.



Drawing: 1924UT, x208 & x235
CM: 327.9 Seeing: All

2012 March 27th, Start: 1911UT Finish: 1932UT
381mm Newtonian Reflector, x208 & x235
Ls= 89, Ds= 25.2, De=+22, D= 12.9", Ph= 97%
P= 13.4, Q= 103.9

Figure 13: Mars on 2012 March 27th. Some dark material present in the North Polar Cap?

good view of the NPC was had on 2012 March 02. The author was able to use powers of x250 and x400 to observe the details in the cap and the surrounding Lowell band (see figure 10). The last observation of Mars for the 2011-12 apparition shows a very bright NPC, the brightness seems to spread onto the proceeding limb (see figure 9). An interesting observation of the NPC was made on 2012 March 27th (figure 11).

The author was using Sir Patrick Moore's 381mm (15 inch) Newtonian reflector, and it seemed that there was some dark material present on the western part of the North Polar Cap. The lighter part of the cap seemed to be a little more muted on this occasion. It seems that the retraction of the NPC is quite dynamic and changes in the NPC occur as a result. These changes not only affect the cap, but the Lowell band and the surrounding environs.

4. White Cloud Activity

Due to the thawing of the NPC, there was a great deal of white cloud activity. White clouds were observed in the following regions:

- Aeolis
- Elysium
- Amenthes
- Libya
- Syrtis Major (which made the region look bluish)
- Edom
- Chryse
- Tharsis complex
- Hellas
- Argyre
- Electris
- Eridania



Figure 14: Hellas looking very brilliant on 2012 May 10th.

Very often the bright clouds would become very brilliant when observed on the morning or evening limb. Particularly bright white clouds were observed in Hellas and Elysium. In particular, on 2012 May 12th, Hellas looked like a brilliant SPC (see figure 14).

White clouds were also observed to collect around the three large Tharsis volcanoes (Ascraeus Mons, Pavonis Mons and Arsia Mons.) When this occurred it was possible to discern the the three volcanoes as three bright regions on the disk. Similarly, Olympus Mons would become very bright when clouds collected around it. There were times when there appeared to be a lot of cloud activity over the Tharsis complex. In particular as we discussed earlier, on 2012 March 22-23 (figure 6) the author and Dr. Hugh Sasse were able to observe the top of Olympus Mons 'peaking' out above the surrounding white clouds.

5. Dust Storms

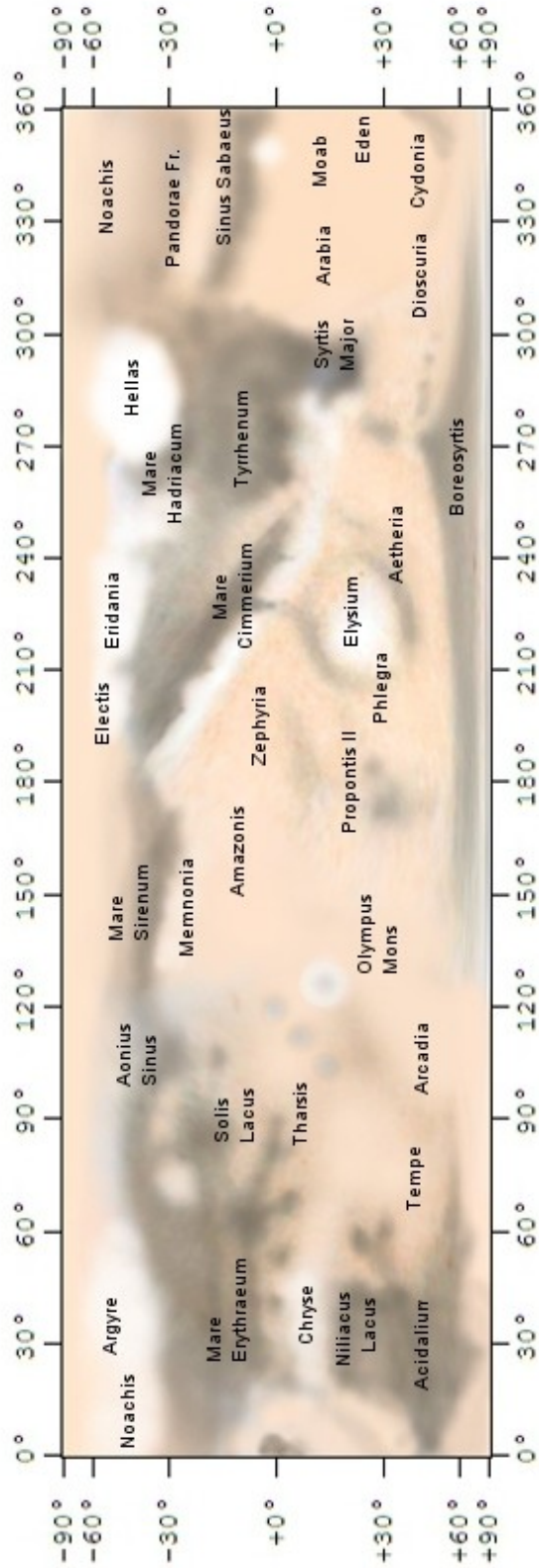
No dust storms were either observed nor suspected by the author during this apparition.

6. Summary Chart

On the next page, the map provides a summary of the 2011-12 Mars observations. It should be noted that:

- The positions of the Tharsis Montes were taken from the Mars map as drawn by Shiro Ebisawa which can be found on the BAA Mars Section website. The Tharsis Montes were observed by the author when white clouds collected around them.
- The regions $\lambda:140^\circ$ to 190° were not well covered due to poor weather, thus fine details are somewhat lacking in this region.

Mars Map: 2011-2012 Aphelic Apparition



Paul G. Abel

Based on visual observations made using:
203mm Newtonian (Knighton Observatory)
508mm DK (University of Leicester Observatory)

Note: Very few observations were
made covering CM: 140-190