

## MARS

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## OBSERVATIONS

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**On the Observations of the BAA Mars Section  
Made during the Period 1913~1914. Part II**

By

Masatsugu MINAMI (Mn)

This is a sequel to Part I which was given in CMO #431 (25 February issue) where we began introducing the Mars Report of the 1913|1914 apparition of the BAA Mars Section written by Eugène Michel Antoniadi about one hundred years ago, based on the article included in *Memoirs of the BAA*, Vol. XXI. The present Part deals with its Section 2 where the observations of the area bounded from  $\Omega=10^{\circ}\text{W}$  to  $70^{\circ}\text{W}$ , and from  $\Phi=60^{\circ}\text{S}$  to  $60^{\circ}\text{N}$ , this division being a traditional one of the BAA Mars Section. So the associated title runs: *Mare Erythræum, Margaritifer Sinus, Auroræ Sinus and Mare Acidaliium*. This will provide the idea how these well-known markings were observed and described in 1913|1914.

As noted in Part I, in this 1913|1914 apparition the planet Mars was most closed to the Earth on 1 January 1914 with the maximal diameter  $15.05''$ . It was at opposition on 5 January 1914. At the beginning of 1914, the apparent declination was near  $26.5^{\circ}\text{N}$ , and hence the planet shined at a very high altitude sky if observed preferably from the

northern hemisphere. This apparition was akin to the one we met in 1992|1993. In future, the apparition in 2039|2040 will provide a similar opposition.

Director of the BAA Mars Section at that time was Eugène M Antoniadi. He was 43 years old in 1914. He had been involved in the BAA Mars Section as Director from the end of the 19<sup>th</sup> century, and wrote the Reports for 1896 1899, 1901, 1903, 1905, 1907, 1909, 1911, 1914 until 1916. Notable is the fact he already observed the big Mars in 1909 and 1911 by the use of the 83cm grand refractor at Meudon, and hence he was already an observer with a proven track record and well accumulating knowledge. We expect so that he must have kept his eyes on the observations, while we do not know whether or not the observations themselves including his were adequate in 1913|1914.

The *Memoir* looks published in 1920, and it is certain some were written surely in 1918 and 1919. If the time of writing was April 1918, it was when he was 48 years old.

SECTION II begins with the description of Argyre :

**ARGYRE** (Argyre I): The Director picks out several observations how it is bright or dim. The description depends on the observations by McEwen, Phillips, Porthouse, Thomson, and the Director. "Argyre glistened at sunrise on 15 September; was bright setting on 10 November; was unnoticed on CM on 21|22 November; indiscernible risen on 22 and 27 November; not seen setting on 22|23 December; invisible on CM on 24 December; unnoticed risen on 26 December; was very bright on CM, but indiscernible setting on 27 December; was bright risen on 28 December; invisible risen on 29 December; rose white on 31 December; rose brilliant and protruding on 2 and 3 January; was bright near CM on 23 and 26 January (*Mn's* Note: Thomson's drawing on 26 January at  $\omega=085^\circ\text{W}$ ,  $\phi=1.7^\circ\text{N}$  just shows the northern limb is brighter without boundary); rose and set white on 31 January; was unnoticed risen on 1 and 2 February; looked very bright risen, but scarcely whitish near CM on 4 February, was invisible risen on 5 February, set bright on 6 and 10 March; appeared white near CM on March

12; rosewhitish on 16 March; was unnoticed setting on 13 April; set very white indeed on 14, 15, 16 and 18 April; was white on CM on 18, 19 and 20 April; rose white on 22 and 24 April".

That's all of the description of Argyre: Compared with the markings cited below, looks a bit dramatic but the observer's name was not known except for Thomson on 26 January and Antoniadi on 22 April at  $\omega=012^\circ\text{W}$ . It is suspected the 18 April observations are his own because of writing. However no remarks about the seeing are given, and no record of the continuous chasing from the sunrise to the sunset is touched. The total number of the observations is low and hence perhaps the conscious chasing was not employed.

Argyre is a representative of the bright areas, but the following M Erythræum is a typical example of the dark markings.

**MARE ERYTHRÆUM** appeared "greenish" to Thomson on 22 November. "The joint data of McEwen, Phillips, Porthouse, Thomson and the Director shows this *mare* seemingly faintish on 15 September, 21 November and 22 November; almost normal on 21~23

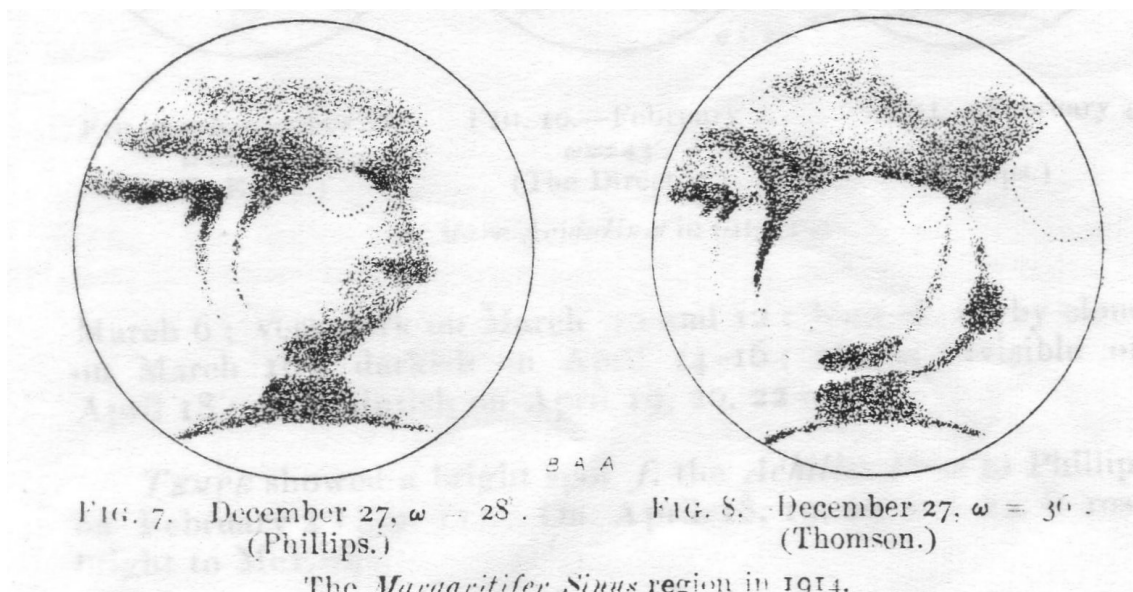


FIG. 7. December 27,  $\omega = 28^\circ$ .  
(Phillips.)

FIG. 8. December 27,  $\omega = 36^\circ$ .  
(Thomson.)

The *Margaritifer Sinus* region in 1914.

December; faintish on 24, 26 and 27 December; very faint on 28 December; faintish on 29 and 31 December; very faint on 3 January; faintish on 26, 31 January, 1, 2, 4, 5 February, 6, 10, 12, 16 March, 12~16, 18 April; darkish on 19|20 April; faintish on 22 April; and darkish on 24 April."

"A bright streak was seen by McEwen on 6 March at  $\omega=087^\circ\text{W}$  near the evening *Protei Regio*."

**PYRRÆ REGIO** "is almost conspicuous on Phillips' and Thomson's drawings of 27 December (Figs 7 and 8; see the preceding page) and on Phillips' of 29 December," which was made at  $\omega=005^\circ\text{W}$  by using a 12  $\frac{1}{4}$  spec. We suspect that Phillips and Thomson were using the same telescope. By the way, Pyrrhæ Regio (named by Schiaparelli in 1877) looks nowadays a useless nomenclature. It will be interesting to find from when it became immaterial to us.

**MARGARITIFER SINUS**, "greenish to Thomson on 22 November, was, as usual, much fainter than *Sinus Furcosus*." As noted previously, the nomenclature *Sinus Furcosus* was given by Antoniadi in 1907 while it was renamed as *Sinus Meridiani* in 1924. Originally it was called *Baie du Méridien* in 1889 by Flammarion. In 1901 Antoniadi used the name *Furca* which must imply a *Fork*. The description continues as follows: "From the joint data of McEwen, Phillips, Porthouse, Thomson, and the Director, we infer that this 'gulf' was probably faintish on 21 November; exceedingly faint on 22 November; faintish on 23, 24, 26 December; darkish on 27 December (Figs. 7 & 8); faintish on 28 and 29 December; darkish on 31 December, 2 and 31 January; faint on 1|2 February; darkish on 4 February; faintish on 5 February and 10

March; darkish on 12 and 16 March; very faint on 16 April; faint on 18 April; darkish on 19|20 April; and faintish on 22 and 24 April." The record looks somewhat desultory: It's even unknown how it describes the aspect in the morning or in the afternoon.

**IANI FRETUM** is the one named by Antoniadi in 1907 after the Italian old god of doors and gates, and originally called *Canale di Deucalione* by Schiaparelli in 1879. It is rather teasing to meet with such a name which turned to be frivolous one hundred years later, since nowadays such a marking as *Brangæna* has been actualised (we should wonder why such names as *Iani Fr* and *Iani S* still exist in Ebisawa's map). However *Iani* reappeared in a modern map of the USGS, as in the term *Iani Chasma* as a partner of *Aram Chasma*. This is simply because there is a restrictive rule that one should employ names which are found on the Maps of Schiaparelli or Antoniadi when any modern institution wants to introduce new nomenclatures on Mars.

Here the original description is that "*Iani Fretum*, heavily shaded to Porthouse, seemed normal to McEwen, Thomson and the Director; but Phillips did not draw it." (See Fig. 7.)

**AROMATUM PROMONTORIUM** (Nomenclature due to Schiaparelli in 1877): This is a name given to a bright area to the north of Eos, but the area must have been received a decisive change including some others around there, and so again this is a marking we would not like to care. This must be a cape adjacent to the southern sea. Maybe the area surrounded by dotted line e.g. in Fig. 7 (Phillips). Antoniadi often observed it by using the 83cm grand refractor at Meudon. This was first noticed by Herschel, and said

it had been stable for a long time. However its naming must not be the one to be kept for another hundred year length. It is curious that the ghostlike nomenclature is still found on Ebisawa's map, although he invented such scenic spots as Orestes and Electra.

**AURORÆ SINUS** "was normally outlined, and its duskiness extended to further S than in 1911|1912. The drawings of McEwen, Phillips, Thomson, and the Director apparently show this 'bay' faintish on 21|22 November and (next) on 20~22 December; darkish on 23, 24, 26, 27 (Figs. 7 & 8) and 28 December; faintish on 29 December; faint, veiled, on 26 January; darkish on 31 January; faintish on 2, 4, 5 February, 1, 6 March; darkish on 10 and 12 March; faintish on 12~16, 18~20 April; and normal on 22 and 24 April."

There is no comparative degree, and no change in some elapsed time e.g. by using the Local Martian Time.

**CHRYSE** "rose bright to McEwen on 15 September, and to Antoniadi on 1 February" (at  $\omega=350^\circ\text{W}$ ,  $\phi=1.2^\circ\text{N}$ ). "It set very white to the latter on 28 February and on 12 April; and also to McEwen on 15 April."

"On 27 December (Fig. 8) and 4 February, Thomson saw a bright spot here, near the 'estuary' of *Jamuna* in *Auroræ Sinus*."

**XANTHE** "comes out shaded on some drawings of McEwen, Phillips, Thomson. A cloud area, elongated ENE to WSW, was detected by Thomson near *Lunæ Lacus* on 22 December. *Xanthe* set white to the Director on 28 February."

**JUVENTÆ FONIS** "was only suspected by Phillips on 21 December."

**LUNÆ LACUS** "had the disappointing appearance of a faint, diffused smudge. Nor was it always there. From the data of McEwen, Phillips, Thomson, and the Director we conclude that this object was seemingly dusky on 20~24, 26~28 December, 26 January; darker perhaps on 31 January; diffused on 4, 6, 10 January; and very faint on 12 March, 14, 16 April. McEwen's drawing of 24 December shows two (shadowy) condensations hereabout, but no Member confirms this."

**NILIACUS LACUS**, "after the results of McEwen, Phillips, Porthouse, Thomson, and the Director, was apparently darkish on 22, 27 November; faintish on 20 December; darkish on 21 December; faintish on 22, 23 December; darkish on 24 December; confused on 26 December; faintish on 27|28 December; faintish on 29, 31 December and 1 January (*Mn's* Note: The observation cited here as the one on 29 December may be due to Phillips at  $\omega=005^\circ\text{W}$ ,  $\phi=5.8^\circ\text{N}$ ; *Niliacus L* is apparently located at the morning side, but no morning mist is suggested); faintish on 31 January; invisible on 1 February (*Mn's* Note: This is an observation of Antoniadi, at  $\omega=350^\circ\text{W}$ , near the morning terminator, while there seems no consciousness about the morning mist); but darkish on 2 February." This 2 Feb case was accomplished at  $\omega=043^\circ\text{W}$ , and so the marking was after the noon so that it is quite natural for the marking to be darkish. However the drawing does not show that *Niliacus L* is detached from *Mare Acidalium*; rather it looks *Niliacus L* is vanished or absorbed in *Mare Acidalium*. We should say his description looks enigmatic. The previous conclusion that *Niliacus L* is 'faintish on 27 December' is not easily nodded if we refer to Figs. 7 & 8 by Phillips and Thomson respectively.

Antoniadi continues in the following way that *Niliacus Lacus* was “faintish on 4 and 5 February; very faint on 6 March; dark on 10 March; faintish on 12 March; obliterated by white cloud on 16 March (*Mn*’s Note: no description of  $\omega$ ); faintish on 14 April; darkish on 15|16 April; unnoticed on 18 April; faintish on 19 April; and confused on 22, 24 April.”

**ACHILLIS PONS** “was frequently drawn by McEwen, even when Mars subtended 6.6". But Porthouse and the Director could not make it out near opposition. Thomson often missed it; yet he described it slanting ENE to WSW on 27 December (Fig. 8) and 4 February; while Phillips depicted it shaded on 27 December (Fig. 7), when it was ‘glimpsed, but faint’; he also saw it on 29 December, when it was slanting” at  $\omega=005^\circ\text{W}$ ,  $\phi=5.8^\circ\text{N}$ , (*Mn*’s Note: Phillips’ drawing suggests a cloud-like belt running up from *Cydnia* and depicts as if it creeps up and pierces *Achillis Pons* from the east to make a sharp notch there), “and again on 4 February” at  $\omega=043^\circ\text{W}$ .

**Mare ACIDALIUM** “looked like a sombre trapezoidal mark over the snows. Thomson’s drawing of 27 December (Fig. 8) and Phillips’ of 29 December (at  $\omega=005^\circ\text{W}$ ) show it bulging to E beyond  $\Phi=50^\circ\text{N}$ , and pointed to SW. Thomson found it ‘blue grey’ on 22 November, perhaps ‘greenish’ on 4 February. It was never blackish, as in November 1896 ( $\eta=72^\circ$ , as against  $\eta=47^\circ\sim 160^\circ$  in 1913|1914)(*Mn*’s Note:  $\eta$  denotes the heliocentric longitude of Mars and, roughly speaking, it differs from the areocentric longitude of the Sun  $L_s$  by about 86 degrees in the way  $L_s=\eta-86$ , if the present writer *Mn* refers to one of his old notebook), its intensity, when greatest, slight-

ly surpassing that of *Sinus Furcosus*; otherwise it fell short of it (Figs. 7 & 8). The delineations of McEwen, Phillips, Porthouse, Thomson and the Director show *Mare Acidalium* apparently very dark on 21|22 November; dark on 27 November; faintish on 20 December; very dark on 21|22 December; dark on 23, 24, 26, 27, 28, 29 December; faint on 31 December; faintish and small on 2 January; very dark on 26, 31 January; invisible on 1 February (on the drawing by Antoniadi at  $\omega=350^\circ\text{W}$ ); dark on 2 February (by Antoniadi at  $\omega=043^\circ\text{W}$ ); darkish on 4 February (by Phillips at  $\omega=043^\circ\text{W}$ ); faint on 5 February and 6 March; very dark on 10 and 12 March; blotted out by cloud on 16 March; darkish on 14~16 April; almost invisible on 18 April; faintish on 19, 20, 22, 24 April.”

**TEMPE** “showed a bright spot following *Achillis Pons* to Phillips on 4 February at  $\omega=043^\circ\text{W}$ . On 18, 19, 20, 24 April it rose bright to McEwen.” The comment about Phillips’ drawing on 4 February sounds slightly queer since the bright spot is rather small, just following and very adjacent to *Achillis Pons*.

Finally the text shows several paragraphs of “**Minor Detail**” which are printed by packing between the lines, but here we would like to omit it, but we wish at the final corner of this series we may pick out some interesting notices. This time (in SECTION II) it contains descriptions of *Ganges*, *Indus*, *Jamuna*, *Nilokeras*, *Tanais* and so on. In the previous case (in SECTION I) reviewed were the canals *Gehon*, *Hiddekel*, *Oxus*, *Protonilus* and so on.

(To be continued)

## *Letters to the Editor*

●.....*Subject: Large regional dust storm activities*  
*Received: 1 April 2015 at 11:56 JST*

Dear all, MRO MARCI Weather Report for the week of 23 March 2015 ~ 29 March 2015 shows some large scale dust activities :

The comment says "Active dust lifting south of Hellas continued during the first few days of the week, contributing suspended particles to a lingering haze that extended across the southern high latitudes. Portions of the high latitude residual haze extended north into Cimberia and Sirenum, up to around 45 degrees latitude. Multiple frontal dust storms were observed moving south along the Acidalia storms track into Chryse and eastern Valles Marineris. A large regional storm towards the end of the week crossed the equator and expanded into the region extending across Solis, Margaritifer, Aonia, and the Argyre Basin. The pulses of storms in Acidalia and Chryse contributed to thick dust hazes settling in the canyons of Valles Marineris east of Melas Chasma. Localized dust storm were also observed over the course of the week in Amazonis, northwestern Arabia, Deuteronilus, Utopia, near the Elysium Montes, and in Tyrrhena. The increased frequency of dust-lifting events and onset of cross-equatorial activity along the Acidalia storm-track observed this past week is consistent with the timing noted in previous years. Although global background atmospheric opacities continue to rise with increased storm activity, both rover sites were not directly in the paths of any storms and remain relatively clear and storm-free."

Best Regards,

[http://www.msss.com/msss\\_images/2015/04/01/](http://www.msss.com/msss_images/2015/04/01/)

**Reiichi KONNAI** (Fukushima, JAPAN)

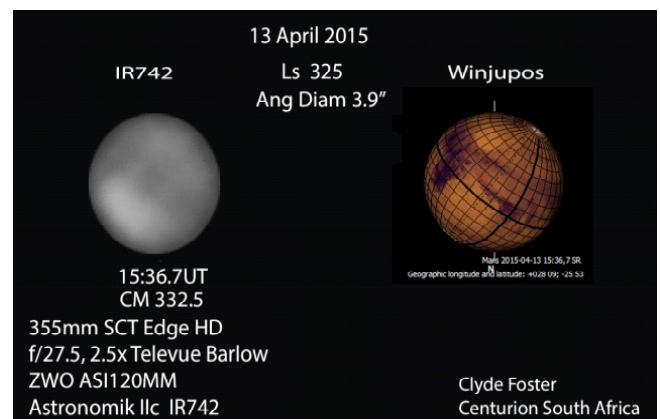
●.....*Subject: Mars 6 April 2015*  
*Received: 7 April 2015 at 02:08 JST*

Good evening all, Attached IR image. After quite a while I had a clear late afternoon, and as I was opening the observatory to allow the scope to cool down for a Jupiter imaging session a bit later, I could not resist the opportunity to see if I could see my old friend Mars. I had great difficulty finding the planet as I was slightly out of focus. However, I eventually managed to see a very faint "blob" as I swept the area, and was able to focus in. I have tried to orientate the image with south at the top. Aurorae Sinus and Mare Erythraeum fairly prominent, with Niliacus lacus seemingly visible on the northern limb. Moab/Eden area showing quite brightly on the preceding (left) limb. Another new milestone, with Mars below 4" now. Best regards,

<http://www.kwasan.kyoto-u.ac.jp/~cmo/cmoms/2013/150406/CFs06Apr15.jpg>

○.....*Subject: Mars 13 April 2015*  
*Received: 14 April 2015 at 02:14 JST*

Good evening all, Attached IR image from this evening with the Winjupos comparison.



No significant comment or detail, other than the bright Arabian desert region being its normal bright self. I have left orientation as taken. Best regards,

<http://www.kwasan.kyoto-u.ac.jp/~cmo/cmoms/2013/150413/CFs13Apr15.jpg>

**Clyde FOSTER** (Centurion, SOUTH AFRICA)

●.....*Subject: Fw: The Passing of Walter H. Haas*  
*Received: 7 April 2015 at 23:15 JST*

My friend and mentor is gone at age 97. Many years of a great friendship.

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 From: Matthew Will  
 Sent: Monday, April 06, 2015 11:27 PM  
 To: undisclosed-recipients:  
 Subject: The Passing of Walter H. Haas

Passing of Walter H. Haas

It is with great sadness that we let you know that we have been informed that Walter H. Haas, founder and director emeritus of our organization, the Assn of Lunar & Planetary Observers, passed away this morning, April 6, 2015, at 6:10 a.m. MDT (12:00 UT) of natural causes in Las Cruces, New Mexico, his home town for many years.

Walter was born July 3, 1917. He founded the ALPO in 1947 and served as executive director until the 1985. He had been in gradually failing health recently but his mind was still sharp as a tack. Many of us owe an unmeasurable debt of gratitude to Walter for shaping lunar and planetary astronomy for what is has evolved into today as well as shaping our own interest in the Solar System and our lives.

Viewing will be at La Paz - Grahams Funeral Home, in Las Cruces, NM, on Monday, April 13 from 5 - 8 p.m.

[www.lapaz-grahams.com](http://www.lapaz-grahams.com)

Services will be held at First Presbyterian Church in Las Cruces, 200 W. Boutz, at 10 a.m., followed by a grave-side service at 11 a.m. Walter's daughter, Mary Alba, requests that in lieu of flowers, donations be made to your local hospice and the ALPO. Personal comments and photos about Walter for publication in the next ALPO Journal are welcome. Please send them to

[ken.poshedly@alpo-astronomy.org](mailto:ken.poshedly@alpo-astronomy.org)

-- Ken Poshedly

Executive Director, Assn of Lunar & Planetary Observers  
Editor & Publisher, "Journal of the Assn of Lunar & Planetary Observers," Atlanta, Georgia USA

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**Jeff BEISH** (Lake Placid, FL)

●.....*Subject: Re: Don Parker*

*Received: 28 April 2015 at 04:06 JST*

Dear Carlos, Though we haven't communicated in a while, I continue to appreciate your comments which I not infrequently see on various web pages, and wanted to say thank you, particularly, for the sensitive appreciation of our friend Don Parker. He was a big man, physically and otherwise and he made a tremendous contribution to amateur imaging of the planets. Though I corresponded with him over a number of years and felt I knew him quite well, I only met him once, and then briefly. He will

be much missed.

Best wishes on your own planetary adventures!

Kind regards,

○.....*Subject: from Bill Sheehan: news*  
*Received: 25 May 2015 at 09:25 JST*

Dear Masatsugu, I have not heard from you for a while, so I am writing just to reestablish contact and to make sure that all is well....

I suppose we will be needing another article for the CMO/ISMO journal. I can come up with something in short order if required.

In March, Debb and I were in Scotland, observing the almost-total eclipse of the Sun, then spent some time visiting friends in the north of England: A highlight was spending time with David Sellers, who has written great books on the transits of Venus and the definitive biography of William Gascoigne, Jeremiah Horrocks's contemporary and still renowned for his invention of the eyepiece micrometer. David showed me a replica fabricated by an instrument-maker in the U.S., and it really is a remarkable piece. I also saw where Goodricke was living in York when he made his variable star discoveries, paid our respects to the desolate Marston Moor, where Gascoigne perished fighting for the royalists in the Civil Wars, and had a grand day—with fish and chips, of course—at Captain Cook's hometown at Whitby, a picturesque little town. David and his charming wife Jane drove Debb and me to Chester, where I visited Richard Baum, an old friend, and several keen selenographers, before going south through Oxford and into London. Among other things, I gave a talk on Mars at the National Museum for the Society for the History of Astronomy, which seemed to be well received and is due to be published in *The Antiquarian Astronomer*.

Back here again, I have been dealing with work, about which the less said the better. But apart from that, I am well. I take the dogs on walks everyday, follow a strict dietary regimen (at the moment, I am abstaining from all alcoholic beverages), and have

been working diligently on the Pluto book to be co-authored with Dale Cruikshank. Dale is describing the modern era, to which he has been a main contributor, while I remain still in the 19th century, writing about the discovery of Neptune. Quite soon, however, I should be back to the calculations for "Planet X" that I was working on when I contributed that essay on Carrigan's calculations. I should have some interesting things to report in due course.

Meanwhile, just this past week—on May 22—we noted the 121st anniversary of Percival Lowell's talk in Boston, at which he gave his preview of what he hoped to establish at the observatory just being set up in Flagstaff, while May 31 marks the anniversary of his first observations with the 12-in. refractor.

July 9-23 I shall be in Flagstaff, in the new place acquired last summer; tentatively hoping to have Ewen Whitaker up for a visit. (He lives in Tucson, but his son-in-law, a pilot, and daughter live very close to our place.) We will have some kind of events related to Pluto—I still find the sentiments in favor of its remaining a planet very strong!—and perhaps take a look through the Clark, whose refurbishment was complete and now looks better than

new! Of course, the New Horizons flyby will occur on July 14—exactly fifty years to the day since the Mariner 4 flyby; the latter was an epoch in my childhood—I remember how disappointed I was that there were no Lowellian canals! These two—Mariner 4 and New Horizons—are bookends of Solar System exploration.

Grant me news of you, Reiichi, and all my Japanese friends. I often think still of the beauty of Japan which we shared on the Lowell Road to Noto all these years ago now.

Kind regards,

PS. The world of keen planetary observers feels much more lonely now that we have lost, in short order, both Don Parker and Walter Haas. The generation that knew what it was to study planets visually at the eyepiece is passing away, and eventually will seem as remote and unrecapturable as the scenes that George Catlin painted on his visits to the Western Prairies when they belonged to the Indians and the Buffalo.

**Bill SHEEHAN** (Willmar, MN)

## Trend of the Summit Cloud of Elysium Mons in 2014

By

**Masami MURAKAMI**

ISMO 2013/14 Mars Note (#07)

**B**ased on the images submitted to the ISMO Mars Gallery in 2013|2014, we would like to see how the summit cloud of Elysium Mons (at  $\Omega = 215^\circ\text{W}$ ) behaved during the period from  $\lambda=085^\circ\text{Ls}$  to  $\lambda=145^\circ\text{Ls}$  in 2014. We especially refer to the Local Martian Time (=LMT) of the summit, and chase the cloud and its southward expansion.

Already Christophe PELLIER gave an excellent analysis of the area of Elysium observed in the 2011|2012 apparition in CMO #407 (25 February 2013) ISMO 2011/2012 Mars Note #09 in

<http://www.kwasan.kyoto-u.ac.jp/~cmo/cmomn4/CMO407.pdf> while

[http://www.kwasan.kyoto-u.ac.jp/~cmo/cmo/407/ISMO\\_Note\\_2011\\_09.htm](http://www.kwasan.kyoto-u.ac.jp/~cmo/cmo/407/ISMO_Note_2011_09.htm)

for the Japanese translation.

The following discussion, however, is not so meteorological nor dynamical, but we just want to show what kind of images have been accumulated in 2014, and we wish they will work as a springboard for further discussion or a guide to further Elysium observations.

The classical picture where Elysium was considered pentagonal or pure circular has long been broken down. Recently the Ætheria dark patch sidled up (since 1975) to Elysium and has looked to form



as if it's the western boundary of Elysium, keeping the structure where a pinkish belt along the eastern border of the dark patch prevails in good contrast with the summit cloud or the white cloud belt associated with Elysium Mons. For example, an HST image taken in 1999 shows well Elysium Mons covered by a summit cloud. Together with it the pinkish ground belt is apparent following Elysium Mons. Don PARKER (DPK)'s image here shows Elysium Mons covered with a summit cloud and the misty matter around there is apparently connected with the large morning mist of the planet. The pink-



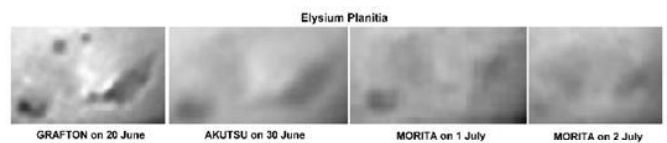
ish ground belt is also partly visible. Bill FLANAGAN (WFI)'s image was taken quite later from the opposition time and the LMT of Elysium Mons is just before noon. The white cloud belt stands to the southward direction, quite parallel to the following (pinkish) belt: If we refer to the Blue component of WFI's image, the white cloud streak is more prominent while the pinkish belt is rather invisible showing that the pink belt is a ground pattern. We later show the full images both of DPK's and WFI's images.

It should be remarked that the summit cloud of Elysium Mons does not trail westward. Instead it streams out linearly rather southward. As shown by DPK's image above the cloud stream joins the morning mist which comes from the east side of Syrtis Major (or the mist at the equatorial zone). It is an interesting theme to see how the case is different from cases seen at the Tharsis region.

As we hear, Masatsugu MINAMI is of the opinion that the circulations of the water vapour on Mars look to be deeply affected and maintained by the existence of higher mountains, and hence the difference of the situation at Elysium from the cloud situation at Tharsis may be important. Another thing to be noticed is the change of the atmos-

phere when the vast warm dust entails around the mountains. In 2001, we were aware that the water vapour circulation deactivated the function by the arrival of the dust storm at the Tharsis area including Olympus Mons. So we should be attentive around Elysium when a possible occurrence of a vast dust at the Elysium region is observed in future. The following image set is the one used in CMO #259 - 2001 Mars CMO Note #05: *Elysium Planitia Dust Clouded at the Beginning of July 2001*.

<http://www.kwasan.kyoto-u.ac.jp/~cmo/cmomn0/259Note5/index.htm>



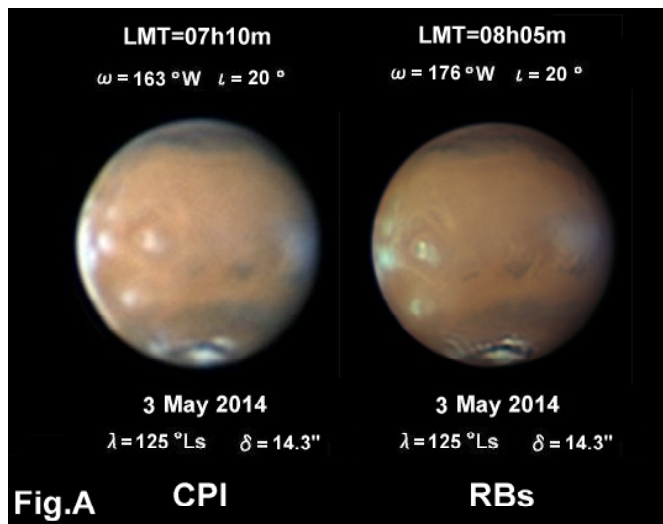
Unfortunately at that time we were at a delicate situation since the orography of Elysium Mons must have been at a final stage at  $\lambda=200^\circ\text{Ls}$ , while the occurrence of the 2001 global dust storm was set at  $\lambda=184^\circ\text{Ls}$ .

Ed GRAFTON's image was made at  $\lambda=181^\circ\text{Ls}$  before the advent of the storm, and it is difficult to judge the water vapour cloud over there. However according to the Japanese observations after 30 June looks to show well the effect of the warm air-borne dust over the cloud associated with Elysium Mons.

Incidentally we note that the orographic cloud of Arsia Mons is known to remain even after  $\lambda=200^\circ\text{Ls}$ , related with the difference of the meteorology of the southernmost Tharsis from other Montes.

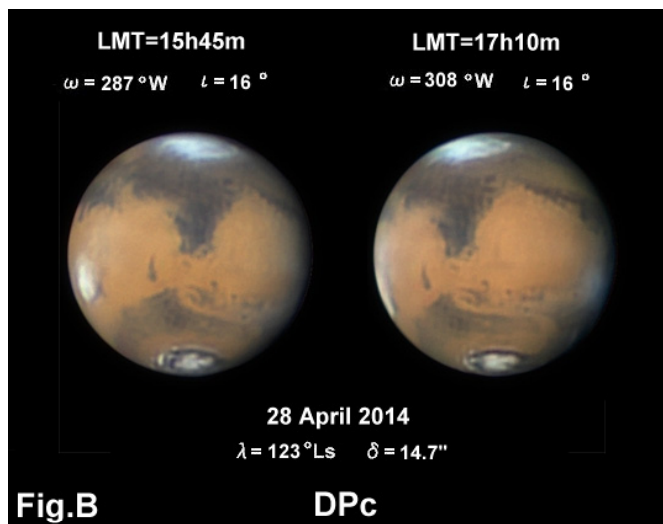
**N**ow, it is a subject to see how the situation near the morning terminator differs from the one near the evening. Figure A at the next page shows the case where Elysium is near the morning terminator, and Fig. B shows the case where Elysium is near the evening limb.

In Fig. A, the image at 07:10LMT is given by Christophe PELLIER (CPI) and the other is given by Richard BOSMAN (RBs) on the same day 3 May ( $\lambda=125^\circ\text{Ls}$ ). Two are different by about one hour in



LMT. At the similar longitudes to Elysium, the morning mist is quite thick. On both images the pinkish streak is a bit visible. Elysium Mons is not so evident yet, but it seems the summit begins being covered by the morning mist. It is quite probable that the summit cloud may be brought first by the water vapour of the morning mist.

Figure B shows the cases near the evening limb given by Damian PEACH (DPc), just two from his



set of several images. At 15:45LMT, the southward white cloud which starts from the summit cloud of Elysium Mons is thickly shown together with the pinkish/whitish streak along the *Ætheria* dark patch. At 17:10LMT, only seen is the limb cloud, and no detail is visible. These images were obtained after opposition. To see more, the images taken before opposition are preferable when the phase angle  $\iota$  is large. This time not so many preferable images were given, but refer to some nice images in Fig. 4

below.

We are now in a position to give a total of 16 Elysium images which may supplement the gap between 07:10LMT and 17:10LMT. In this trial, we arrange the images sequentially referring to the LMT. We show them in four files (Fig. 1 ~ Fig. 4).

**Figure 1** at the next page shows four images given by DPK, Maurice VALIMBERTI (MVI), WFI and Teruaki KUMAMORI (Km). DPK's image is really excellent: The summit cloud is now evident at 10:30LMT, and the mist which starts from Elysium Mons southward is apparently linked with the thick morning mist. The pinkish streak is also evident. MVI's image at 11:10LMT made just after opposition shows that the morning mist on Mars has been slightly weakened, while the summit cloud looks to remain. WFI's image and Km's image were made at the same LMT, but note that WFI shot quite later in season, and the data  $\lambda=145^\circ\text{Ls}$  is at the end of the seasons of images employed this time. It is interesting to see the difference of the distributions of the white clouds at Utopia. The time 11:45LMT implies it's morning yet, even then the summit being covered by the cloud: We may say it is a remnant of the morning status.

**Figure 2** then shows images near the noon. MJs is the code of Mark JUSTICE, and SBd is of Stefan BUDA. MJs' image was taken at 12:20LMT, so a bit in the afternoon, and together with WFI's image, shows a slightly thicker summit cloud. Both show the linkage of the cloud expansion to the south with the equatorial morning mist. DPK's and SBd's images were taken quite before the opposition time, and both show explicitly the summit cloud of Elysium Mons which is now thickened. DPK's image also shows the morning mist thickly which well suggests a linkage with the summit cloud. The season of SBd's image at  $\lambda=085^\circ\text{Ls}$  is the youngest among the seasons employed this time. His description of the summit cloud looks smaller than that of DPK's, while his summit cloud is isolated and whitish: In Blue component, it is clearly shown that it's expanding toward south. The pinkish streak is clear.

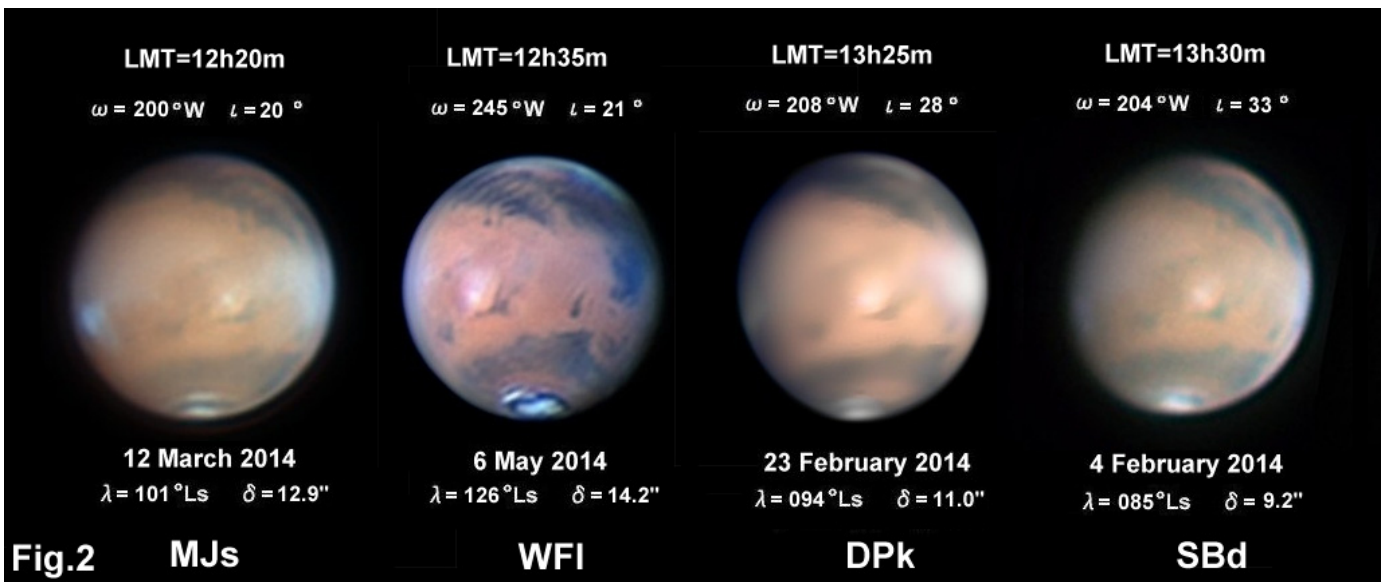
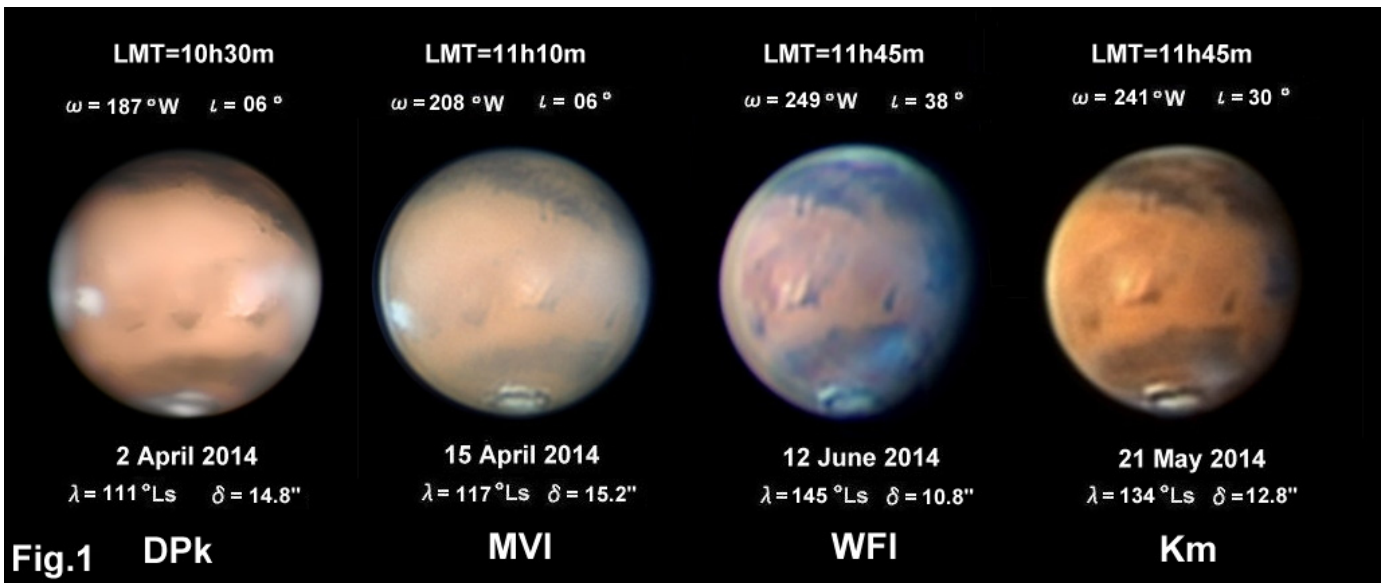
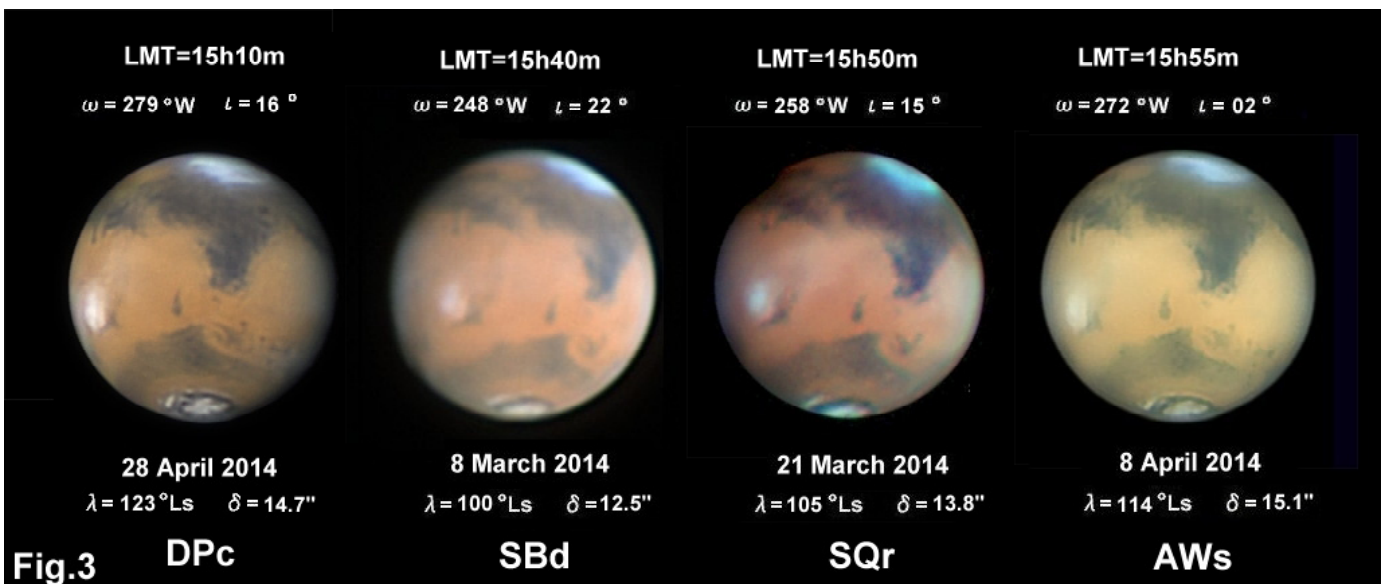


Figure 3 below shows a set of images taken between 15 and 16 hours LMT. SQr is our code of Stefano QUARESIMA whose image was sent from

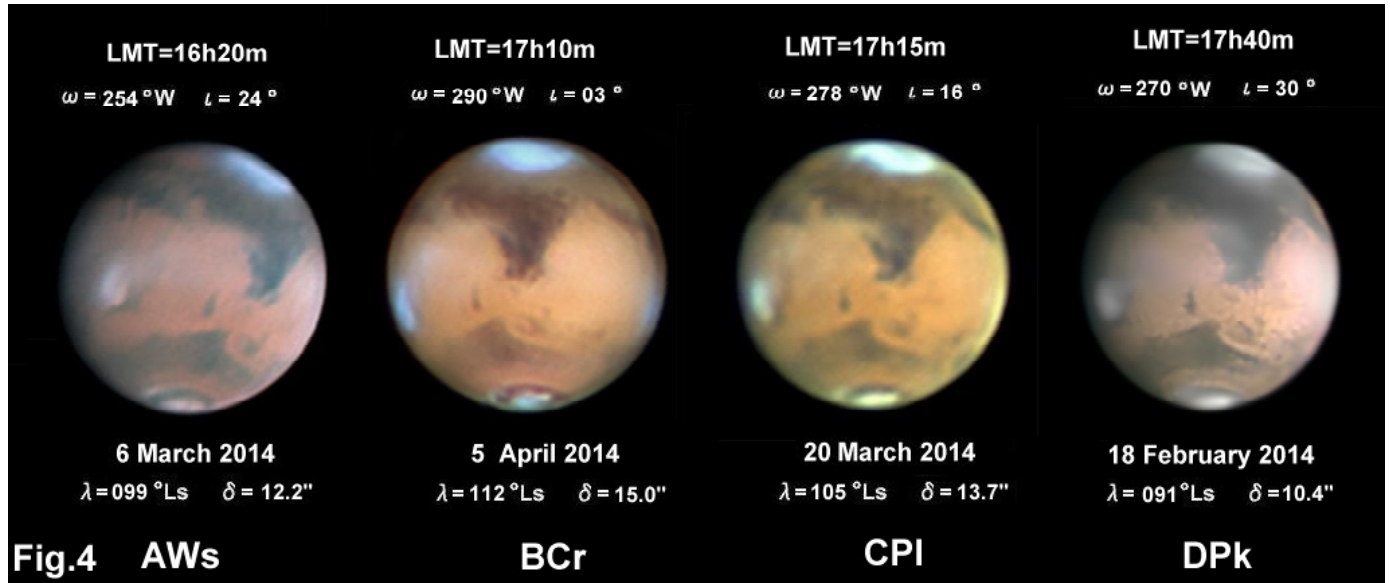
Gianni QUARRA. AWs implies that the image was taken by Anthony WESLEY. DPc's image is a member of the series shown in Fig B above. Every image



proves well the pinkish streak and the southward expansion of the cloud connected with the summit cloud of Elysium Mons. SQR's image quite shows the linkage of the Elysium cloud with the mist band along the equatorial zone (crossing Syrtis Major). DPC's image brilliantly shows the Elysium matters. SBd's image also depicts the cloud streak and pinkish streak inside Elysium, and suggests a southward expansion of the cloud to the equatorial zone. ↗

AWs' image is quite detailed, and the structure inside Elysium is well shown.

**Figure 4** below, finally, collects the images in the evening in LMT. BCr is our code of Bratislav CURCIC from Melbourne. Every image was taken before opposition. Every shows that the cloud inside Elysium is quite thick, not isolated but connected with the mist at the equatorial zone. AWs' image at 16:20LMT shows that the white cloud ex-



pansion is still clearly distinguished from the pinkish ground streak. As we could expect, CPI and DPK took the cloud in question quite near the evening terminator before opposition.

We thus far lined up the images in accordance with LMT during the seasons from  $\lambda=085^\circ\text{Ls}$  to  $\lambda=145^\circ\text{Ls}$ , but could not discriminate the change of the strength of the cloud or the dependency of the cloud on the seasons.

We finally list up below some excellent elements

of the ISMO images from which we selected 16 + $\alpha$  images in the above text. All observations listed below are supposed to contain the image of Elysium Mons. Some will be described as one image even if it is a component of the set of several images (e.g. we chose just one among a set of images made by MVI on 5 April).

We would like to express our sincere acknowledgement to the ISMO observers who contributed to this survey of the cloud aspect associated with Elysium Mons.

DATE	$\lambda$	$\omega$	$\iota$	Observer	Local Martian Time
Mar 06	099°Ls	254-270°W	24°	AWs	16h20m- 17h15m
Mar 07	099°Ls	263°W	23°	MJs	16h45m
Mar 08	100°Ls	217-250°W	22°	MVI	13h35m- 15h45m
Mar 08	100°Ls	248°W	22°	SBd	15h40m
Mar 08	100°Ls	256°W	22°	MJs	16h10m
Mar 09	100°Ls	234°W	22°	AWs	14h45m
Mar 09	100°Ls	244°W	22°	MJs	15h25m
Mar 10	100°Ls	221-224°W	21°	Mo	13h50m- 14h00m

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Mar 12 101°Ls	200°W	20°	MJs	12h20m
Mar 12 101°Ls	202°W	20°	SBd	12h30m
Mar 12 101°Ls	210-217°W	20°	MVl	13h00m- 13h30m
Mar 13 102°Ls	189°W	20°	MJs	11h35m
Mar 18 104°Ls	276°W	17°	JPp	17h10m
Mar 18 104°Ls	214-253°W	16°	MKd	13h00- 15h35m
Mar 20 105°Ls	278°W	16°	CPI	17h15m
Mar 21 105°Ls	258°W	15°	SQR	15h50m
Mar 23 106°Ls	177°W	13°	MKd	10h20m
Mar 29 109°Ls	255°W	09°	EMr	15h15m
Mar 30 109°Ls	222-269°W	08°	CTr	13h00m- 16h10m
Apr 01 110°Ls	205°W	07°	EMr	11h50m
Apr 01 110°Ls	230°W	07°	PGc	13h30m
Apr 02 111°Ls	187°W	06°	DPk	10h32m
Apr 02 111°Ls	223°W	06°	PGc	12h55m
Apr 03 111°Ls	182°W	05°	FWl	10h10m
Apr 03 111°Ls	182°W	05°	PGc	10h10m
Apr 05 112°Ls	290°W	03°	BCr	17h10m
Apr 05 112°Ls	293°W	03°	MVl	17h25m
Apr 06 112°Ls	161°W	03°	PGc	08h35m
Apr 06 113°Ls	287°W	03°	BCr	17h00m
Apr 08 114°Ls	272°W	02°	AWs	15h55m
----- opposition -----				
Apr 09 114°Ls	274-284°W	02°	Mo	15h45m-16h30m
Apr 10 115°Ls	291°W	02°	AWs	16h55m
Apr 11 115°Ls	259°W	03°	AWs	14h45m
Apr 12 115°Ls	252°W	03°	Km	14h15m
Apr 13 116°Ls	207-241°W	04°	MVl	11h12m- 13h30m
Apr 13 116°Ls	223-243°W	04°	BCr	12h15m- 13h35m
Apr 13 116°Ls	224-257°W	04°	MJs	12h20m- 14h30m
Apr 13 116°Ls	240°W	04°	SBd	13h25m
Apr 14 116°Ls	199-241°W	05°	MJs	10h35m- 13h25m
Apr 14 116°Ls	219°W	05°	SBd	11h55m
Apr 14 116°Ls	220-231°W	05°	BCr	12h00m- 12h45m
Apr 14 116°Ls	221-248°W	05°	MVl	12h05m-13h50m
Apr 14 116°Ls	229°W	05°	AWs	12h35m
Apr 15 117°Ls	184-224°W	06°	MVl	09h30m- 12h10m
Apr 15 117°Ls	204-223°W	06°	MJs	10h50m- 12h10m
Apr 15 117°Ls	230°W	06°	Km	12h35m
Apr 18 118°Ls	188°W	08°	Km	09h40m
Apr 22 120°Ls	276°W	12°	PLw	15h15m
Apr 23 121°Ls	274°W	13°	RBs	15h05m
Apr 24 121°Ls	181°W	13°	MJs	08h50m
Apr 24 121°Ls	211°W	13°	MKd	10h50m
Apr 26 122°Ls	297-303°W	14°	DPc	16h30m- 16h55m
Apr 27 122°Ls	288-306°W	15°	DPc	15h50m- 17h05m
Apr 28 123°Ls	279-308°W	16°	DPc	15h12m- 17h10m

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Apr 28 123°Ls	232°W	16°	MLw	12h05m
Apr 30 124°Ls	197°W	18°	DTy	09h36m
May 03 125°Ls	163-201°W	20°	CPI	07h10m- 09h45m
May 03 125°Ls	175°W	20°	LA <sub>t</sub>	08h00m
May 03 125°Ls	176°W	20°	RBs	08h05m
May 04 126°Ls	167°W	21°	DTy	07h25m
May 04 126°Ls	169°W	21°	MLw	07h30m
May 05 126°Ls	226°W	21°	EMr	11h20m
May 05 126°Ls	254-261°W	21°	WFl	13h10m- 13h40m
May 06 126°Ls	230°W	21°	PGc	11h35m
May 06 126°Ls	240°W	21°	EMr	12h15m
May 06 126°Ls	245-252°W	21°	WFl	12h35m- 13h05m
May 12 129°Ls	185°W	25°	PGc	08h20m
May 12 129°Ls	288°W	25°	MJs	15h10m
May 18 132°Ls	244°W	29°	Mo	12h00m
May 18 132°Ls	252°W	29°	Km	12h30m
May 21 134°Ls	241°W	30°	Km	11h45m
May 23 135°Ls	189°W	31°	MVl	08h10m
May 23 135°Ls	226°W	31°	Km	10h40m
May 25 136°Ls	179°W	32°	MJs	07h30m
May 29 138°Ls	139-178°W	33°	MJs	04h45m-07h20m
May 31 139°Ls	237-290°W	34°	XDp	11h10m- 14h44m
June 01 139°Ls	257°W	35°	LA <sub>t</sub>	12h30m
June 02 140°Ls	248°W	35°	LA <sub>t</sub>	11h50m
June 08 143°Ls	274°W	37°	JBd	13h30m
June 11 144°Ls	262°W	37°	WFl	12h40m
June 12 145°Ls	249°W	38°	WFl	11h44m

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**CMO #434/ ISMO #60 (25 May 2015)**

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